Silent operators
at the left periphery

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1

Carlson (1983, 2006) observes that functional elements often present mismatches in form and interpretation that lexical elements do not.

- John wrote a paper because he had to [write/*wrote a paper]

- these doors   vs. These have wooden doors.

- Caesar in Italiam contendit duasque ibi   legiones conscribit
  Caesar in Italy   reached   two-and here legions   enrolled
  `… and here conscripted two legions'

- he ne sealde nanum nytene ne   nanum fisce   nane sawle
  he not gave   none   beasts not none   fish   none souls
  `he did not give beasts or fish souls'

Carlson 1983. Marking constituents. Heny & Richards, eds., *Linguistic Categories*, Kluwer.

Carlson 2006. 'Mismatches' of form and interpretation. van Geenhoven, ed., *Semantics in Acquisition*, pp. 19–36. Berlin: de Gruyter.

2

Carlson argues that there's a learning problem if the learner is supposed to figure out functional meanings from what he/she hears.

- Carlson proposes that functional elements themselves are meaningless.
- Functional meanings are carried by features or phonetically null operators that appear on the phrases over which they scope, and their effects percolate down to heads in order to receive expression, in one way or another.
- Pretty radical for 1983! (Even for 2006…)

3

Results in the past decades converge impressively with Carlson's proposal

- See a sampler of brief quotes below. Note that these issues are not simple scope/surface mismatches that are typically handled with Quantifier Raising.
- It seems that for the logical scaffolding to be phonetically null or to be even disembodied is almost the norm.
- If so, careful consideration of compositionality and learnability is called for. What are the rules of the game? Questions for discussion!

4

+/- Syntactic status

- Some of the silent operators have syntactic status: bind variables, check features, apply recursively, or have a spot in the clausal spine.

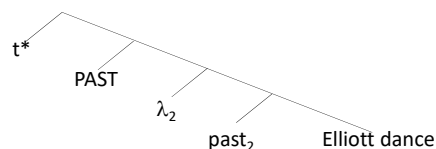   PAST, AltShift, Dist, $\exists$, $\forall$, Op$\neg$, Exh, O

- Some only/mainly make a semantic contribution.

    $\cap$, $\cup$, $\neg$

- Some may be in-between.

    type-shifters such as Lift, BE, THE, **z**, etc.

5

Kusumoto on PAST

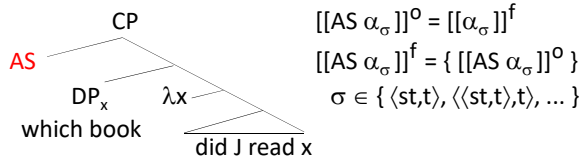$dance'$ = $\lambda x_e \, \lambda t_i \, \lambda w_s \, [dance(x)(t)(w)]$
$past'$ = g(2)
PAST' = $\lambda P_{<i,<s,t>>} \, \lambda t_i \, \lambda w_s \, \exists t''[t''<t \land P(t)(w)]$

Kusumoto 2005. On the quantification over times in natural language. *Natural Language Semantics* 13/4: 317–357.

Harley 2012. Semantics in distributed morphology. *Semantics: An International Handbook of Natural Language Meaning*, Vol. 3.
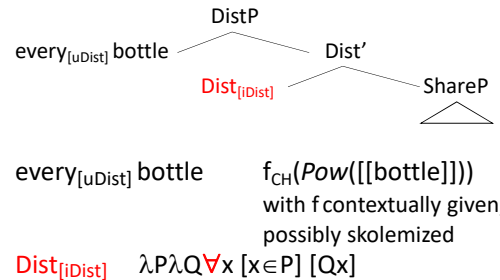
6

Kotek on Aʟᴛ[ernatives]Sʜɪꜰᴛ[er]

AʟᴛSʜɪꜰᴛ (AS) sits on the clausal spine and is the source of interrogative semantics. It takes a set of (sets of) propositions and returns the focus-semantic value of that set as the ordinary value of the question.

CP

AS

DP$_x$ λx

which book

did J read x

$[[AS\ \alpha_\sigma]]^O = [[\alpha_\sigma]]^f$

$[[AS\ \alpha_\sigma]]^f = \{\ [[AS\ \alpha_\sigma]]^O\ \}$

$\sigma \in \{\ \langle st,t\rangle,\ \langle\langle st,t\rangle,t\rangle,\ ...\ \}$

Kotek 2016. On the semantics of wh-questions. *Sinn und Bedeutung* 20.

7

Beghelli & Stowell on distributivity

DistP

every$_{[uDist]}$ bottle   Dist'

Dist$_{[iDist]}$ ShareP

every$_{[uDist]}$ bottle $f_{CH}(Pow([[bottle]]))$
with f contextually given, possibly skolemized

Dist$_{[iDist]}$ $\lambda P\lambda Q\forall x\ [x\in P]\ [Qx]$

Beghelli & Stowell 1997. Distributivity and negation. *Ways of Scope Taking* 71-109.
Szabolcsi 2010. *Quantification* (p. 190). CUP.

8

Kratzer on indefinite series

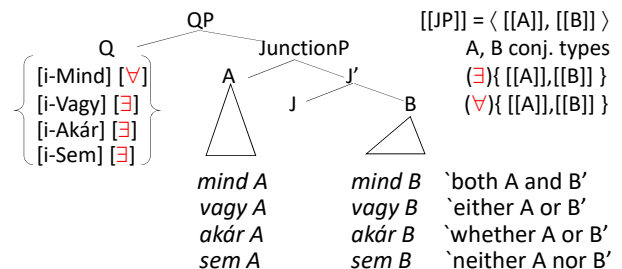|	Interrogative	**kaut**-series	**ne**-series	**jeb**-series
person	**kas**	kaut kas, kads	ne-viens	jeb-kads
thing	**kas**	kaut kas	ne-kas	jeb-kas
place	**kur**	kaut kur	ne-kur	jeb-kur
time	**kad**	kaut kad	ne-kad	jeb-kad
manner	**ka**	kaut ka	ne-ka	
determiner	**kads, kurs**	kaut kads	ne-kads	jeb-kads, jeb-kurs

That speakers of Latvian, German, or Spanish ... perceive the pronouns and determiners of the *kaut*-, *irgendein* or *algun* series as existentials would no longer mean that those expressions are ... existentials. Their existential look would be the overt expression of syntactic agreement with propositional [∃], the true carrier of existential force. Those indefinites might have an uninterpretable but pronounced [∃] feature, then, that must enter an agreement relation with a[n]... interpretable feature that happens to be unpronounced.

Kratzer 2005. Indefinites and the operators they depend on: From Japanese to Salish. Carlson & Pelletier, eds., *Reference and Quantification.*

9

Szabolcsi on strictly tuple constructions
à la Kratzer 2005, particles have [u-features]

QP

Q   JunctionP

[i-Mind] [∀]   A   J'
[i-Vagy] [∃]
[i-Akár] [∃]   J   B
[i-Sem] [∃]

mind A	*mind B*	`both A and B'
vagy A	*vagy B*	`either A or B'
akár A	*akár B*	`whether A or B'
sem A	*sem B*	`neither A nor B'

$[[JP]] = \langle\ [[A]],\ [[B]]\ \rangle$
A, B conj. types
(∃){ [[A]],[[B]] }
(∀){ [[A]],[[B]] }

Szabolcsi 2018. Two types of quantifier particles:
Quantifier-phrase internal vs. heads on the clausal spine. *Glossa* 3.

10

Ladusaw on English negative concord

When the feature [neg] occurs on clausal nodes, it will trigger the application of a propositional negation operator to the propositional interpretation of the clause otherwise determined by the composition principles. By our definition then, it is the feature [neg] which expresses negation, not the lexical category which introduces it. It follows from these assumptions that any clause whose head bears the feature [neg] will be interpreted as negated... [neg] is also affected by the principle: A category inherits the feature [neg] from a specifier sister or an adjoined sister.

Ladusaw 1992. Expressing negation. *Semantics and Linguistic Theory 2*.

11

Zeijlstra on negative concord

It.   Gianni non [iN] ¬ ha telefonato
      Gianni non [iN] ¬ ha telefonato a nessuno [uN]
      Op [iN] ¬ nessuno [uN] ha telefonato
      Op [iN] ¬ nessuno [uN] ha telefonato a nessuno [uN]

Rus. Op [iN] ¬ Ivan ne [uN] pozvonil
      Op [iN] ¬ Ivan nikomu [uN] ne [uN] pozvonil
      Op [iN] ¬ nikto [uN] ne[uN] pozvonil
      Op [iN] ¬ nikto [uN] nikomu [uN] ne[uN] pozvonil

Zeijlstra 2004. *Sentential Negation and Negative Concord*. PhD, UvA.

12

Chierchia on an abstract ¬ operator

The main peculiarity of N-words is that they can support an abstract form of negation NEG$_{[n-D]}$. I assume that NEG is a functional head governed by the following axioms:

NEG$_{[n-D]}$ must

i. co-occur with a C-commanding contentful, abstract negative operator ¬ (adjoined to NEG's projection);

ii. enter into an agreement relation in its Spec position with DP$_{[n-D]}$.

O$_{ALT}$ ¬ [Nessuno$_{[n-D]}$ NEG$_{[n-D]}$ ha telefonato]

Chierchia 2013. *Logic in Grammar,* Chapter 4. OUP.

13

Fox on (recursive) Exh

The syntax of natural language has a covert operator which is optionally appended to sentences, and this operator is responsible for Scalar Implicatures.

Crucially, [the below] is consistent with the free choice possibility, ◊p∧◊q, though it, of course, doesn't assert free choice. ... Ignorance might seem implausible, and the hearer might employ the parsing strategy again:

Exh(C')(Exh(C)(◊(p∨q))) = ◊(p∨q) ∧ ¬◊(p∧q) and ¬(◊p∧¬◊q) and ¬(◊q∧¬◊p) = ◊p ∧ ◊q and ¬◊(p∧q)

Fox 2007. Free choice and the theory of scalar implicatures. Sauerland et al. eds., *Presupposition and Implicature in Compositional Semantics.*

14

Chierchia on exhaustifier **O**

a. ||Nessuno$_{[[n-D]]}$|| = λP ∃x∈D [person(x) ∧ P(x)]

b. ||Nessuno$_{[[n-D]]}$||^{ALT} = {λP ∃x∈D [person(x) ∧ n(x) ∧ P(x)]: D'⊆D ∧ n∈Num}

c. [[n-D]] is checked by O$_{ALT}$

d. Example: O$_{ALT}$ [pro non ho visto nessuno$_{[[n-D]]}$]

O$_{ALT}$ is required in this structure to check *nessuno*'s unvalued feature [[n-D]]. Negation is required for semantic coherence; without it, exhaustification would be contradictory.

Chierchia 2013. *Logic in Grammar,* Chapter 4. OUP.

15

Zeijlstra on learning algorithm for covert Ops

1. Assume 1:1 correspondence between morpho-syntactic M and semantic content S.

2. If some M manifests the presence of semantic content S, but cannot be the carrier of S, assign [uF] to M.

3. Assign [iF] to all M that introduce the semantic context manifested by [uF]. Postulate covert Op if needed.

4. Assign [iF] to all M that are responsible for the rest of the grammatical occurrences of [uF] (even if they don't really have S semantics).

A covert Op may only be postulated if the grammaticality of a sentence cannot otherwise be accounted for.

Covert checker of [uF] must have proper sem. content S.

Zeijlstra 2014. On the uninterpretability of interpretable features. *Minimalism and beyond*. Amsterdam: John Benjamins, pp.109-129.

16

Winter on default disembodied ∩

den Dikken 2006 meets Winter 1995:

```
        JP
    A ⟋    ⟍ J'
        J ⟋  ⟍ B        J for Junction
      ∅/and
```
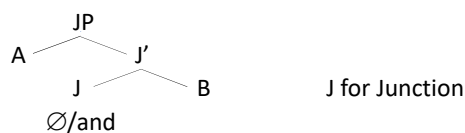
JP interpreted as a mere pair ⟨ [[A]], [[B]] ⟩.
Optional, default next step: [[A]] ∩ [[B]].
∩ is a "disembodied" operation.

den Dikken 2006. EITHER-float and the syntax of co-OR-dination. *NLLT* 24.
Winter 1995. Syncategorematic conjunction and structured meanings. *SALT 5.*

17

Szabolcsi on disembodied ∩ and ∪

• [$_{JP}$ A [$_{J'}$ J B]] interpreted as ⟨ [[A]], [[B]] ⟩. Optional, default next step: [[A]] ∩ [[B]].

• KA particles (in disjunction, question, indefinites, etc.) override the default by introducing a presupposition,

[[Host]] asymmetrically entails host's immediate context (imm. context has additional possibilities). Requires [[A]] ∪ [[B]] interpretation.

Szabolcsi 2015. What do quantifier particles do? *L&P* 38: 159-204.
Szabolcsi 2018. Two types of quantifier particles… *Glossa* 3.

18

Particles carry pre[post]-supposition, demand ∪

KA particles carry the pre[post]-supposition,
Host [[A]] asymmetrically entails A's immed. context.
Satisfied if the immediate context is [[A]] ∪ [[B]].

hyaku-nin-to**ka**   Taroo-ga hon-o kaimasita **ka**?
100-classifier-TOKA   Taroo-nom book-acc bought.pol. Q
`some 100'              `Did Taroo buy a book?'

Kannada iterated, non-exhaustive disjunction
  ii   hotel-nalli uuTa-n**oo** tinDi-n**oo** yeenaadru sigutte.
  this hotel-loc   meals or snacks or anything   will-find
  'At this hotel meals or snacks or such things are available'
                                              Amritavalli 2003: (17a)

19

What legitimates disembodied operators?

Averting L-triviality (¬)
Default interpretation (∩)
Satisfying pre[post]-supposition (∪, ∩)
Filling a language-specific gap (BE, THE)
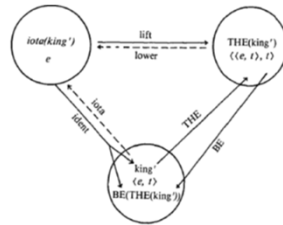
Sheer semantic need (**z** for binding, lift, AltShift)

...?... (PAST, Gen, ◊, □, etc.)

Lessons from the type-shifting literature?

20

Partee on type-shifters
Lift, BE, THE, etc.

Jacobson on binding combinator **z**

z = λfλhλx[f(hx)(x)]
z-saw' = λfλhλx[f(hx)(x)](saw') = λhλx[saw'(hx)(x)]
z-saw(his_dog)' = λhλx[saw'(hx)(x)](λy[the-dog-of'(y)])
                    = λx[saw'(the-dog-of'(x))(x)]

Partee 1987. Noun Phrase interpretation and type-shifting principles.
Jacobson 1999. Towards a variable-free semantics. *L&P 22*: 117-184.

21

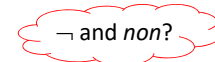## Chierchia on type shifting as last resort

Blocking Principle
For any type shifting operation τ and any X:
      * τ(X)
if there is a determiner D such that for any set X in its
domain, D(X) = τ(X).

English has *the* interpreted as ι, and *a(n)* interpreted
as ∃. This leaves ∩ (property to individual correlate)
as the only option English can use in a covert way.

¬ and *non*?

Chierchia 1998. Reference to kinds across languages. *NLS* 6: 339-405.

22

Partee & Rooth on lifting vs. lowest types

(i) Enter each verb lexically in its minimal type.
(ii) Lexical rules furnish "higher"-type homonyms.
(iii) Processing strategy: Higher-type homonyms only
when needed for type coherence (e.g. *need and buy a
new coat*).

• (iii) undergenerates – and "flip-flop" overgenerates:

The dept. is looking for a phonologist or a phonetician
OK `... but I don't know which'
Mary indicated that every student failed or got a D
`indicated that every st. failed or every st. got a D'
OK `ind. that every st. failed or ind. that every st. got a D'

Partee & Rooth 1983. Generalized conjunction and type ambiguity.

23

More questions

• What (kind of) operators are never disembodied?

• In what positions do null/disembodied ops occur?

• Are null/disembodied ops subject to "no crossing"
  as non-variable-binding operators (heads)?

• Are the rules different for these operators and
  for overt functional elements?

24

4