24.903 Week #9 – 2022-04-04 + 2022-04-06

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1 The case of *only*

(1) Only boxes are blue.

What relation between the two sets does *only* claim to hold?

only as the converse of *all*:

(2) *only* (A)(B) = B⊆A

only is not conservative:

(3) Only boxes are blue ≠ only boxes are boxes that are blue.

Maybe *only* isn't a determiner quantifier:

(4) a. Only Amel slept.

b. Only two books were bought.

c. Tayla only bought jewelry.

2 Some work on conservativity and other universals of quantification

2.1 Theoretical work

- Kai von Fintel & Edward L Keenan. 2018. Determiners, conservativity, witnesses. *Journal of Semantics* 35(1). 207–217. DOI: 10.1093/jos/ffx018
- Richard Zuber & Edward L Keenan. 2019. A note on conservativity. *Journal of Semantics* 36(4). 573–582. DOI: 10.1093/jos/ffz007

- Tyler Zarus Knowlton et al. 2021. Determiners are "conservative" because their meanings are not relations: Evidence from verification. *Semantics and Linguistic Theory (SALT)* 30. 206. DOI: 10.3765/salt.v30i0.4815

2.2 Empirical work

- Dorothy Ahn & Uli Sauerland. 2017. Measure constructions with relative measures: Towards a syntax of non-conservative construals. *The Linguistic Review* 34(2). 215–248. DOI: 10.1515/tlr-2017-0001
- Maribel Romero. 2021. The many readings of *many*: Pos in the reverse proportional reading. *Linguistics and Philosophy* 44(2). 281–321. DOI: 10.1007/s10988-019-09288-1
- Dorothy Ahn & Heejeong Ko. 2022. On non-conservativity of Korean floating quantifiers. *Glossa: a journal of general linguistics* 7(1). DOI: 10.16995/glossa.5776
- İsa Kerem Bayırlı. 2022a. Proportionality and conservativity: The view from Turkish. *Glossa: a journal of general linguistics* 7(1). DOI: 10.16995/glossa.5767
- İsa Kerem Bayırlı. 2022b. The left-CONS2 Constraint. LingBuzz: 006429
- Elizabeth Coppock. 2022. Part-introducing 'percent' in English. *Glossa: a journal of general linguistics* 7(1). DOI: 10.16995/glossa.5791
- Haoze Li. 2022. Relative measurement and scope in Mandarin. *Glossa: a journal of general linguistics* 7(1). DOI: 10.16995/glossa.5787

2.3 Formal/machine learning work

- Shane Steinert-Threlkeld & Jakub Szymanik. 2019. Learnability and semantic universals. *Semantics and Pragmatics* 12(4). 1. DOI: 10.3765/sp.12.4
- Shane Steinert-Threlkeld. 2021. Quantifiers in natural language: Efficient communication and degrees of semantic universals. *Entropy* 23(10). 1335. DOI: 10.3390/e23101335

- Iris van de Pol et al. 2021. Quantifiers satisfying semantic universals are simpler. *Proceedings of the Annual Meeting of the Cognitive Science Society* 43(43). https://escholarship.org/uc/item/1vm445rp
- Roni Katzir, Nur Lan & Noa Peled. 2020. A note on the representation and learning of quantificational determiners. *Sinn und Bedeutung* 24(1). 392–410. DOI: 10.18148/sub/2020.v24i1.874

2.4 Acquisition work

- T. Hunter & J. Lidz. 2013. Conservativity and learnability of determiners. *Journal of Semantics* 30(3). 315–334. DOI: 10.1093/jos/ffs014
- Jennifer Spenader & Jill de Villiers. 2019. Are conservative quantifiers easier to learn? Evidence from novel quantifier experiments. *Proceedings of the Amsterdam Colloquium* 22. 504–512. https://archive.illc.uva.nl/AC/AC2019/uploaded_files/inlineitem/Spenader_and_de_Villiers_Are_conservative_quantifie.pdf

3 Reminder on pronouns [from Week #5]

(5) (Working to repair a broken doodad. Where is the screwdriver?)
It's right next to it.

We assume that pronouns come with a "referential index", a number. And we assume that the context determines a "variable assignment", a function from numbers to entities.

The meaning for *it* then is stated as follows:

(6) For any context c, any world w, and any index n,
$[\![\text{it}_n]\!]^{c,w}$ = the non-human individual x such that $g_c(n) = x$,
where g_c is the variable assignment determined by context c.

Our sentence in (5) is now represented as follows:

(7) It_i is right next to it_j (where i, j are numbers)

The sentence is only felicitous in a context that determines a variable assignment that assigns non-human individuals to the indices i and j.

4 Free vs. bound variables

(8) Every player kicked the ball in front of her.

The example in (8) has two distinct interpretations:

1. *free variable*: There is a particular individual x (who is appropriately referred to by a pronoun of the f-series) such that every player kicked the ball in front of x.
2. *bound variable*: Every player is an x such that x kicked the ball in front of x.

How do we get the bound variable interpretation compositionally? In other words, how do we get (9a) to mean (9b)?

(9) a. *kicked the ball in front of her*

b. $\lambda x.\ x$ kicked the ball in front of x

5 The semantics of variable binding

We continue to assume that pronouns have indices.

We adopt the convention in syntax to also give indices to (some) noun phrases. The bound variable interpretation of our sentence would be represented initially as follows:

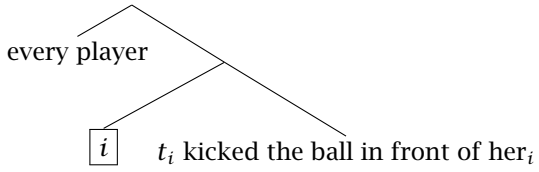
(10) [every player]$_i$ kicked the ball in front of her$_i$.

where the quantified noun phrase *every player* is co-indexed with the pronoun *her*, which is the syntactic side of variable binding.

We assume that the binding noun phrase moves (in this case, "string vacuously") and leaves behind two things: a co-indexed "trace" and a boxed index:

(11) [every player] $\boxed{i}$ t_i kicked the ball in front of her$_i$.

We assume the following tree structure after movement:



We will call $\boxed{\text{i}}$ a (variable) abstractor. We will not give it a meaning directly (although that can be done) but treat it as triggering a special composition principle called ABSTRACTION:

(12) ABSTRACTION
If an expression α has two daughters, one of which is of the form $\boxed{\text{i}}$ (where i is a number) and the other is an expression β of type t, then for any context c, and any world w,
$[\![\alpha]\!]^{c,w} = \lambda x_e.\ ([\![\beta]\!]^{c^{x/i},w} = 1)$

The principle uses the notion of a modified variable assignment, which is the central innovation in this analysis of variable binding:

(13) MODIFIED VARIABLE ASSIGNMENTS
For any context c, individual x and number i,
$c^{x/i}$ ("context c modified so as to assign x to i") is the context that is just like c except that it determines a variable assignment which differs from the variable assignment determined by c in that it assigns x to the number i.

So, even if $[\![\text{she}_i]\!]^{c,w} = \text{Marta}$, $[\![\text{she}_i]\!]^{c^{x/i},w} = x$.

Putting it all together, the meaning of "$\boxed{i}$ t_i kicked the ball in front of her$_i$" will be a function that maps any individual x to true iff "t_i kicked the ball in front of her$_i$" is true when x is assigned to the index i in both of its occurrences. So, "$\boxed{i}$ t_i kicked the ball in front of her$_i$" will characterize the set of individuals who kicked the ball in front of them. That then can combine with *every player* to give the correct meaning to our sentence.

To get used to the new machinery, we calculated the meaning of the structure "$\boxed{8}$ t_8 left". This could, for example, be the structure created as a relative clause (*who left*).

(14) For any context c, world w,
$[\![\boxed{8} \text{ she}_8 \text{ left}]\!]^{c,w}$
$= \lambda x.\ [\![\text{she}_8 \text{ left}]\!]^{c^{x/8},w}$
$= \lambda x.\ [\![\text{left}]\!]^{c^{x/8},w}([\![\text{she}_8]\!]^{c^{x/8},w})$
$= \lambda x.\ [\![\text{left}]\!]^{c^{x/8},w}(g_{c^{x/8}}(8))$
$= \lambda x.\ [\![\text{left}]\!]^{c^{x/8},w}(x)$
$= \lambda x.\ [\lambda y.\ y \text{ left in } w](x)$
$= \lambda x.\ x \text{ left in } w$

We noticed that in the end, we get the same meaning for *who*$_8$ *left* as for the (bare) predicate *left*. Their differences must thus lie in their syntax (or their meanings may in the end diverge after all). We won't explore this here.