564 Lecture 18 Oct. 26, 1999

Homework:

1. p. 67, last exercise on the page.

(a) To shift a predicate to the more complex modifier type

[λf $D_{<e,t>}$ in an n-place predicate of type $<_1e,<_2e,..<_ne,t>>>$**.** [λg $D_{<e,t>}$ **.** [λx D_e **.** g(x)=1 and f(x)=1]]]]

Or in words: Take any function f of type <e,t> in an n-place predicate of type $<_1e,<_2e,..<_ne,t>>>$, and change it to a function g of type <<e,t>,<e,t>> such that for any function h of type <e,t> and for any x in D_e, g(h)(x)=1 if h(x)=1 and f(x)=1.

Let's see how this will work if we apply it to our basic denotation for "gray" as a predicate:

[[**gray**]]: [λx D_e **.** x is gray]

if we apply our type-shifing rule to the above, we get:

[λg $D_{<e,t>}$ **.** [λx D_e **.** g(x)=1 and [[**gray**]](x)=1]]
i.e.
[λg $D_{<e,t>}$ **.** [λx D_e **.** g(x)=1 and x is gray]]

(b) To go the other way, shifting a modifier to the simpler, predicate type:

[λf $D_{<e,t>,<e,t>}$ within an n-place predicate of type $<_1e,<_2e,..<_n<e,t>,<e,t>>>>$ **.**
[λx D_e **.** such that for any (all) functions g $D_{<e,t>}$ f(g)(x)= 1]]]]

Or in words: take any function f of type $<_1e,<_2e,..<_n<e,t>,<e,t>>>>$, and change it to a function of type <e,t> such that for any function g $D_{<e,t>}$ and any x D_e , f(g)(x)=1 -- that is, change it to a function that's true just in case the element x makes "x is SOMETHING" part of the definition true no matter what the other function g is -- so let's say we have the definition of "gray" below:

[[**gray**]] = $[\lambda f \quad D_{<e,t>}$ **.** $[\lambda x \quad D_e$ **.** f(x)=1 and x is gray]

and we apply our type-shifting rule to it, we get a function like this.

$[\lambda x \quad D_e$ **.** such that for any (all) functions g $\; D_{<e,t>}$ [[**gray**]](g)(x)= 1]]]]

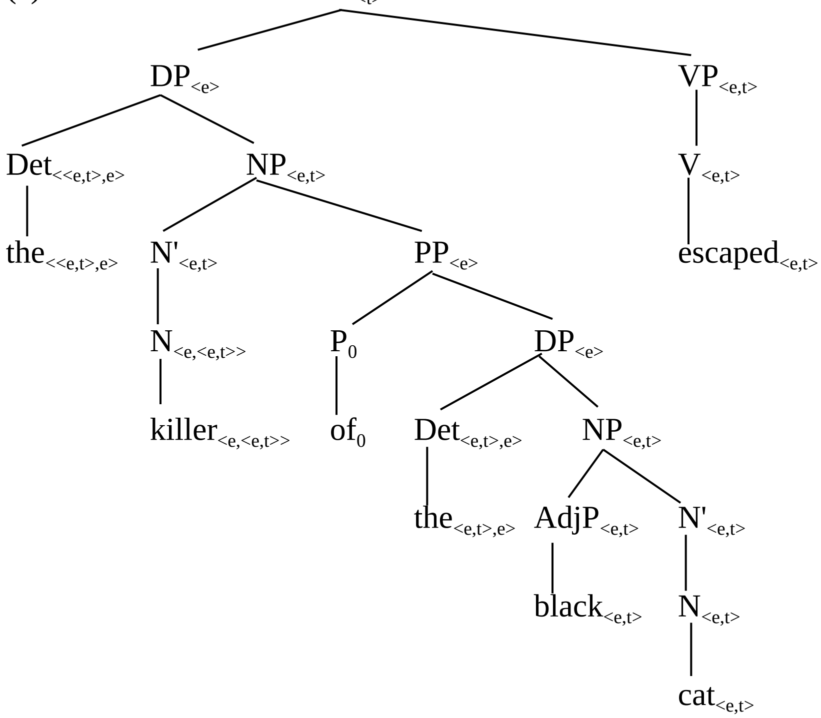
the resulting function of type <e,t> will turn out true if x is a grey cat, or a gray day, or a gray hat, or a gray carpet, or anything at all that is gray -- which is what happens in the simple <e,t> definition: $[\lambda x \quad D$. x is gray]

Interpretation of this question:

This question is asked in the context of the discussion of how to implement a type-shifting analysis of predicates/modifiers. They want you to write a rule that will apply to any n-place predicate (that is, to predicates that can take two arguments, like [[**in**]], as well as to predicates that can take one argument, like [[**gray**]]) to shift it from its type as a predicator (the simpler type) to its type as a modifier (the more complex type). Then they want you to write the same rule in reverse. This time, the rule will take the more complex type (as modifier) as input and give the simpler type (as predicate) as output. (In a type-shifting analysis, we would choose one of these two types as the basic type, to be listed in the lexicon, and then adopt one of the two type-shifting rules you'll produce as a general rule that could apply to any appropriate item in the lexicon). We're not adopting a type-shifting analysis here, but if we were, we'd need one of these rules. The crucial bit is to get it to apply to both one- and two-place predicates equivalently.

2. Exercise on p. 76

(a)



(b) (i) A real-world situation ("state of affairs") where the sentence represented in (a) is false:

There is a unique killer of a unique black cat and that person did not escape.

(ii) A real-world situation where the sentence in (a) doesn't get a denotation because the DP "The black cat" has no denotation:

There is more than one black cat, or no black cats.

(iii) A real-world situation where the sentence in (a) doesn't get a denotation because the DP "The killer of the black cat" has no denotation:

There is a unique black cat, but either there is no killer of the black cat or there is more than one killer of the black cat.

Note: these are presupposition failures. The failure in (iii) is the same failure that you get if you utter the sentence "The man who killed the black cat escaped" when the black cat is still alive.

3. Exercise 2 p. 80

(a) (i) b_1

(ii) b_2

(iii) there is no such apple.

(b) [[**leftmost**]] as a 1-place predicate:

$[\lambda x \quad D_e .$ x is leftmost$]$

Assuming that the sister to "leftmost", "dark apple in the row", is also a 1-place predicate produced by Predicate Modification along these lines:

$[\lambda x \quad D_e .$ x is dark and x is an apple in the row$]$,

then Predicate Modification will give a denotation for "leftmost dark apple in the row" along these lines:

$[\lambda x \quad D_e .$ x is leftmost and x is dark and x is an apple in the row$]$

This says that a element satisfies this function iff it is both leftmost and dark and an apple in the row -- "the leftmost apple in the row" is trying to pick out the unique apple in the row that is both leftmost and dark. If [[**leftmost**]] is a one-place predicate, then both (ii) and (iii) above should not be interpretable. In fact, however, (ii) is interpretable, and (iii) is not. So our denotation for **leftmost** must be wrong.

(c) A more satisfactory definition for leftmost will say that x is leftmost if it is the element in the set of things denoted by the sister to **leftmost** that is leftmost. That is, it'll make it relative the same way that our definition of "small" was relative to the size of things that were elephants in our first attempt. Here's a possible approach, where **leftmost** is of type $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$:

[[**leftmost**]]:

$[\lambda f \quad D_{\langle e,t\rangle} . [\lambda x \quad D_e . f(x) = 1$ and x is the leftmost element of $\{y: f(y)=1\}]]$

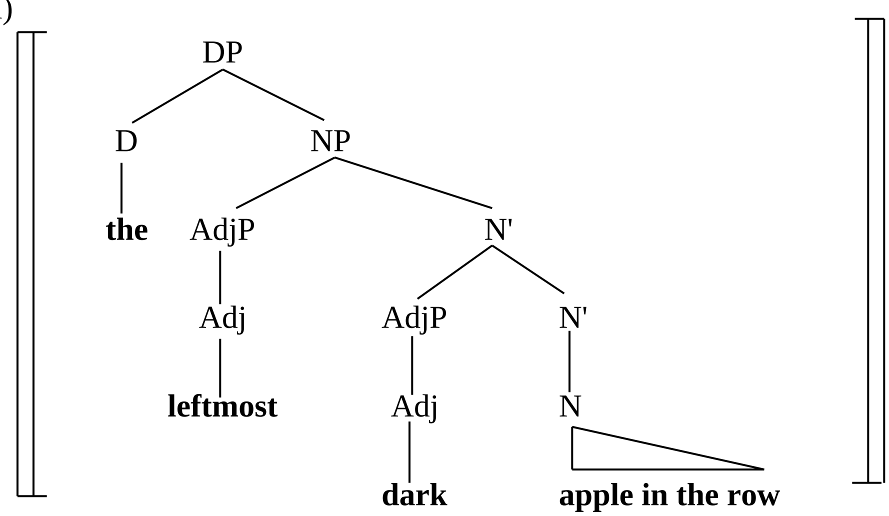
Now, consider what happens if we allow the above denotation of "leftmost" and "dark apple in the row" (abbreviated "DAinR") to combine: it'll result in the following function:

[λx D_e **.** [[**DAinR**]](x) =1 and x is the leftmost element of
{y: [[**DAinR**]](y)=1}]

that is, it's true of something (x) if x is a dark apple in the row and x is the leftmost element of all the things that are dark apples in the row.

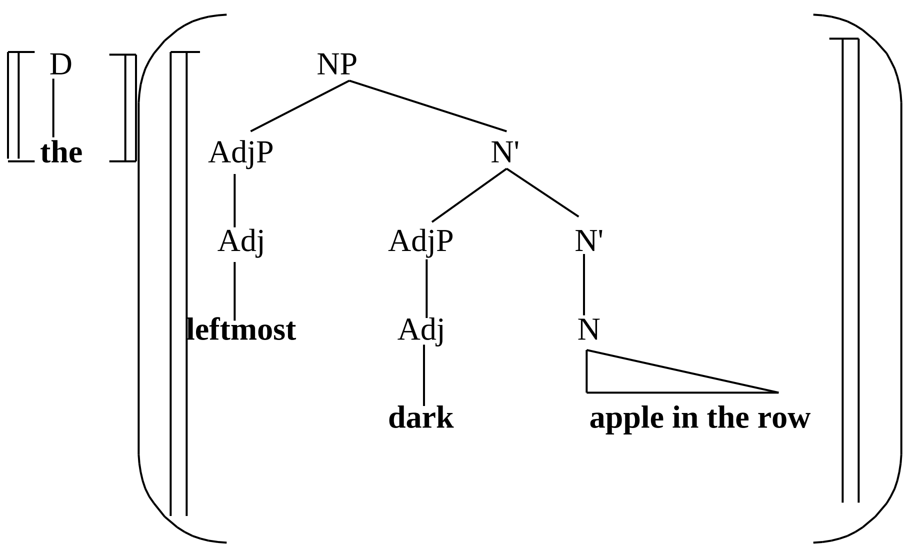
(d)

(i)



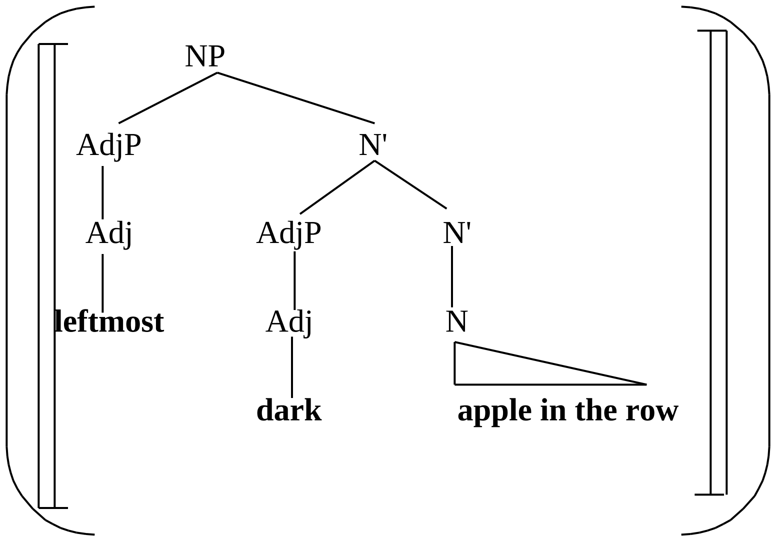
(ii)

=

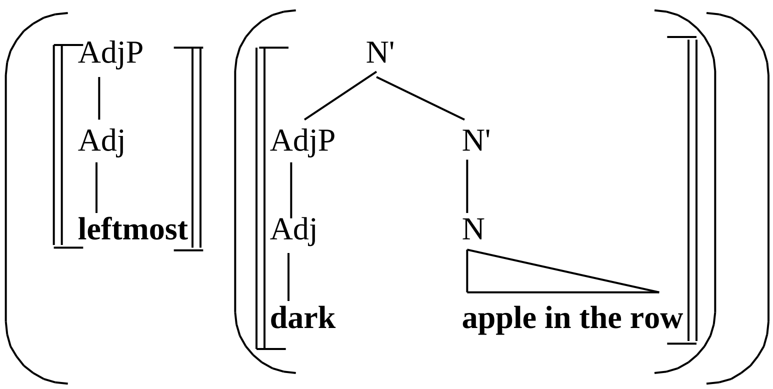


by F.A.

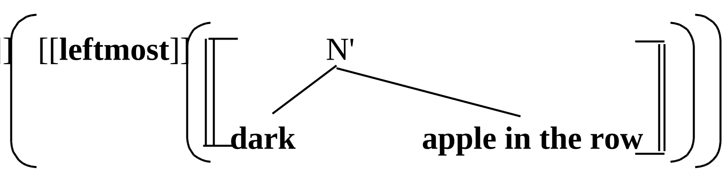
(iii)

= [[**the**]] 

by N.N.

= [[**the**]] 

by F.A.

= [[**the**]] 

by NN

= [[**the**]] ([[**leftmost**]]([λz D_e **.** [[**dark**]](x) =1 and [[**apple in the row**]]=1]))

by P.M.

= [[**the**]] ([[**leftmost**]]([λz D_e **.** z is dark and z is an apple in the row]))

by lexical entries for **dark** and **apple in the row**.

(N.B.: [λz D_e **.** z is dark and z is an apple in the row] = characteristic function of the set $\{b_2, b_4, b_5\}$

= [[**the**]] ([λf $D_{<e,t>}$ **.** [λx D_e **.** f(x) =1 and x is the leftmost element of {y: f(y)=1}]]([λz D_e **.** z is dark and z is an apple in the row]))

by lexical entry for **leftmost** (in (c) above)

= [[**the**]] ([λx D_e **.** [λz D_e **.** z is dark and z is an apple in the row](x) =1 and x is the leftmost element of {y: [λz D_e **.** z is dark and z is an apple in the row](y)=1}]]

by definition of the lambda-notation (substituting the function "[λz ...]" for all occurrences of "f").

= [[**the**]] ([λx D_e **.** x is dark and x is an apple in the row and x is the leftmost element of the set of all y such that y is dark and y is an apple in the row])

by definition of the lambda-notation (substituting the element x for all occurrences of z in the first occurrence of "[λz ...]" and substituting the element y for all occurrences of z in the second occurrence of "[λz ...]").

N.B. : [λx D_e **.** x is dark and x is an apple in the row and x is the leftmost element of the set of all y such that y is dark and y is an apple in the row] is the characteristic function of the set $\{b_2\}$

= [[**the**]] ([λx D_e **.** x is the leftmost dark apple in the row])

by simplifying the condition above.

= [λf $D_{<e,t>}$ and there's exactly one x C such that f(x)=1 **.** the unique y C such that f(y) =1] ([λx D_e **.** x is dark and x is an apple in the row and x is the leftmost dark apple in the row])

by the lexical entry for **the** (p. 81, 5').

= the unique y such that y is dark and y is an apple in the row and y is the leftmost dark apple in the row, providing that there is a unique such y.

in this case,
= b_2 **,** because there is a unique leftmost dark apple in the row, and b_2 is it.