Determiners and generalized quantifiers

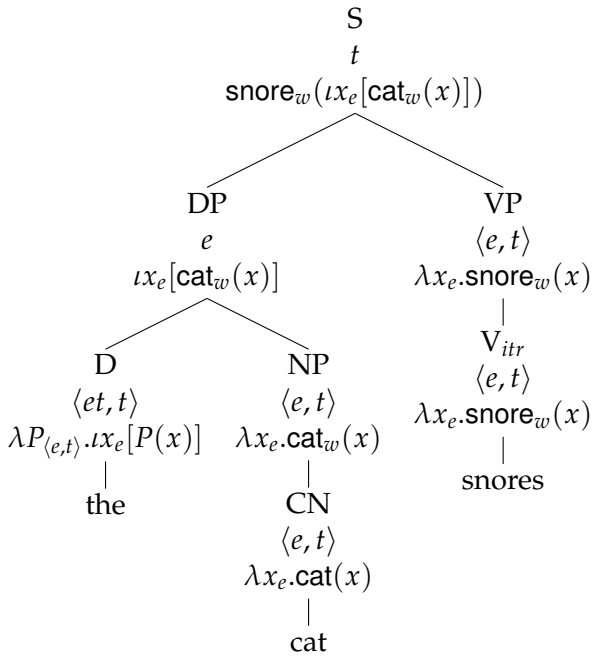
1. *The*

- A *the*-phrase denotes an referential individual of type e. The definite determiner *the* is of type $\langle et, e\rangle$: it combines with a CN/NP of type $\langle e, t\rangle$ to return an referential individual of type e.

(1) a. $[\![\text{the}]\!]^w = \lambda P_{\langle e,t\rangle}.\iota x_e[P(x)]$
(The function that applies to a predicate P and returns the **unique** entity x s.t. $P(x)$ holds)

b. $[\![\text{the cat}]\!]^w = \iota x_e[\mathsf{cat}_w(x)]$
(The unique entity x such that x is a cat)

c. The cat snores.



- The definite determiner *the* presupposes **uniqueness**.

(2) a. [Pointing at one cat], the cat snores.
b. [Pointing at two cats], # the cat snores.

This presupposition is modeled as introduced by the presupposition of the ι-operator:

(3) $\iota x_e[P(x)]$ is defined iff there exists exactly one x such that $P(x) = 1$. Formally:
a. $[\![\text{the}]\!] = \lambda P_{\langle e,t\rangle} : \exists 1! x[P(x)].\iota x_e[P(x)]$
b. $[\![\text{the}]\!] = \lambda P_{\langle e,t\rangle} : \exists x[P(x) \wedge \forall y[P(y) \rightarrow y \leq x]].\iota x_e[P(x) \wedge \forall y[P(y) \rightarrow y \leq x]]$

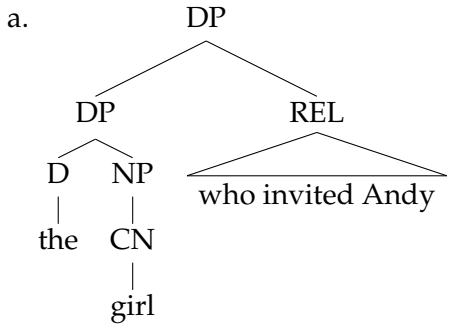
NB: Definition (b) is more preferable since it also extends to plural definite descriptions like *the cats*.

- Adding relative clauses (REL)

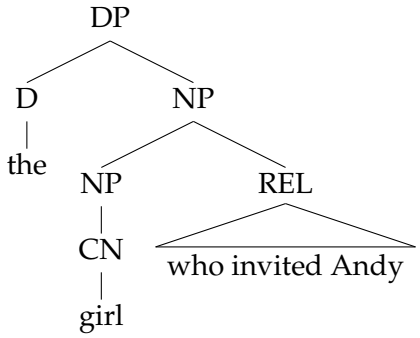
  Discussion: Which of the following (simplified) trees correctly describes the structure of the definite description "the girl who invited Andy"? [In other words, does the relative clause "who invited Andy" modify "girl" or "the girl"?] Why?

  (4) the girl who invited Andy

a.

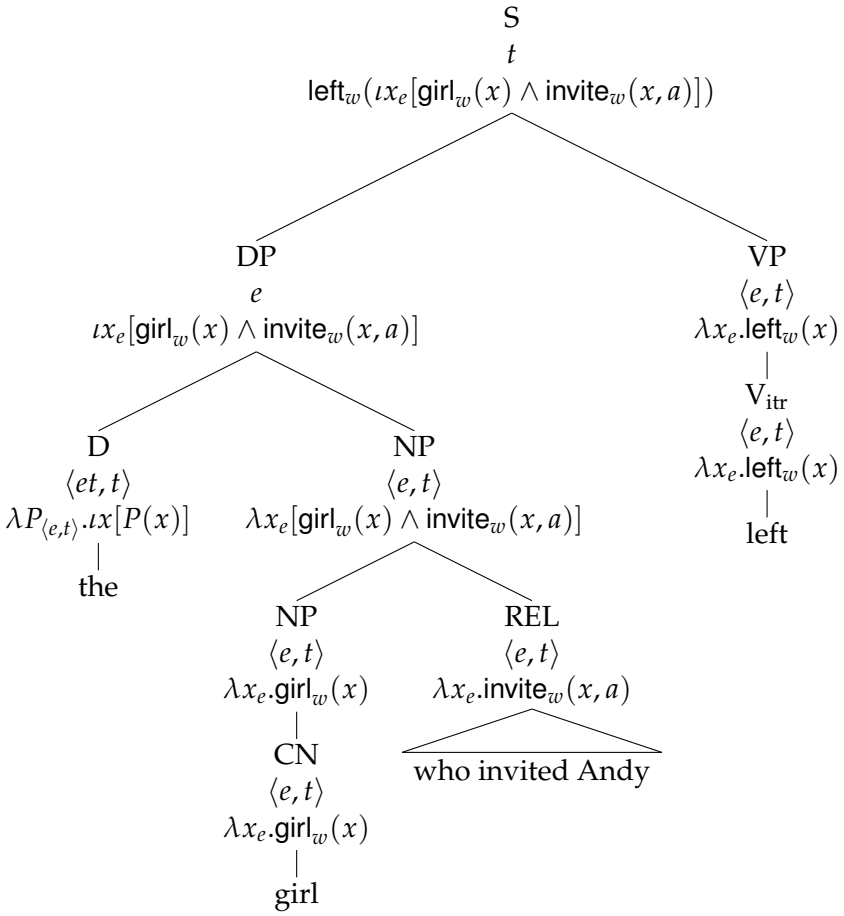


b.



- **Exercise:** Compose the following sentence:

  (5) The girl who invited Andy left.



2. Generalized quantifiers and quantificational determiners

- Recall: We define quantificational determiners like *some* and *every* as relations between two sets of entities.

  (6) a. Some cat meows.
  b. Every cat meows.
  c. No cat meows.

2.1. Generalized quantifiers

- Quantificational DPs (e.g. *everything*, *something*, *nothing*, *every cat*, *some cat*, *no cat*) are not individuals (of type e): (cf. proper names like *John*, definite DPs like *the cat*), nor individual sets (of type $\langle e, t \rangle$) (cf. common nouns like *cat*).

  – They are not individuals. Compare with e-type NPs:

  (7) *Law of Contradiction*
  a. Mary is coming and Mary is not coming. (Contradiction)
  b. Someone is coming and someone is not coming. (Not contradiction)

  (8) *Law of Excluded middle*
  a. Mary is coming or Mary is not coming. (Tautology)
  b. Every is coming or everyone is not coming. (Not tautology)

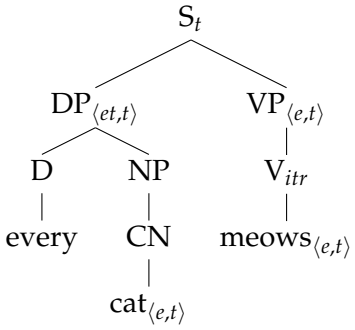
  (9) *Only an e-type NP can normally license a singular discourse pronoun.*
  a. John /the man/ a man walked in. He looked tired.
  b. Every man /no man/ more than one man walked in. *He looked tired.

  – They are also not sets/predicates.
  * N-words: It is hard to think of *nobody* as a set. The best thing we can do is to treat it as an empty set. But then *nobody* and *no linguist* would be semantically equivalent, contra fact.
  * Numeral modified quantifiers: It's unclear what set *at least one question* and *at most three questions* refer to.

  Discussion: Can you think of more differences between generalized quantifiers and e-type NPs or common nouns?

- We treat quantificational DPs as second-order functions of type $\langle et, t\rangle$, called **generalized quantifiers**. In (10), *moews* is an argument of *every cat*.

(10) Every cat meows.



(11) a. $[\![\text{every cat}]\!]^w = \lambda P_{\langle e,t\rangle}.\forall x[\mathsf{cat}_w(x) \rightarrow P(x)]$

b. $[\![\text{every cat meows}]\!]^w = [\![\text{every cat}]\!]^w([\![\text{meows}]\!]^w)$
$= (\lambda P_{\langle e,t\rangle}.\forall x[\mathsf{cat}_w(x) \rightarrow P(x)])(\lambda y_e.\mathsf{meows}_w(y))$
$= \forall x[\mathsf{cat}_w(x) \rightarrow \mathsf{meows}_w(x)])$

(12) a. $[\![\text{some cat}]\!]^w = \lambda P_{\langle e,t\rangle}.\exists x[\mathsf{cat}_w(x) \wedge P(x)]$

b. $[\![\text{some cat meows}]\!]^w = \exists x[\mathsf{cat}_w(x) \wedge \mathsf{meows}_w(x)]$

(13) a. $[\![\text{no cat}]\!]^w = \lambda P_{\langle e,t\rangle}.\neg\exists x[\mathsf{cat}_w(x) \wedge P(x)]$

b. $[\![\text{no cat meows}]\!]^w = \neg\exists x[\mathsf{cat}_w(x) \wedge \mathsf{meows}_w(x)]$

2.2. Type-shifters

- Individuals (of type e) can also be shifted into generalized quantifiers via *type-lifting*.

(14) $\textsc{lift} = \lambda a_\alpha \lambda P_{\langle \alpha,t\rangle}.P(a)$

(15) a. $[\![\text{Kitty}]\!]^w = k$

b. $\textsc{lift}([\![\text{Kitty}]\!]^w) = \lambda P_{\langle e,t\rangle}.P(k)$

c. $(\textsc{lift}([\![\text{Kitty}]\!]^w))([\![\text{meows}]\!]^w) = (\lambda P_{\langle e,t\rangle}.P(k))(\lambda x_e.\mathsf{meows}_w(x))$
$= (\lambda x_e.\mathsf{meows}_w(x))(k)$
$= \mathsf{meows}_w(k)$

- We can extract the quantification domain of an $\exists$-quantifier via the BE-shifter (Partee 1986):

(16) $\textsc{be} = \lambda\mathcal{P}\lambda z[\mathcal{P}(\lambda y.y = z)]$

(17) $\textsc{be}([\![\text{some cat}]\!]^w) = \lambda z[(\lambda f_{\langle e,t\rangle}.\exists x[\mathsf{cat}_w(x) \wedge f(x)])(\lambda y.y = z)]$
$= \lambda z.\exists x[\mathsf{cat}_w(x) \wedge x = z]$
$= \{z \mid \mathsf{cat}_w(z)\}$

- **Discussion:** (i) What do we get by applying BE to $[\![\text{every cat}]\!]^w$ and $\textsc{lift}([\![\text{John}]\!]^w)$? (ii) What do we get by applying LIFT to $[\![\text{every cat}]\!]^w$ and $\textsc{lift}([\![\text{John}]\!]^w)$?

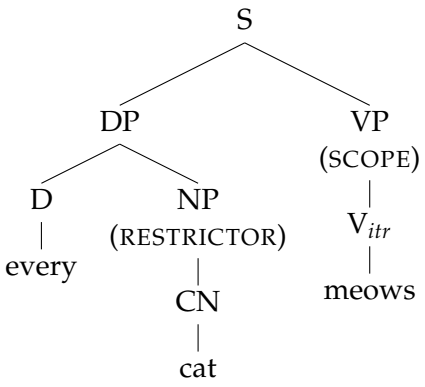
2.3. Quantificational determiners

- The determiner *every* combines with a common noun of type $\langle e, t\rangle$ to return a generalized quantifier of type $\langle et, t\rangle$. Therefore, its type is quite complex: $\langle et, \langle et, t\rangle\rangle$.

(18) a. $[\![\text{every}]\!]^w = \lambda Q_{\langle e,t\rangle} \lambda P_{\langle e,t\rangle}.\forall x[Q(x) \rightarrow P(x)]$
b. $[\![\text{some}]\!]^w = \lambda Q_{\langle e,t\rangle} \lambda P_{\langle e,t\rangle}.\exists x[Q(x) \wedge P(x)]$
c. $[\![\text{no}]\!]^w = \lambda Q_{\langle e,t\rangle} \lambda P_{\langle e,t\rangle}.\neg\exists x[Q(x) \wedge P(x)]$

- A quantificational determiner takes two arguments (both of which are of type $\langle e, t\rangle$). The first argument is its **restrictor**, and the second argument is its **scope**.

(19)



Discussion: Identify the restrictor and scope of *every* in the following sentences.

(20) a. Every student who read chapter 5 passed the exam.
b. Everyone passed the exam.
c. John read every chapter.