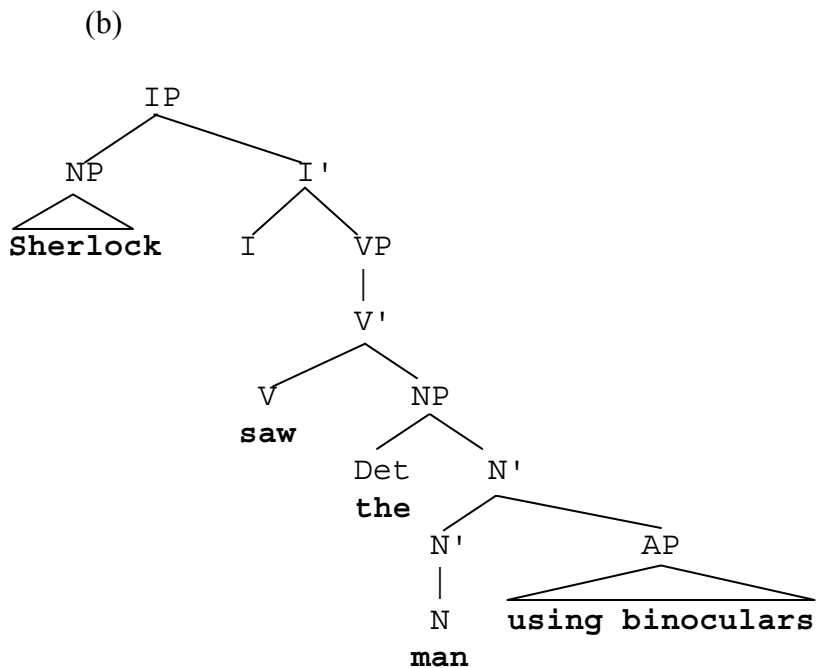
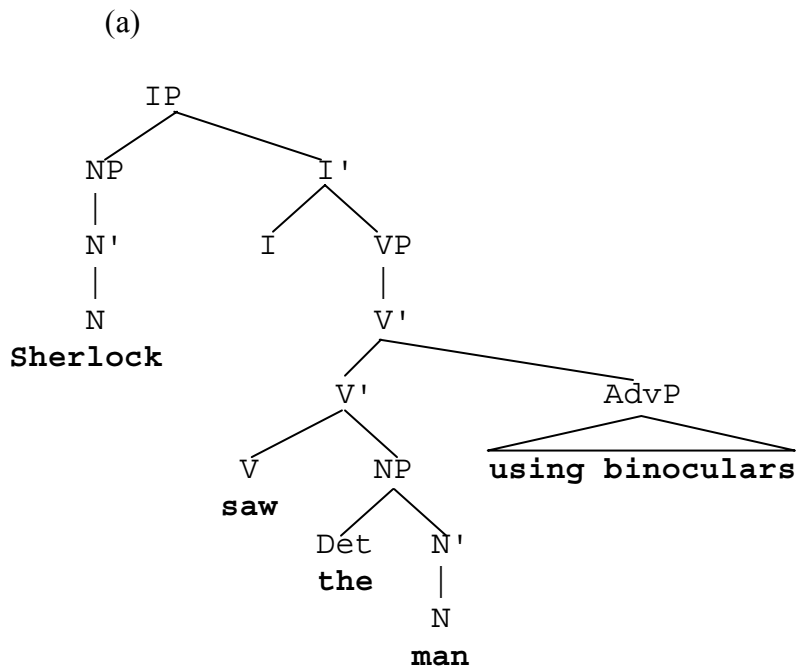


1. A Case of Structural Ambiguity

- (1) Sherlock saw the man using binoculars.
(i) Sherlock used the binoculars to see the man. [= (a)]
(ii) A man was using binoculars, and Sherlock saw him. [= (b)]



Q: How does the difference in meaning relate to the difference in structure?

Q': Put another way: If each word in (1) means the same thing in both structures, how is it that when the meanings are put together different ways, the sentence ends up meaning something different?

2. What Are Meanings?

Assumption: The meanings of words and larger expressions pick out *things* that exist in the world in some sense. These “things” can be:

- **very concrete**: me, Building 32.
- **somewhat more abstract**: the month of March, the state of being happy
- **completely abstract**: mathematical objects such as sets or functions

denotation = the “thing” that an expression picks out

3. Denotations of the Words in (1)

Sherlock: denotes a particular person, namely, Sherlock himself. (For the purposes of the example, let's assume this is a real person and we know who we're talking about.)

man: denotes a **set** – the set of men.

= $\{x: x \text{ is a man}\}$

Notice: *the man* is the same type of expression as *Sherlock*, so we want it to denote a particular individual. We also know that *the* and *man* combine to form this meaning, so how can we get this? Here's one way...

the: denotes a **function** that takes a set as an argument; let's call this function **f**:

Def: for any set S,
 $f(S) = \text{the most relevant member of } S^1$

Another assumption: the VP of a sentence always denotes a **set**, and the sentence is true iff the person/thing denoted by the subject NP is a member of that set.

Notice: *saw* by itself is not a VP, but needs a complement (direct object). So if $[saw \text{ NP}]$ denotes a set, what can *saw* by itself denote? Here's one answer...

¹ Linguists actually argue for a different function, but it would take me too far afield to motivate it. The key here is just that *the* denotes a function that takes a set and yields something that's a member of that set.

saw: denotes a **function** that takes a person/thing as argument and yields a **set**. Let's call this function **g**.

Def: for any person/thing x ,

$$g(x) = \{y: y \text{ saw } x\}$$

using binoculars: For simplicity, I'm not going to talk about the internal composition of this is (i.e., what *using* denotes and what *binoculars* denotes). I'm simply going to assume that *using binoculars* denotes a set, namely the set of people who were using binoculars

$$= \{x: x \text{ was using binoculars}\}^2$$

4. How Are Meanings Put Together?

Assumption 1: The meanings are put together "as you go up the tree." For example, in

(1.a) *the* and *man* combine together first before combining with *saw*.

Constituent Structure reflects semantic composition (and vice versa)

Assumption 2: There are three ways that meanings are put together:

- A function applies to an argument: If one constituent denotes a function, then it applies to its sister, taking the denotation of the sister as its argument.
- Two sets are intersected: If two sisters both denote sets, then you take the intersection of the sets.

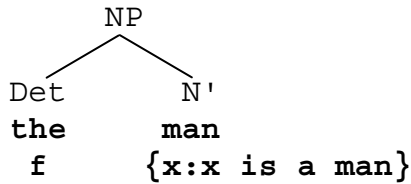
[Def. of set intersection: Given two sets A and B , $A \cap B$ ("A intersect B") is another set, and it contains everything that is a member of both A and B.]

- Check whether something is a member of a set: At the top level of the sentence, the subject will denote a person/thing and the VP will denote a set. The sentence is true iff that person/thing is a member of that set.

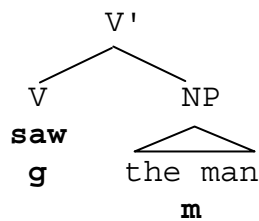
² I'm putting *was using* in there instead of *is using* because the sentence is in the past tense. In real semantic theories, this is accomplished by having the past tense itself denote a function, but it would get too complicated to do this at this point.

5. How does this work in the two structures for (1)?

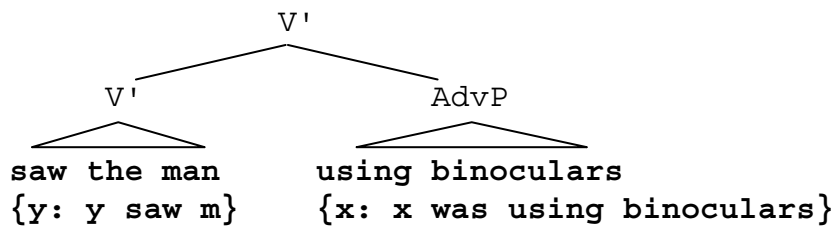
5.1. Structure (a) [Sherlock was using binoculars]



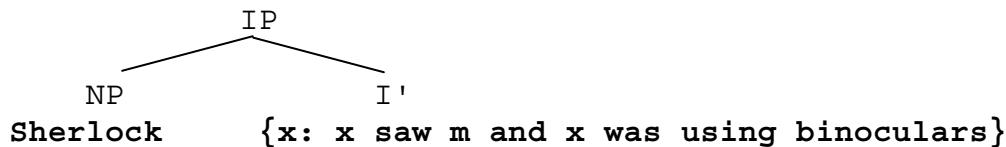
→ *the man* denotes
 $f(\{x: x \text{ is a man}\}) = \text{the most relevant man, let's call him } m$



→ *saw the man* denotes
 $g(m) = \{y: y \text{ saw } m\}$

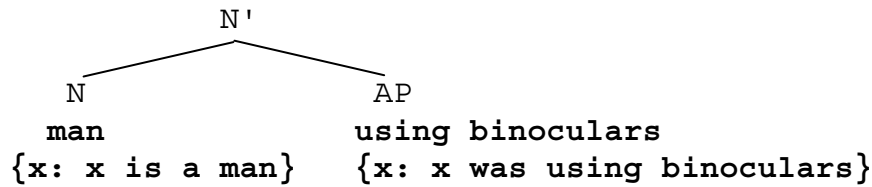


→ *saw the man using binoculars* denotes
 $\{y: y \text{ saw } m\} \cap \{x: x \text{ was using binoculars}\}$
 $\{x: x \text{ saw } m \text{ and } x \text{ was using binoculars}\}$

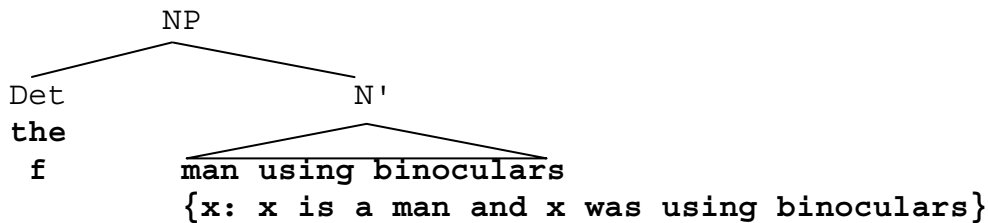


→ THE SENTENCE IS TRUE IFF
 $\text{Sherlock} \in \{x: x \text{ saw } m \text{ and } x \text{ was using binoculars}\}$

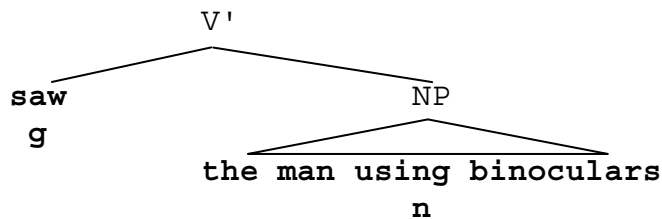
5.2. Structure (b) [the man was using binoculars]



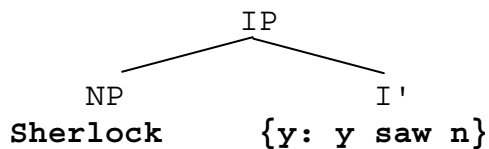
→ *man using binoculars* denotes
 $\{x: x \text{ is a man}\} \cap \{x: x \text{ was using binoculars}\}$
 $= \{x: x \text{ is a man and } x \text{ was using binoculars}\}$



→ *the man using binoculars* denotes
 $= f(\{x: x \text{ is a man and } x \text{ was using binoculars}\})$
 $= \text{the most relevant man who was using binoculars, let's call him } n.$



→ *saw the man using binoculars* denotes
 $g(n) = \{y: y \text{ saw } n\}$



→ THE SENTENCE IS TRUE IFF
 $\text{Sherlock} \in \{y: y \text{ saw } n\}$

6. And if you want to learn more about semantics...

Talk to Tamina or take 24.903!