For-adverbials and the scope of indefinites*

Lucas Champollion
(University of Tübingen)

champoll@gmail.com

Workshop "Indefinites and beyond"
Göttingen, November 18^{th}-19^{th}, 2011

1 Introduction

- *For*-adverbials are commonly considered the most reliable diagnostic of the distinction between atelic and telic predicates (Vendler, 1957; Verkuyl, 1989):

  (1) a. John ran / drove towards the store / drank wine for an hour. *atelic*
  b. ?John ran a mile / drove to the store / drank 1l of wine for an hour. *telic*

- As an idealization, atelicity and telicity correspond to two higher-order properties:

- An atelic predicate has the **subinterval property**: whenever it holds at an interval I, it holds at every subinterval of I. (Attributed to Bennett and Partee, 1972)

  (2) John ran from 3 to 5pm. ⇒ John ran from 3 to 4pm. *atelic*

  Definition: Subinterval(P) $\stackrel{\text{def}}{=} \forall I\ [\textsc{At}(P, I) \rightarrow \forall J[J \sqsubset I \rightarrow \textsc{At}(P, J)]]$

- Everybody assumes that we can disregard short intervals (minimal-parts problem).

- A telic predicate is **temporally quantized**: Whenever it holds at an interval, it does not hold at any one of its subintervals. (Based on Krifka, 1986)

*This research is part of a dissertation written at Penn, Stanford, and PARC (Chapter 8 of Champollion, 2010). I am grateful to all three institutions. Special thanks to my advisor, Cleo Condoravdi; my committee members, Aravind Joshi, Maribel Romero, Florian Schwarz; to Sigrid Beck, Danny Bobrow, Beth Levin, Lauri Karttunen, Paul Kiparsky, Tony Kroch, Chris Potts, Annie Zaenen, and many others. (This handout is a slightly longer version than the one used in the talk.)

(3) John ran a mile from 3 to 5pm. $\not\Rightarrow$ John ran a mile from 3 to 4pm. *telic*

Definition: Temporally-quantized(P) $\stackrel{\text{def}}{=} \forall I\ [\text{AT}(P, I) \rightarrow \forall J[J \sqsubset I \rightarrow \neg\text{AT}(P, J)]]$

2 Same-object effects with indefinites

- Indefinites in the syntactic scope of universal quantifiers can take semantic scope both over and under it:

(4) Every man loves a woman. $\exists > \forall; \forall > \exists$

- del Prete (2011)'s terms: *Same-object* (SO) and *different-object* (DO) readings.

(5) a. SO = the indefinite picks out one object
b. DO = the indefinite can range over potentially different objects

- Indefinites in the syntactic scope of *for*-adverbials only get a SO reading (Carlson, 1977; Kratzer, 2007):

(6)	a.	John pushed a cart for an hour.	✓SO, *DO
	b.	I dialed a wrong phone number for five minutes.	✓SO, *DO
	c.	She bounced a ball for 20 minutes.	✓SO, *DO
	d.	He kicked a wall for a couple of hours.	✓SO, *DO
	e.	She opened and closed a drawer for half an hour.	✓SO, *DO
	f.	I petted a rabbit for two hours.	✓SO, *DO

- A common idea is that *for*-adverbials are universal quantifiers over moments (*for an hour = at each moment of an hour*) or at least very short intervals.
- Then SO = wide scope, DO = narrow scope.
- **SO effect puzzle:** Why should the semantic scope of an indefinite be sensitive to something outside its syntactic scope?
- Same effect in German (Kratzer, 2007):

(7) a. Ich hab' eine falsche Telefonnummer fünf Minuten lang gewählt.
I have a wrong telephone.number five minutes long dialed.
b. Ich hab' fünf Minuten lang eine falsche Telefonnummer gewählt.
I have five minutes long a wrong telephone.number dialed.

- Not a pragmatic effect: plausibility concerns can be overridden

(8) ??John found a flea on his dog for a month. (Zucchi and White, 2001)

From Deo and Piñango (2011):

(9) a. ??John noticed a discrepancy/two discrepancies for a week.
b. ??John discovered a new proof/two new proofs for a week.

- Not limited to singular indefinites:

(10) John saw thirty zebras for three hours. ✓SO ($30 > \forall$); *DO ($\forall > 30$)

2.1 Exceptions to the wide-scope generalization

2.1.1 Salience and world knowledge effects

- Different-object interpretations are possible when a salient level of granularity can be inferred from context or from world knowledge (Champollion, 2010):

(11) *Context:* discussing the daily intake of patients
The patient took two pills for a month and then went back to one pill.

(12) We built a huge snowman in our front yard for several years. (Deo and Piñango, 2011)

- This inference takes time (self-paced reading tests, Todorova et al. (2000)):

(13) a. Even though Howard sent a large check to his daughter for many years, she refused to accept his money. *longer reading time*

b. Even though Howard sent large checks to his daughter for many years, she refused to accept his money. *shorter reading time*

2.1.2 Bare plurals and mass nouns

- Bare plurals and mass nouns do not have to take distributive wide scope over *for*-adverbials (Carlson, 1977; Verkuyl, 1972; Dowty, 1979)

(14) a. John found fleas on his dog for a month.
b. John discovered crabgrass in his yard for six weeks.

(15) a. Tourists discovered that quaint little village for years.
b. Water leaked through John's ceiling for six months.

2.1.3 Interveners

- Interveners are overt temporal adverbials which allow an indefinite to have a different-object interpretation when they occur between it and the *for*-adverbial:
- Context-dependent temporal definites (Deo and Piñango, 2011)

  (16) Jane ate an egg/two eggs **at breakfast** for a month.

- Temporal universal quantifiers (Zucchi and White, 2001)

  (17) John found a flea on his dog **every day** for a month.

- Pluractional adverbials (see also Beck and von Stechow, 2007)

  (18) John found a flea on his dog **day after day** for a month.

Summary The following facts need to be explained:

1. Indefinites in the scope of *for*-adverbials lead to SO effects
2. SO effects survive in the face of scopal restrictions and adverse pragmatic pressures
3. There is a diverse class of exceptions to them:
   (a) salience and world knowledge effects
   (b) bare plurals and mass nouns
   (c) intervening temporal definites, quantifiers, and pluractionals

3 Claim and roadmap

- *For*-adverbials are not quantifiers. SO effects are not surprising – they are the default case. (Following Kratzer (2007).)
- DO effects (except for bare plurals and mass nouns) are an instance of **nonatomic phrasal distributivity**. "Nonatomic", because the domain of time does not have atoms; "phrasal", because it is an entire VP that is distributed.
- We will build a bridge between distributivity and *for*-adverbials.
- Section 4 reviews distributivity theory and focuses on the motivation for Link's and Schwarzschild's D operators.

- Section 5 extends Schwarzschild's D operator to the temporal domain and applies it to *for*-adverbials.

4 A crash course in distributivity theory

4.1 Lexical vs. phrasal distributivity

This distinction refers to the size of the distributively interpreted predicate.

- **Lexical distributivity/collectivity** involves lexical (non-complex) predicates:

(19) a. The children smiled. *distributive*
b. The children were numerous. *collective*

- **Phrasal distributivity/collectivity** involves a VP, typically with an indefinite:

(20) a. The girls are wearing a dress. *distributive*
b. The girls are sharing a pizza. *collective*
c. The girls are building a raft. *collective/distributive*

- Link (1987): Phrasal distributivity cannot be captured by lexical operations or meaning postulates, and must be modeled by a VP-level operator D^{Link} ("each").

(21) $[\![\mathrm{D}^{Link}]\!] = \lambda P_{\langle et\rangle}\lambda x\forall y[y \leq_{Atom} x \rightarrow P(y)]$
(Takes a predicate P over individuals and returns a predicate that applies to any individual whose atomic parts each satisfy P.)

(22) a. The girls built a raft.
≈ The girls built a raft together. *collective*
b. The girls D^{Link}(built a raft).
≈ The girls each built a raft. *distributive*

4.2 Atomic vs. nonatomic distributivity

- Sentences like (20a) and (19a) involve atomic distributivity (i.e. over singular individuals).

- Nonatomic distributivity involves sums of singular individuals, as well as entities in nonatomic (continuous) domains.

- Just as in atomic domains, we can distinguish between lexical and phrasal distributivity.

- Nonatomic lexical distributivity is shown in examples like this:

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

- Here the predicate *gather near Amsterdam* can be applied distributively (i.e. several gatherings) to nonatomic entities (a single person cannot gather)
- Nonatomic phrasal distributivity is usually unavailable (e.g. Lasersohn, 1989):

(24) Rogers, Hammerstein and Hart wrote a musical.

a. **True** if the three of them wrote a musical together. ✓*collective*
b. **True** if each of them wrote a musical by himself. ✓*atomic distributive*
c. **False** if Rodgers and Hammerstein wrote a musical together, and Rodgers and Hart wrote another musical together. **nonatomic distributive*

(25) **Scenario** Al, Bill, Jim and Ed each weigh 100kg.

a. **True**: The men weigh 300kg. ✓*collective (together)*
b. **True**: The men weigh 100kg. ✓*atomic distributive (per man)*
c. **False**: The men weigh 200kg. **nonatomic distributive (per pair)*

- Exception: a level of granularity is made salient through context or world knowledge (Lasersohn, 1995; Schwarzschild, 1991, 1996)

(26) **Scenario** Two pairs of shoes are on display, each pair with a $50 price tag.

a. The shoes cost $100. ✓*collective (together)*
b. The shoes cost $25. *? atomic distributive (per shoe)*
c. The shoes cost $50. ✓*nonatomic distributive (per pair)*

- Following Schwarzschild (1996), we can model the context dependency of nonatomic distributivity by assuming that there is a VP-level D operator that contains an anaphoric cover over contextually salient entities (pairs of shoes, etc.).

(27) $[\![\mathrm{D}^{Schwarzschild}]\!] = \lambda P_{\langle et\rangle}\lambda x\forall y[\mathrm{C}(y) \wedge y \leq x \rightarrow P(y)]$ (C a free variable)

(28) a. The shoes cost $50. *collective*
b. The shoes $\mathrm{D}^{Schwarzschild}$(cost $50). *nonatomic distributive*

- Nonatomic distributivity is much easier with a bare plural (Link, 1997):

(29) a. Rodgers, Hammerstein and Hart wrote a musical. **pairwise*
b. Rodgers, Hammerstein, and Hart wrote musicals. *pairwise*

- The missing reading of (29a) clearly involves phrasal distributivity.

- The D operators are only needed to model phrasal distributivity. For lexical distributivity, we can use meaning postulates (Hoeksema, 1983):

  (30) The children smiled.
  a. $\text{smile}(\bigoplus(\text{child}))$
  b. **Meaning postulate:** $\forall x, y[\text{smile}(x) \wedge \text{smile}(y) \rightarrow \text{smile}(x \oplus y)]$

- The "pairwise" reading of (29b) can be analyzed in the same way (Lasersohn, 1989):

  (31) Rodgers, Hammerstein, and Hart wrote musicals.
  a. $\exists$X [musicals(X) $\wedge$ write(rodgers $\oplus$ hammerstein $\oplus$ hart, X)]
  b. **Meaning postulate:** $\forall w, x, y, z[\text{write}(w, x) \wedge \text{write}(y, z) \rightarrow \text{write}(w \oplus x, y \oplus z)]$

- Following Krifka (1992), Kratzer (2007) and others, we can see (30b) and (31b) as instances of a general principle of *lexical cumulativity* that holds for all verbs.

- In the following, I will represent verbs as event predicates (type vt) and use explicit functions for thematic roles (Parsons, 1990).

- Then lexical cumulativity can be implemented by meaning postulates like these ones for all verbs V and thematic roles θ:

  (32) a. $\forall e, e'[\text{V}(e) \wedge \text{V}(e') \rightarrow \text{V}(e \oplus e')]$
  b. $\forall e, e', x, y[\theta(e) = x \wedge \theta(e') = y \rightarrow \theta(e \oplus e') = x \oplus y]$

- Following Link (1983) I write ${}^*P$ for the closure of P under sum. Following Kratzer (2007) I add stars to verbs and thematic roles to remind us that their meaning is "pluralized" in the sense of (32).

- Crucially, these postulates apply only to verbs and not to VPs. So *write a musical* can apply to a sum of events only if they all have the same theme (a musical).

  (33) a. $[\![\text{write}]\!] = \lambda e.{}^*\text{write}(e)$
  b. $[\![\text{write a musical}]\!] = \lambda e.{}^*\text{write}(e) \wedge \text{musical}({}^*\text{th}(e))$
  c. $[\![\text{write musicals}]\!] = \lambda e.{}^*\text{write}(e) \wedge {}^*\text{musical}({}^*\text{th}(e))$

  (34) $[\![$Rodgers, Hammerstein and Hart wrote a musical.$]\!]$
  $= \exists e[{}^*\text{write}(e) \wedge {}^*\text{ag}(e) = \text{rodgers} \oplus \text{hammerstein} \oplus \text{hart} \wedge \text{musical}({}^*\text{th}(e))]$
  (Allows for several writing events and for teamwork, but there has to be only one musical in total.)

  (35) $[\![$Rodgers, Hammerstein and Hart wrote musicals.$]\!]$
  $= \exists e[{}^*\text{write}(e) \wedge {}^*\text{ag}(e) = \text{rodgers} \oplus \text{hammerstein} \oplus \text{hart} \wedge {}^*\text{musical}({}^*\text{th}(e))]$

(Allows for several writing events and for teamwork, and there can be several musicals in total.)

- Table 1 summarizes the discussion so far.

Table 1: Distributivity in atomic domains

	lexical (V level)	phrasal (VP level)
atomic	available	available
nonatomic	available	only w. context

(a) Empirical generalization

lexical (V level)	phrasal (VP level)
lexical cumulativity	Atomic D op.
lexical cumulativity	Cover-based D op.

(b) Explanation

4.3 Distributivity and thematic roles

- The D operators must be generalized so they can target different thematic role positions (Roberts, 1987; Lasersohn, 1998).

(36) a. The first-year students D(took an exam). *Target: agent*
b. John D(gave a pumpkin pie) to two girls. *Target: recipient*
c. John D(summarized) the articles. *Target: theme*

- More evidence comes from adnominal *each*, an overt form of D (Link, 1986; Champollion, 2011a):

(37) The boys told the girls two stories each. *Target: agent or theme*

5 Application to *for*-adverbials

5.1 SO effects: The basic case

- Following Kratzer (2007), we can account for SO effects simply by letting the *for*-adverbial apply its predicate to the entire time interval denoted by its complement.

- Not like this:

(38) $[\![\text{for an hour}]\!]$ (naive quantificational analysis)
$= \lambda P_{\langle vt \rangle} \exists t[\text{hours}(t) = 1 \ \wedge \ \forall t'[t' <_{Atom} t \rightarrow \exists e[P(e) \ \wedge \ \tau(e) = t')]]]$

- But like this:

(39) ⟦for an hour⟧ (measure function analysis)
$= \lambda P_{\langle vt \rangle} \lambda e$:Subinterval(P). $P(e) \ \wedge \ \text{hours}(\tau(e)) = 1$

- The subinterval property is presupposed.

- Activity predicates do not require any special handling. Lexical cumulativity is vacuous since activity predicates are already lexically pluralized.

(40) ⟦John pushed a cart for an hour⟧
$= \exists e : \text{Subinterval}(\lambda e'[^*\text{push}(e') \ \wedge \ \text{cart}(^*\text{th}(e'))])$.
$[^*\text{ag}(e) = j \ \wedge \ ^*\text{push}(e) \ \wedge \ \text{cart}(^*\text{th}(e)) \ \wedge \ \text{hours}(\tau(e)) = 1]$
(There is a pushing event whose theme is a cart, whose agent is John, and whose runtime measures one hour.)

- Lexical cumulativity causes a predicate like *find applies to sums of finding events, which may have nonadjacent runtimes. The following LF entails that one and the same flea is found repeatedly.

(41) ⟦John found a flea for a month⟧
$= \exists e : \text{Subinterval}(\lambda e'[^*\text{find}(e') \ \wedge \ \text{flea}(^*\text{th}(e'))])$.
$[^*\text{ag}(e) = j \ \wedge \ ^*\text{find}(e) \ \wedge \ \text{flea}(^*\text{th}(e)) \ \wedge \ \text{months}(\tau(e)) = 1]$
(There is a sum of finding events whose theme is one flea, whose agent is John, and whose runtime measures one month.)

- This explanation does not work for plural indefinites, however:

(42) John saw thirty zebras for three hours. ✓SO $(30 > \forall)$; *DO $(\forall > 30)$

- Predicates like *see thirty zebras* do not have the subinterval property: picture a safari in which the thirty zebras are seen in succession.

(43) ⟦see thirty zebras⟧ $= \lambda e[^*\text{see}(e) \wedge {}^*\text{zebra}(^*\text{th}(e)) \wedge |^*\text{th}(e)| = 30]$
(True of any possibly plural event in which a total of thirty zebras are seen)

- However, applying distributive QR (called SQI in Landman (1996)) to *thirty zebras* leaves a trace behind whose value is an atomic individual x. For any fixed atomic x, the predicate *see* x has the subinterval property. In this case, QR is driven by the need to satisfy the presupposition of the *for*-adverbial.

(44) ⟦see t_1⟧ $= \lambda e[^*\text{see}(e) \wedge {}^*\text{th}(e) = g(1)]$
(True of any possibly plural event in which the atomic individual $g(1)$ is

seen)

- One can then nondistributively QR *three hours* above *thirty zebras* to ensure that the three-hour timespan does not covary with the zebras.

(45) [[three hours] $\lambda 2$ [[thirty zebras (each)] $\lambda 1$ [[John saw t_1] [for t_2]]]]

- In the LF in (45), the silent *each* stands for the effect of distributive QR.

5.2 Explaining salience and world knowledge effects

- We have seen that a salient granularity licenses a different-object interpretation:

(46) *Context:* discussing the daily intake of patients
The patient took two pills for a month and then went back to one pill.

- The VP of this sentence cannot combine directly with the *for*-adverbial because it does not have the subinterval property:

(47) $[\![\text{take two pills}]\!] = \lambda e[^*\text{take}(e) \wedge {}^*\text{pill}({}^*\text{th}(e)) \wedge |{}^*\text{th}(e)| = 2]$
(True of any possibly plural event in which a total of two pills is taken)

- I therefore assume that there is a silent operator that shifts the meaning of the VP so that it has the subinterval property.

- We have seen that nonatomic distributivity requries a salient level of granularity:

(48) **Scenario** Two pairs of shoes are on display, each pair with a \$50 price tag.
The shoes cost \$50. ✓*nonatomic distributive (per pair)*

- I propose that different-object effects under *for*-adverbials are due to D operators that target the τ (runtime) function instead of a thematic role.

(49) a. The shoes $D^{Schwarzschild}$(cost \$50). *(i.e. per pair)*
b. [This patient $D^{Schwarzschild}$(took two pills)] for a month. *(i.e. per day)*

- Since there are no atoms in the temporal domain, we expect that only $D^{Schwarzschild}$ and not D^{Link} should be able to target τ.

- Since Schwarzschild's operator is anaphoric on context, we expect that different-object effects are only possible in special contexts and not out of the blue.

- Link's and Schwarschild's D operators always target the subject. The following event-based version of Schwarzschild's D operator can target any thematic role. In particular, they can target τ. For details, see Champollion (2010), chapter 8.

(50) **Definition: Schwarzschild-style D operator for event predicates**
$[\![\mathrm{D}_{\theta,\mathbf{C}}^{Schwarzschild}]\!] \stackrel{\text{def}}{=} \lambda P_{\langle vt\rangle}\lambda e[e \in {}^*\lambda e' \left(\begin{array}{l} P(e') \wedge \\ \mathbf{C}(\theta(e')) \end{array} \right)]$
(Takes an event predicate P and returns a predicate that holds of any event e which consists entirely of events that are in P and whose θs **satisfy C**.)

- The generalized D operator has two parameters: a thematic role θ and a granularity parameter C (Schwarzschild's cover parameter).
- Following Schwarzschild (1996), I assume that the C parameter can be set either to the predicate *Atom* or to an anaphorically salient level of granularity. But since time is a continuous domain, D can only target time if C is not set to *Atom*.
- This leads to the picture in Table 2.

Table 2: Distributivity in the temporal domain

	lexical (V level)	phrasal (VP level)
atomic	**n/a**	**n/a**
nonatomic	available	only w. context

(a) Empirical generalization

	lexical (V level)	phrasal (VP level)
	n/a	**n/a**
	lexical cum.	Cover-based D op.

(b) Explanation

- In a context where there is a salient level of granularity, such as $\lambda t.\mathrm{days}(t) \leq 1$ in the context "Discussing the daily intake of patients", $\mathrm{D}^{Schwarzschild}$ has a salient antecedent and can therefore apply to the VP *take two pills*.

(51) $[\![\mathrm{D}_{\tau,\lambda t.\mathrm{days}(t)\leq 1}^{Schwarzschild}(\text{take two pills})]\!]$
$= \lambda e[e \in {}^*\lambda e' \left(\begin{array}{l} {}^*\mathrm{take}(e') \wedge {}^*\mathrm{pill}({}^*\mathrm{th}(e')) \wedge |{}^*\mathrm{th}(e')| = 2] \wedge \\ \mathrm{days}(\tau(e')) \leq 1 \end{array} \right)]$
(True of any plural event that consists of one or more events of taking two pills which each take place within a day.)

- The result has the subinterval property, at least if we disregard times that are shorter than a day. This predicate can therefore be combined with *for a month* and then with *the patient*:

(52) $[\![$The patient $\mathrm{D}^{Schwarzschild}_{\tau,\mathrm{days}(t)\leq 1}$(took two pills) for a month$]\!]$
$= \exists e[{}^*\mathrm{ag}(e) = \mathrm{the.patient} \wedge \mathrm{months}(\tau(e)) = 1 \wedge$
$e \in {}^*\lambda e' \left(\begin{array}{l} {}^*\mathrm{take}(e') \wedge {}^*\mathrm{pill}({}^*\mathrm{th}(e')) \wedge |{}^*\mathrm{th}(e')| = 2] \wedge \\ \mathrm{days}(\tau(e')) \leq 1 \end{array} \right)]$
(There is a plural event that consists of one or more events of taking two pills which each take place within a day. Its agent is the patient, and its runtime measures a month.)

- Given a "generous" interpretation of *months*, this formula is verified by a plural event with a discontinuous runtime, provided that there is a month between the beginning and the end of this event.

5.3 The special status of bare plurals and mass terms

- Consider again the distinction between the following examples:

(53) a. Rodgers, Hammerstein and Hart wrote musicals. *(true)*
b. Rodgers, Hammerstein and Hart wrote a musical. *(false)*

- We have seen that the literature on distributivity explains this contrast as follows:
  - In (53a), lexical cumulativity leads to nonatomic distributivity.
  - In (53b), the indefinite has a same-object or a fully distributive interpretation because lexical cumulativity can't distribute over indefinites. Schwarzschild's operator doesn't apply because there is no supporting context.

- We can expand this explanation to the following contrast:

(54) a. John found fleas on his dog for a month. *OK*
b. ??John found a flea on his dog for a month. *odd out of the blue*

  - In (54a), lexical cumulativity leads to a "several-findings" interpretation. Following Krifka (1986), the bare plural *fleas* is interpreted as *one or more fleas* (the *two or more* part is an implicature). The subinterval property presupposition can apply successfully to *find one or more fleas*. No D operator.

(55) $[\![$John found fleas for a month$]\!]$
$= \exists e : \mathrm{Subinterval}(\lambda e'[{}^*\mathrm{find}(e') \wedge {}^*\mathrm{flea}({}^*\mathrm{th}(e'))]).$
$[{}^*\mathrm{ag}(e) = j \wedge {}^*\mathrm{find}(e) \wedge {}^*\mathrm{flea}({}^*\mathrm{th}(e)) \wedge \mathrm{months}(\tau(e)) = 1]$
(There is a finding event or sum of finding events whose theme is a set of fleas, whose agent is John, and whose runtime measures one month.)

– In (54b), the indefinite has a same-object interpretation because lexical cumulativity can't distribute indefinites. Only Schwarzschild's D operator could, but it doesn't apply because there is no supporting context. Link's D operator is not available because we have a nonatomic domain.

5.4 Modeling interveners

- We have seen that temporal definites, quantifiers, and pluractionals can lead to different-object effects:

(56) a. Jane ate an egg **at breakfast** for a month.
b. John found a flea on his dog **every day** for a month.
c. John found a flea on his dog **day after day** for a month.

- *Every day* and *day by day* mean the same as $\mathrm{D}^{Schwarzschild}$, except that the granularity is hard-wired to "day" instead of being given by context:

(57) $[\![\text{every day}]\!] = [\![\text{day by day}]\!] \stackrel{\text{def}}{=} \lambda P_{\langle vt\rangle}\lambda e[e \in {}^*\lambda e' \left(\begin{array}{l} P(e') \wedge \\ \mathbf{days}(\tau(e')) \leq \mathbf{1}) \end{array} \right)]$
(Takes an event predicate P and returns a predicate that holds of any event e which consists entirely of events that are in P and whose runtimes **are at most a day long**)

- This leads to an interpretation like the following (ignoring the presupposition of *for a month* for convenience):

(58) a. [[John [[[found a flea] every day] for a month]]]

b. $\exists e[{}^*\mathrm{ag}(e) = \mathrm{john} \ \wedge \ \mathrm{months}(\tau(e)) = 1 \wedge$
$e \in {}^*\lambda e' \left(\begin{array}{l} {}^*\mathrm{find}(e') \ \wedge \ {}^*\mathrm{flea}({}^*\mathrm{th}(e')) \ \wedge \ |{}^*\mathrm{th}(e')| = 1] \wedge \\ \mathrm{days}(\tau(e')) \leq 1 \end{array} \right)]$
(There is a plural event that consists of one or more events of finding a flea which each take place within a day. Its agent is John, and its runtime measures a month.)

- *At breakfast* also means the same as $\mathrm{D}^{Schwarzschild}$, except that granularity is hard-wired to "breakfast".

(59) $[\![\text{at breakfast}]\!] \stackrel{\text{def}}{=} \lambda P_{\langle vt\rangle}\lambda e[e \in {}^*\lambda e' \left(\begin{array}{l} P(e') \wedge \\ \exists \mathbf{i}[\mathbf{breakfast}(\mathbf{i}) \wedge \tau(e') \leq \mathbf{i}]) \end{array} \right)]$
(Takes an event predicate P and returns a predicate that holds of any event e which consists entirely of events that are in P and whose runtimes **are within a breakfast**)

- These entries should be integrated into a more extensive account of temporal dependencies, see Pratt and Francez (2001), von Stechow (2002) and Champollion (2011b). This is not trivial.

6 Summary

- Why do indefinites take only wide scope over *for*-adverbials unless there is supporting context?
  - *For*-adverbials are not scope-taking elements themselves
- Why do context and *every day* make it possible for indefinites to take low scope?
  - They can both introduce VP-level nonatomic distributivity in the sense of Schwarzschild (1996)
- Why are bare plurals and mass nouns able to take low scope?
  - They cause the VP to have the subinterval property (via lexical cumulativity).

References

Beck, S. and von Stechow, A. (2007). Pluractional adverbials. *Journal of Semantics*, 24(3):215–254.

Bennett, M. R. and Partee, B. H. (1972). *Toward the logic of tense and aspect in English*. Indiana University Linguistics Club.

Carlson, G. N. (1977). *Reference to Kinds in English*. PhD thesis, University of Massachusetts, Amherst, MA.

Champollion, L. (2010). *Parts of a whole: Distributivity as a bridge between aspect and measurement*. PhD thesis, University of Pennsylvania, Philadelphia, PA.

Champollion, L. (2011a). A cover-based account of distance distributivity. To be presented at 2011 Amsterdam Colloquium.

Champollion, L. (2011b). Temporal prepositional phrases and implicit variables. Presentation at the Workshop in honor of Arnim von Stechow, Konstanz, November 11, 2011.

del Prete, F. (2011). A plurality-based analysis of habitual and frequentative sentences. Workshop on aspect and modality in lexical semantics.

Deo, A. and Piñango, M. M. (2011). Quantification and context in measure adverbials. SALT 21 presentation handout.

van der Does, J. (1993). Sums and quantifiers. *Linguistics and Philosophy*, 16:509–550.

Dowty, D. R. (1979). *Word meaning and Montague grammar*. Reidel, Dordrecht, Netherlands.

Hoeksema, J. (1983). Plurality and conjunction. In ter Meulen, A., editor, *Studies in Modeltheoretic Semantics*, pages 63–83. Foris, Dordrecht, Netherlands.

Kratzer, A. (2007). On the plurality of verbs. In Dölling, J., Heyde-Zybatow, T., and Schäfer, M., editors, *Event structures in linguistic form and interpretation*, pages 269–300. de Gruyter, Berlin, Germany.

Krifka, M. (1986). *Nominalreferenz und Zeitkonstitution. Zur Semantik von Massentermen, Pluraltermen und Aspektklassen*. Fink, Munich, Germany (published 1989).

Krifka, M. (1992). Thematic relations as links between nominal reference and temporal constitution. In Sag, I. A. and Szabolcsi, A., editors, *Lexical Matters*, pages 29–53. CSLI Publications, Stanford, CA.

Landman, F. (1996). Plurality. In Lappin, S., editor, *Handbook of Contemporary Semantics*, pages 425–457. Blackwell Publishing, Oxford, UK.

Lasersohn, P. (1989). On the readings of plural noun phrases. *Linguistic Inquiry*, 20:130–134.

Lasersohn, P. (1995). *Plurality, conjunction and events*. Kluwer, Dordrecht, Netherlands.

Lasersohn, P. (1998). Generalized distributivity operators. *Linguistics and Philosophy*, 21(1):83–93.

Link, G. (1983). The logical analysis of plurals and mass terms: A lattice-theoretical approach. In Bäuerle, R., Schwarze, C., and von Stechow, A., editors, *Meaning, use and interpretation of language*, pages 303–323. de Gruyter, Berlin, Germany.

Link, G. (1986). Je drei Äpfel - three apples each: Quantification and the German 'je'. In *Link (1998)*, pages 117–132.

Link, G. (1987). Generalized quantifiers and plurals. In Gärdenfors, P., editor, *Generalized Quantifiers: Linguistic and Logical Approaches*, pages 151–180. Reidel, Dordrecht, Netherlands. Reprinted in Link (1998), Chapter 4.

Link, G. (1997). Ten years of research on plurals — where do we stand? In Hamm, F. and Hinrichs, E., editors, *Plurality and quantification*, pages 19–54. Kluwer, Dordrecht, Netherlands.

Link, G. (1998). *Algebraic semantics in language and philosophy.* CSLI Publications, Stanford, CA.

Parsons, T. (1990). *Events in the semantics of English.* MIT Press, Cambridge, MA.

Pratt, I. and Francez, N. (2001). Temporal prepositions and temporal generalized quantifiers. *Linguistics and Philosophy*, 24(2):187–255.

Roberts, C. (1987). *Modal subordination, anaphora, and distributivity.* PhD thesis, University of Massachusetts, Amherst, MA.

Schwarzschild, R. (1991). *On the meaning of definite plural noun phrases.* PhD thesis, University of Massachusetts, Amherst, MA.

Schwarzschild, R. (1996). *Pluralities.* Kluwer, Dordrecht, Netherlands.

von Stechow, A. (2002). Temporal prepositional phrases with quantifiers: Some additions to Pratt and Francez (2001). *Linguistics and Philosophy*, 25:755–800.

Todorova, M., Straub, K., Badecker, W., and Frank, R. (2000). Aspectual coercion and the online computation of sentential aspect. *Proceedings of the 22nd annual conference of the Cognitive Science society*, pages 3–8.

Vendler, Z. (1957). Verbs and times. *The Philosophical Review*, 66:143–160.

Verkuyl, H. J. (1972). *On the compositional nature of the aspects.* Reidel, Dordrecht, Netherlands.

Verkuyl, H. J. (1989). Aspectual classes and aspectual composition. *Linguistics and Philosophy*, 12(1):39–94.

Zucchi, S. and White, M. (2001). Twigs, sequences and the temporal constitution of predicates. *Linguistics and Philosophy*, 24:187–222.