for-adverbials and the specified quantity generalization

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Goals of this talk:

- to argue and present novel evidence that the scopal behavior of *for*-adverbials and of mass/plural quantifiers like *all, most* are governed by the same principles (Carlson, 1981; Moltmann, 1991, 1997).
- to present a novel generalization in need of formalization.

Background. The standard account of *for*-adverbials is that they contain a distributive (near-)universal quantifier over subevents or (temporal) subintervals. (e.g. Dowty, 1979; Krifka, 1998). This explains why they accept atelic predicates:

(1) John ran for an hour
≈ *Within each subinterval/subevent during an hour, John ran.*

and why they reject telic predicates:

(2) #John built this house for a month.
≈ *Within each subinterval/subevent during a month, John built this house.*

Why the standard account can't be the whole story. Treating *for* as a quantifier doesn't account for its restricted scopal behavior.

(3) John found a flea on his dog for a month. (Zucchi and White, 2001)
a. There is a flea that John found on his dog for a month. *(pragm. odd)*
b. *Over the course of a month, John found different fleas on his dog

⇒ the indefinite *a flea* must outscope the *for*-adverbial

(4) John found a flea on his dog every day for a month.
a. There is a flea that John found on his dog every day for a month. *(odd)*
b. On every day during a month, John found a (different) flea on his dog.

⇒ the indefinite *a flea* doesn't have to outscope the *for*-adverbial

Why is this a puzzle?

- Dowty (1979) does not impose any constraints on the scope of *for*-adverbials and of indefinites

  ⇒ Fails to predict that (3) has only one reading

- Krifka (1998), Kratzer (2007) force quantifiers to in effect take scope above *for*-adverbials

  ⇒ Fails to predict that (4) has two readings

- Zucchi and White (2001) suggest two semantic mechanisms that hard-wire the fact that *a flea* takes narrow scope in (3) but not (4):

  – either *a flea* is not a quantifier, but introduces a free variable in the style of Kamp (1981); Heim (1982) that is existentially bound underneath *every day*, if present, or else at the discourse level

  – or *find a flea* only applies to flea-finding events that are *maximal* with respect to a time interval variable that is bound universally by *every day*, if present, or else existentially by *for a month*.

  ⇒ Makes the right predictions for (3) and (4) by design

Why Zucchi and White (2001) can't be the end of the story

- Does not leave room for exceptions in which an indefinite takes narrow scope:

  (5) [In a report discussing the daily intake of medications by a certain patient:] The patient took two pills for a month and then went back to one pill. (after Moltmann (1991))
  ⇒ *two pills* can have narrow scope below the *for*-adverbial, unlike (3)

- Stipulative.

Questions, repeated for clarity:

1. Why do indefinites under take only wide scope over *for*-adverbials unless there is supporting context?
2. Why does *every day* make it possible for indefinites to take low scope?

Suggested answers.

1. *for*-adverbials contain *intermediate distributors*: i.e. universal quantifiers over nonatomic entities of vague size.
2. When the level of granularity is left open, a predicate that contains a quantifier with an overt determiner cannot be applied distributively to nonatomic entities.
   - That's why *find a flea* is incompatible with *for a month* in (3): it can't apply distributively to subintervals of the month because their size is left open
3. In a context that specifies the level of granularity, any predicate can be applied distributively to nonatomic entities.
   - That's why *take two pills* can take scope under *for a month* in (5)

4. *every* lexically specifies the level of granularity and allows any predicate to apply distributively.

   - That's why *find a flea every day for a month* is ok in (4) on the narrow-scope reading

Supporting evidence for these four claims.

1. *for*-adverbials contain *intermediate distributors*: i.e. universal quantifiers over nonatomic entities of vague size.

   - Intermediate distributivity (aka neutral readings) has been widely discussed (Scha, 1981; Gillon, 1987, 1990; van der Does, 1993; Heim, 1994; Schwarzschild, 1991, 1996)

     Example: Suppose *these men* refers to Tom, Dick and Harry.

     (6) These men lifted the piano.
     True in a scenario where there were only two piano liftings: one by Tom and Dick, and the other one by Dick and Harry

   - Evidence that *for*-adverbials distribute over subintervals of vague size comes from the *minimal-parts problem* (Taylor, 1977; Dowty, 1979, a.o.)

     Background: Waltzing takes at least three steps, so can't be true at instants

     (7) John and Mary waltzed for an hour
     $\not\Rightarrow$ #John and Mary waltzed within every single moment of the hour
     $\Rightarrow$ John and Mary waltzed within every short subinterval of the hour

   - One could maintain that we don't know what goes on at instants, so *waltz* could be true at instants in a technical sense. Here is an argument that doesn't suffer from this flaw: *for*-adverbials cannot be true at each instant, because there would be no room for gaps.

     (8) Mary slept in the attic for a week. (Partee p.c. to Vlach (1993))
     $\not\Rightarrow$ #Mary slept in the attic within every single moment of the week
     $\Rightarrow$ Mary slept in the attic within every short subinterval of the week

   - Another type of predicates that distribute over nonatomic entities are mass NP quantifiers like *much, most, all*:

     (9) All the ground was speckled with leaves

     "When one says [(9)], one does not mean that there were absolutely no bare spots (that is even excluded by the meaning of *speckled*), only that there were no bare spots big enough to break a pattern of speckles." (Carlson, 1981)

   - This suggests that the behavior of *all* can provide explanations of the behavior of *for*-adverbials
   - *for*-adverbials license dependent plurals, which are licensed by distributive quantifiers only when these are intermediate distibutors: (see also Zweig, 2008)

(10) a. John wore yellow neckties for a week.
$\not\Rightarrow$ *John wore several neckties simultaneously.*
b. All the interns / #Every intern wore yellow neckties.
$\not\Rightarrow$ *Each intern wore several neckties.*

- In some cases, the semantics of the dependent plural itself makes it clear that the *for*-adverbial is an intermediate distributor:

(11) Mary danced pirouettes for an hour.

$\Rightarrow$ The predicate λt. *Mary danced a pirouette at* t can be applied distributively to nonatomic entities (a pirouette takes a noninstantaneous amount of time)

2. **The specified quantity generalization**: When the level of granularity is left open, a predicate that contains a noun phrase with an overt determiner cannot be applied distributively to nonatomic entities.

Parts of this generalization have often been noticed but are brought together here for the first time:

- The "quantization puzzle" (Verkuyl, 1972; Zucchi and White, 2001; Filip, 2000; Rothstein, 2004; Filip, 2008): predicates like *at least three x, a long/short x, a quantity of x, many x, a lot of x, some x, most x* fail to be quantized on their own but are still incompatible with *for*-adverbials – or [+SQA] (specified quantity) in Verkuyl's terms

(12) a. *John ate some / two / many / a quantity of apples for a week.
b. (cf.) John ate apples / applesauce for a week.

$\Rightarrow$ The predicate $\lambda t.t$ *was the runtime of an event in which John ate some / two / many apples* can't be applied distributively to parts of the week.

- Carlson (1981) notes that mass *all* cannot take scope over a singular indefinite:

(13) All the water was poured into a bottle.
A > ALL; *ALL > A

$\Rightarrow$ The predicate $\lambda x.x$ *was poured into a bottle* can't be applied distributively to parts of the water.

- Mass quantifiers tend to reject distributively interpreted VPs with overt quantifiers: (Lønning, 1987; Higginbotham, 1994)

(14) a. Most of the water contained salt.
b. *Most of the water contained ten grams of salt.

$\Rightarrow$ The predicate $\lambda x.x$ *contains ten grams of salt* can't be applied distributively to parts of the water.

- Applying a VP with a numeral to nonatomic parts of a subject is prohibited out of the blue: (e.g. Heim, 1994)

(15) These men weighed 250 lbs.
Cannot be true if Tom weighs 250 lbs by himself, and Dick and Harry weigh 250 lbs together.

⇒ The predicate $\lambda x.x$ *weighed 250 lbs* cannot be applied distributively to nonatomic entities.

- For numerals, Landman (1996, 2000) notes that overlap is not possible: the *distributive scope generalization*. This also holds for *all* and *most*.

(16) Exactly three boys / Most boys / All the boys invited exactly four girls.
Cannot mean that three / most / all boys took part in overlapping groups each of which invited four girls.

⇒ The predicate $\lambda x.x$ *invited exactly four girls* can't be applied distributively to nonatomic entities. That would be necessary to produce overlap.

Exceptions. Intermediate distributivity is only possible with VPs without determiners in them (i.e. intransitive VPs, and those with bare plurals and mass nouns)

(17) Five thousand people gathered near Amsterdam. (van der Does, 1993)

⇒ The predicate $\lambda x.x$ *gathered near Amsterdam* can be applied distributively (i.e. there may be several gatherings) to nonatomic entities (a single person cannot gather)

(18) Rodgers, Hammerstein and Hart wrote musicals. (Gillon, 1987)

⇒ The predicate $\lambda x.x$ *wrote musicals* can be applied distributively to nonatomic entities: e.g. Rodgers and Hammerstein together wrote *Oklahoma*; Rodgers and Hart together wrote *On Your Toes*[1]

3. In a context that specifies the level of granularity, any predicate can be applied distributively to nonatomic entities.

- This has been argued extensively in Schwarzschild (1991, 1996) on the basis of examples like:

(19) a. These shoes cost fifty dollars. *per pair reading ok*
b. These men weigh 250 lbs. *per pair reading not available*

The difference between (19-a) and (19-b) cannot be captured semantically. The difference is that the grouping into pairs is salient in (19-a) but not in (19-b). In Schwarzschild's terms, it is a *contextual cover*.

- This observation extends to *all*:

[1]Some have argued that this popular analysis is wrong and intermediate distributivity is impossible out of context even with bare plurals. See Lasersohn (1989, 1995) and Winter (2001).

(20) a. All these shoes cost fifty dollars. *per pair reading ok*
b. All these men weigh 250 lbs. *per pair reading not available*

- We see the same behavior in *for*-adverbials:

(21) John found a flea on his dog for a month. (Zucchi and White, 2001)
Odd out of the blue because no context is provided

(22) The patient took two pills for a month and then went back to one pill.
Good in a context that supplies the level of granularity "daily"

4. *every* lexically specifies the level of granularity and allows any predicate to apply distributively.

- *every* is compatible with nonatomic complements and can take scope over another quantifier even then, showing that it licenses intermediate distributivity:

(23) a. Every three houses formed a block. (Schwarzschild, 1996)

- The same intermediate distributivity is not available with *all* except with a dependent plural, conforming to the specified quantity generalization:

(24) a. All the houses formed blocks.
Can be true if every three houses formed a block.
b. All the houses formed a block.
Cannot be true if every three houses formed a block.

- Since *every three houses* can override the specified quantity generalization, it is expected that *every day* should too:

(25) a. *John ate some/two/many apples for a week.
b. John ate some/two/many apples every day for a week.

- Independent evidence that adverbial and nominal *every* behave analogously: Dependent plurals (26) are blocked by intervening *every* in both cases (27).

(26) a. The boys wore yellow neckties. (Zweig, 2008)
$\not\Rightarrow$ *Every boy wore several neckties.*
b. The men gave every intern yellow neckties. (Zweig, 2008)
$\Rightarrow$ *Every intern got several neckties from each man.*

(27) a. John wore yellow neckties for a week.
$\not\Rightarrow$ *John wore several neckties simultaneously.*
b. John wore yellow neckties every day for a week.
$\Rightarrow$ *John wore several neckties simultaneously.*

Summary: the claims repeated.

- *for*-adverbials contain *intermediate distributors*: i.e. universal quantifiers over nonatomic entities of vague size.
- The **specified quantity generalization**: When the level of granularity is left open, a predicate that contains a quantifier with an overt determiner cannot be applied distributively to nonatomic entities.
- In a context that specifies the level of granularity, any predicate can be applied distributively to nonatomic entities.
- *every* specifies the granularity and allows any predicate to apply distributively.

Open question. What causes the specified quantity generalization? That is: What is it in the semantics of *for*-adverbials and *most/all* that makes them interact in different ways with intransitive verbs and with VPs with bare plurals and mass terms (on the one hand), and with all other NPs (on the other hand)?

Appendix A: Difficulties in modeling *all*

The talk has suggested that the scopal behavior of *for*-adverbials can largely be reduced to the behavior of *all*. But it is not easy to give a semantics for *all*.

- Can't let *all* distribute only over singularities because this would fail in the mass domain and make it synonymous with *every* in the count domain. This would fail to account for the contrast in (28) (Kroch, 1974) and numerous other asymmetries (licensing of reciprocals, dependent plurals, etc.)

  (28) a. All the students gathered in the room.
  b. *Every student gathered in the room.

- Can't let *all* distribute over pluralities because this would predict that intermediate distributivity is available across the board. We have seen that this would violate the Distributive Scope Generalization.

  (29) a. All the students ate thirty apples.
  $\not\Rightarrow$ Every student took part in a set of students that ate 30 apples.

- Can't let *all* introduce the set containing e.g. all men because this would make it synonymous with numerals like *three* (up to number). This would fail to explain why *all* can't take part in cumulative readings, for example: (Zweig, 2008)

  (30) a. All the students graded thirty papers.
  $\not\Rightarrow$ All the students read at least 1 paper and a total of 30 papers were read overall.
  b. Three students graded thirty papers.
  $\Rightarrow$ Three students read at least 1 paper and a total of 30 papers were read overall.

- Note also that the cumulative reading seems available with collective predicates and adjuncts:

  (31) All the students gathered around thirty tables.
  Can mean: All the students took part in a gathering in which every one of thirty tables was surrounded by some of the students.

- A cover-based account as in Brisson (2003) may be the way out, but how do we formulate a theory of covers that accounts for the above?

Appendix B

This Appendix shows that Zweig (2008)'s entry for *all* (32) does not let *all* distribute. The use of the star on P is vacuous in (32). A sentence like (33) only gets the inverse scope reading.

(32) $[\![\text{all the boys}]\!] = \lambda P \exists X[X = |boy| \ \wedge \ ^*boy(X) \ \wedge \ ^*P(X)]$

(33) All the boys built a raft.
Surface scope: Each boy built a raft. – *not generated*
Inverse scope: There was a raft that all the boys built together.

Zweig (2008) adopts the framework in (Landman, 2000, ch. 6) and assumes that *all the boys* is interpreted in situ. This generates the following representations:

(34) **Surface scope:** $\exists E \exists X[|X| = |boy| \ \wedge \ ^*boy(X) \ \wedge \ X \in {}^*[\lambda X'[^*built(E) \ \wedge \ ^*ag(E, X') \ \wedge \ \exists y[raft(y) \ \wedge \ ^*th(E, y)]]]]$

(35) **Inverse scope:** $\exists E \exists X \exists y[|X| = |boy| \wedge ^*boy(X) \wedge ^*built(E) \wedge ^*ag(E, X) \wedge raft(y) \ \wedge \ ^*th(E, y)]$

These formulas are equivalent. **Proof:** Landman (2000)'s assumption of thematic uniqueness entails that the relation *ag* is a partial function. The fact that the closure under pointwise sum of a partial function whose domain contains mereologically disjoint elements is a partial function. Landman assumes that *ag* only applies to atoms. So the relation $^*ag$ is also a partial function. So for any fixed E, the characteristic set of the function

(36) $^*[\lambda X' \ ^*ag(E)(X')]$

has at most one member. Now consider the following function:

(37) $^*[\lambda X'[^*built(E) \ \wedge \ ^*ag(E, X') \ \wedge \ \exists y[raft(y) \ \wedge \ ^*th(E, y)]]]$

Since its characteristic set is a subset of the function (36), function (37) has at most one member as well. So (37) = *(37), i.e. (37) is its own closure under sum. This means that we can rewrite (34) as (38), which reduces to (39)– the difference is that the star before the lambda has been left out.

(38) $\exists E \exists X[|X| = |boy| \wedge {}^*boy(X) \wedge X \in [\lambda X'[{}^*built(E) \wedge {}^*ag(E, X') \wedge \exists y[raft(y) \wedge {}^*th(E, y)]]]]$

(39) $\exists E \exists X[|X| = |boy| \wedge {}^*boy(X) \wedge {}^*built(E) \wedge {}^*ag(E, X) \wedge \exists y[raft(y) \wedge {}^*th(E, y)]]$

This is equivalent to the wide scope reading in (33) since all the quantifiers are scopally commutative. QED

In general, any existential quantifier in the scope of "all" will end up being scopally commutative with "all". In this sense, "all" in the system of Zweig (2008) is equivalent with in-situ-distributive numerals. In particular it will generate unattested cumulative readings as in (30). The problem arises because Landman (2000)'s lifting operations cause the quantifier *all* to take scope below existential closure. We could tinker with these lifting operations. But I don't see any way to avoid falling in one of the traps described in the previous Appendix.

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