

❖ *Relations: Translation and Semantics* ❖

6.2. Relations: Formal Translation

We've noted before that with additional expressive power comes additional need for attention to subtleties not found in earlier, 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-place predicates to multi-place 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** the 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 see

¹¹ In 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 like "give" or "put" has three.

later, the easy synonymy between active and passive sentences hits a bump when quantifiers are added to the mix.)

Likewise with a three-place relation phrase: if Kitty transfers possession of her handgun, Old Reliable, 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
Kitty gave Trixie Old Reliable } **H³cde**

And there's no requirement that the various 'blanks' of a relation phrase be filled by different terms. So, for instance, it's already obvious that we can 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" – here replacing the **reflexive** "herself" with "Neko" (just as in earlier chapters we replaced pronouns).

Neko likes herself **I²aa**

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

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

Neko likes herself and Jack likes himself ($I^2AA \wedge I^2BB$)
Neko and Jack like each other

“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
 I^2ab : 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 **c:** Jack **f:** Lucretia
 I^2ab : 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.]

Finally, we note that there are relation phrases that look similar to, and are indeed meaning-wise related to, simple predicates, but which still aren’t translated into the

formal language the same way. The next sentence, for instance, seems unobjectionable.

Neko's taller than Jack, but she's not tall.

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

a: Neko **b:** Jack
J²ab: a is taller than b

Neko is **taller than** Jack, but she's not **tall**.

(J²ab ∧)

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

a: Neko **b:** Jack
J²ab: a is taller than b
K¹a: a is tall

Neko is **taller than** Jack, but she's not **tall**.

(J²fa ∧ ~K¹a)

[For Chapter Five:

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

³ We can bring out the semantic relation between “is tall” and “is taller than” by noting that “is tall” 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.]

It may be true that Letitia is older than Neko, but false that Lucretia is old.
It may be true that Jake likes broccoli more than kale, but still false that Jake likes broccoli. (Here “likes” means...?)

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

This last sentence is a Chapter Five sentence; so this whole point can be raised in Chapter Five. “All milk contains calcium” will need, as a predicate for the English subject “milk” a predicate like “is (a sample of) milk”.

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 discussion 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.