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1 Quantificational DPs

In PLIN2001 Semantic Theory we analyzed proper names like 'Alice' and 'Ben' to be referential terms that refer to individuals/entities. Formally, for any model M, $[\![\text{Alice}]\!]^M$ is some entity in the model. This captures our intuition that whenever the proper name 'Alice' is used, the speaker refers (or at least intends to refer) to a particular person.

However, not all determiner phrases (DPs) in English can be analyzed this way, e.g.:

(1) a. every linguist
b. no angry cat
c. most students
d. few old people

These phrases are syntactically DPs in the sense that they show essentially the same distributional patterns as proper names. But as we will see, they have quite different semantic properties.

In this lecture we will explore the meanings of quantificational DPs and quantificational determiners (such as 'every', 'no', 'most', etc). Adopting **Generalized Quantifier Theory**, we will analyze the denotations of quantificational DPs like (1) as **generalized quantifiers**. Generalized quantifiers are simply functions of type $\langle\langle e, t\rangle, t\rangle$ (we will discuss why they need to be functions of this type). An important implication of this analysis is that not all DPs are of type e, or in other words, not all DPs refer.

2 Quantificational DPs do not refer to individuals

First let us convince ourselves that the denotations of quantificational DPs cannot be individuals (or in other words, they are not of type e). If they were individuals, there wouldn't be much difference between the following sentences.

(2) a. Alice smiled.
b. Every linguist smiled.

As we will see below, we need to develop different accounts for these sentences, because the proper name 'Alice' denotes an individual, but the quantificational DP 'every linguist' does not. Let us see why, by tentatively assuming the contrary, i.e. that quantificational DPs do denote individuals.

2.1 Which Individual?

If we assume that quantificational DPs denote individuals, just like proper names, then a question immediately arises: Which individuals do quantificational DPs denote?

Take, for example, 'every linguist'. Clearly, this phrase is not about a particular individual, but about all linguists. If it were to refer to an individual, then that individual has to somehow represent the totality of all linguists. You might think that such a theory could

be potentially developed, but quantificational DPs like 'no linguist' are harder to analyze this way. If 'no linguist' were to refer to an individual, that individual should somehow represent no linguist. What would that mean? Also, we would need to make sure that the referents of 'no linguist' and 'no student' could be different individuals, because the following sentences have different truth-conditions.

(3) a. No linguist smiled.
b. No student smiled.

Similarly, what would be an adequate type-*e* denotation for 'few linguists'? It might be any one linguist, or even no linguist, given that 'Few linguists are rich' is true when no linguists are rich.

Relatedly, the following passages from *Through the Looking-Glass, and What Alice Found There* by Lewis Carroll, which you might have read, illustrate the inadequacy of the hypothesis we are after. Pay attention to how the White King interprets 'nobody', which I emphasize here:

> 'Just look along the road, and tell me if you can see either of them.'
>
> 'I see **nobody** on the road,' said Alice.
>
> 'I only wish I had such eyes,' the King remarked in a fretful tone. 'To be able to see **Nobody**! And at the distance too! Why, it's as much as I can do to see real people, by this light!'
>
> . . . . . .
>
> 'Who did you pass on the road?' the King went on, holding out his hand to the Messenger for some more hay.
>
> '**Nobody**,' said the Messenger.
>
> 'Quite right,' said the King: 'this young lady saw him too. So of course **Nobody** walks slower than you.'
>
> 'I do my best,' the Messenger said in a sullen tone. 'I'm sure **nobody** walks much faster than I do!'
>
> 'He can't do that,' said the King, 'or else he'd have been here first.'

Here's another quote with a similar kind of double-meaning.

> This is a story about four people named Everybody, Somebody, Anybody and Nobody.
>
> There was an important job to be done and Everybody was sure that Somebody would do it.
>
> Anybody could have done it, but Nobody did.
>
> Somebody got angry about this, because it was Everybody's job. Everybody thought Anybody could do it, but Nobody realised that Everybody wouldn't do it.
>
> It ended up with that Everybody blamed Somebody when Nobody did what Anybody could have done.

2.2 Wrong Inferential Patterns

In addition to the question of which individuals they should refer to, quantificational DPs give rise to inferential patterns that are different from proper names. This would be unexpected, if these two types of DPs both referred to individuals.

Take the example in (4). Assuming that everyone speaks at least one language, the following statement is a tautology, i.e. it's guaranteed to be true.

(4) Alex is mono-lingual or Alex is multi-lingual.

Now replace the proper name *Alex* with a quantificational DP 'every linguist'.

(5) Every linguist is mono-lingual or every linguist is multi-lingual.

This is no longer a tautology. In fact, it is false in the actual state of affairs, given that there actually are both mono-lingual and multi-lingual linguists. If 'every linguist' denoted an individual, (5) should be tautological, because it should mean that the referent of the quantificational DP is either mono-lingual or multi-lingual, which is a tautology.

Similarly, consider the following pair of sentences.

(6) a. Alex lives in London or in Paris.
b. Alex lives in London or Alex lives in Paris.

These two sentences have the same truth-conditions. Now replace the proper name with 'every linguist'.

(7) a. Every linguist lives in London or in Paris.
b. Every linguist lives in London or every linguist lives in Paris.

These two sentences are not synonymous, although one of them entails the other (which entails which?).

Likewise, the sentences in (8) are synonymous, but the sentences in (9) are not.

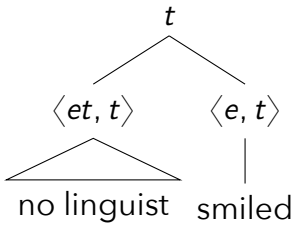
(8) a. Alex went to Paris and Amsterdam.
b. Alex went to Paris and Alex went to Amsterdam.

(9) a. No linguist went to Paris and Amsterdam.
b. No linguist went to Paris and no linguist went to Amsterdam.

These considerations point to the conclusion that quantificational DPs do not denote individuals. Then, what do they denote?

3 Generalized Quantifiers

Let us first figure out the semantic types of quantificational DPs. Take a simple sentence like 'No linguist smiled'. If the quantificational DP is not of type e, there's only one way to make the semantic composition work, namely, the quantificational DP must be of type $\langle\langle e, t\rangle, t\rangle$. From now on, we will often use the shorthand et for $\langle e, t\rangle$ to avoid clatter.



This means that it is the quantificational DP that takes the VP as its argument, rather than the other way around.

Functions of type $\langle et, t\rangle$ are called **generalized quantifiers**. Let us now ask which generalized quantifier 'no linguist' should denote. In the above sentence, it will take $[\![\text{smiled}]\!]^M$, which is a function of type $\langle e, t\rangle$. We know the truth-condition of the sentence, i.e. 'No linguist smiled' is true (with respect to model M) if an only if no linguist (in M) smiled (in M). Or to put it differently, the sentence is true in model M just in case $[\![\text{smiled}]\!]^M$ maps each linguist in m to 0. So, $[\![\text{no linguist}]\!]^M$ should say that for each linguist in M, $[\![\text{smiled}]\!]^M$ returns 0. This can be written as follows:

(10) $[\![\text{no linguist}]\!]^M([\![\text{smiled}]\!]^M) = 1$ iff for each linguist x in M, $[\![\text{smiled}]\!]^M(x) = 0$

Abstracting over the VP meaning, we get the following function of type $\langle et, t\rangle$ as the denotation of 'no linguist'.

(11) For any model M,
$[\![\text{no linguist}]\!]^M = [\lambda f \in D_{\langle e,t\rangle}.\ 1$ iff for each linguist x in M, $f(x) = 0]$

There are actually many equivalent ways of stating the body of this function, e.g. the following is an equivalent representation with (11) in our metalanguage.

(12) For any model M,
$[\![\text{no linguist}]\!]^M = [\lambda f \in D_{\langle e,t\rangle}.\ 1$ iff for no linguist x in M, $f(x) = 1]$

We can give a similar analysis to 'every linguist'. This time, it should say that the VP denotation maps every linguist to 1, instead of 0, because 'Every linguist smiled' is true (with respect to model M) iff the denotation of 'smiled' (in M) maps every linguist (in M) to 1.

(13) For any model M,
$[\![\text{every linguist}]\!]^M = [\lambda f \in D_{\langle e,t\rangle}.\ 1$ iff for every linguist x in M, $f(x) = 1]$

Likewise, for 'some linguist':

(14) For any model M,
$[\![\text{some linguist}]\!]^M = [\lambda f \in D_{\langle e,t\rangle}.\ 1$ iff for some linguist x in M, $f(x) = 1]$

and for 'most linguists':

(15) For any model M,
$[\![\text{most linguists}]\!]^M = [\lambda f \in D_{\langle e,t\rangle}.\ 1$ iff for most linguists x in M, $f(x) = 1]$

Generally, we can state the meaning of any given quantificational DP as follows.

(16) Let QP be a quantificational DP. Then, for any model M,

$$[\![\text{QP}]\!]^M = [\lambda f \in D_{\langle e,t\rangle}.\ 1 \text{ iff for QP } x \text{ in } M,\ f(x) = 1]$$

This looks trivial, but the triviality is only apparent, arising due to the fact that we are using English to analyze English (recall the distinction between metalanguage and object language mentioned mentioned in PLIN2001 Semantic Theory). If you analyze quantificational DPs in a different language using English as your metalanguage, or if you use a different language as your metalanguage, it will look less trivial as we can't state a generalization like (16).

In sum, quantificational DPs take the VP denotation, which is a function of type $\langle e, t\rangle$ and say what kind of individuals it should map to 1 to make the entire sentence true. For example, in the case of $[\![\text{every linguist}]\!]^M$, it says that the entire sentence is true, if the VP denotation maps every linguist to 1. Similarly, $[\![\text{no linguist}]\!]^M$ says that the entire sentence is true if the VP denotation maps no linguist to 1, $[\![\text{some linguist}]\!]^M$ says that the entire sentence is true if the VP denotation maps some linguist to 1, etc.