Why you can't order 50°*F of beer* and other puzzles

Lucas Champollion
New York University

champollion@nyu.edu

8th International Workshop on Constraints and Language Processing, CSLP 2016

October 17, 2016

(1) a. I ran for/*in five minutes.
b. I ran all the way to the store in/*for five minutes.

(2) a. There are five pounds of books in this parcel.
b. *There are five pounds of book in this parcel.

(3) a. Please bring me 50 ounces of beer.
b. *Please bring me 50 degrees of beer.

(4) a. The ants in my kitchen are numerous.
b. *All the ants in my kitchen are numerous.

(5)

a.	five pounds of rice	*weight*
b.	five liters of water	*volume*
c.	five hours of talks	*duration*
d.	five miles of railroad tracks	*spatial extent*
e.	*five miles per hour of driving	**speed*
f.	*five degrees Celsius of water	**temperature*

(6) A measure function μ is *monotonic* iff for any two entities a and b, if a is a proper part of b, then $\mu(a) < \mu(b)$.

(7)

a.	John waited for five hours.	*duration*
b.	The crack widens for five meters.	*spatial extent*
c.	*John drove for thirty miles an hour.	**speed*
d.	*The soup boiled for 100 degrees Celsius.	**temperature*

(8) a. John **ran** for five minutes. *atelic*

b. *John **ran all the way to the store** for five minutes. **telic*

(9) a. John **ate apples** for three hours. *atelic*
b. *John **ate ten apples** for three hours. **telic*

(10) P has the subinterval property if
$\forall e[P(e) \rightarrow \forall i[i < \text{runtime}(e) \rightarrow \exists e'[P(e') \wedge e' < e \wedge i = \text{runtime}(e')]]]$
(Whenever P holds of an event e, then at every subinterval of the runtime of e, there is a subevent of which P also holds.)

(11) 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

(12) The Chinese people have created abundant folk arts …passed on from generation to generation for thousands of years.

(13) The police blocked streets for miles around the museum.

(14) $\forall e[\text{waltz}(e) \rightarrow \forall i[i < \text{runtime}(e) \rightarrow \exists e'[\text{waltz}(e') \wedge e' < e \wedge i = \text{runtime}(e')]]]$
(Whenever *waltz* holds of an event e, then at every subinterval of the runtime of e, there is a subevent of which *waltz* also holds.)

(15) Let ε be a function that gives us access to the subintervals:
$\varepsilon(\lambda t[\text{hours}(t) = 1])(t')$ is true only if t' is less than one hour.

(16) $x \in {}^*(\lambda y.B(y))$ means: x consists of one or more parts of which B holds

(17) $$\forall e[\text{waltz}(e) \rightarrow e \in {}^*\lambda e' \left(\begin{array}{l} \text{waltz}(e') \wedge \\ \varepsilon(\lambda t[\text{hours}(t) = 1])(\text{runtime}(e')) \end{array} \right)]$$

(18) **Stratified reference (Example)**
Let "$\text{SR}_{\textit{runtime, }\varepsilon(\lambda t[\textit{hours}(t) = 1])}(\lambda e[\text{waltz}(e)])$" abbreviate (17).

(19) **Stratified reference (Definition)**
$$\text{SR}_{f,\varepsilon(K)}(P) \stackrel{\text{def}}{=} \forall x[P(x) \rightarrow x \in {}^*\lambda y \left(\begin{array}{l} P(y) \wedge \\ \varepsilon(K)(f(y)) \end{array} \right)]$$

(20) waltz for an hour
Satisfied presupposition:
$$\forall e[\text{waltz}(e) \rightarrow e \in {}^*\lambda e' \left(\begin{array}{l} \text{waltz}(e') \wedge \\ \varepsilon(\lambda t[\text{hours}(t) = 1])(\text{runtime}(e')) \end{array} \right)]$$
(Every waltzing event consists of waltzing subevents whose runtimes are less than an hour.)

(21) eat apples for three hours
Satisfied presupposition:
$$\forall e[[\![\text{eat apples}]\!](e) \rightarrow e \in {}^*\lambda e' \left(\begin{array}{l} [\![\text{eat apples}]\!](e') \wedge \\ \varepsilon(\lambda t[\text{hours}(t) = 3])(\text{runtime}(e')) \end{array} \right)]$$
(Every event in which one or more apples are eaten consists of subevents in which one or more apples are eaten and whose runtimes are less than three

hours.)

(22) *eat ten apples for three hours
Failing presupposition:
$\forall e[[\![\text{eat ten apples}]\!](e) \rightarrow e \in {}^{*}\lambda e' \left(\begin{array}{l} [\![\text{eat ten apples}]\!](e') \wedge \\ \varepsilon(\lambda t[\text{hours}(t) = 3])(\text{runtime}(e')) \end{array} \right)]$
(Every eating-ten-apples event consists of eating-ten-apples subevents whose runtimes are less than three hours.)

(23) a. *John drove for thirty miles an hour. **speed*
b. *The soup boiled for 100 degrees Celsius. **temperature*

(24) *drive for thirty miles per hour
Failing presupposition: $\text{SR}_{\text{speed},\varepsilon([\![\text{thirty mph}]\!])}([\![\text{drive}]\!])$
(Every driving event consists of driving subevents whose speeds are less than thirty mph.)

(25) run for three hours / three hours of running
Satisfied presupposition: $\text{SR}_{\text{runtime},\varepsilon([\![\text{three hours}]\!])}([\![\text{run}]\!])$
(Every running event consists of running subevents whose runtimes are less than three hours.)

(26) fifty liters of beer
Satisfied presupposition: $\text{SR}_{\text{volume},\varepsilon([\![\text{fifty liters}]\!])}([\![\text{beer}]\!])$
(Every beer amount consists of beer parts whose volumes are less than fifty liters.)

(27) *fifty degrees of beer
Failing presupposition: $\text{SR}_{\text{temperature},\varepsilon([\![\text{fifty degrees}]\!])}([\![\text{beer}]\!])$
(Every beer amount consists of beer parts whose temperatures are less than fifty degrees.)

(28) five feet of snow
Satisfied presupposition: $\text{SR}_{\text{height},\varepsilon([\![\text{five feet}]\!])}([\![\text{snow}]\!])$
(Every snow amount consists of snow parts whose heights are less than five feet.)

(29) a. Three safari participants saw thirty zebras.
Available reading: Three safari participants saw at least one zebra each, and thirty zebras were seen overall.
b. All the safari participants saw thirty zebras.
Unavailable reading: Each safari participant saw at least one zebra, and thirty zebras were seen overall.

(30) a. Three safari participants saw zebras.
Available reading: Three safari participants saw at least one zebra each, and at least two zebras were seen overall.
b. All the safari participants saw zebras.

Available *reading:* Each safari participant saw at least one zebra, and at least two zebras were seen overall.

(31) a. All the children smiled. ⇒ Each child smiled.
b. *All the ants in my kitchen are numerous.

(32) **Presupp. of *for 1h*:** $\forall e[\text{VP}(e) \rightarrow e \in {}^*\lambda e' \left(\begin{array}{l} \text{VP}(e') \wedge \\ \varepsilon(\lambda t[\text{hours}(t) = 1])(\text{runtime}(e')) \end{array} \right)]$
(Every VPing event consists of one or more VPing events whose *runtimes* are *less than* an hour.)

(33) **Presupposition of *all*:** $\forall e[\text{VP}(e) \rightarrow e \in {}^*\lambda e' \left(\begin{array}{l} \text{VP}(e') \wedge \\ \text{Atom}(\text{ag}(e')) \end{array} \right)]$
(Every VPing event consists of one or more VPing events whose *agents* are *atoms*.)

(34) All the children smiled.
Presupposition: $\forall e[\text{smile}(e) \rightarrow e \in {}^*\lambda e' \left(\begin{array}{l} \text{smile}(e') \wedge \\ \text{Atom}(\text{ag}(e')) \end{array} \right)]$
(Every smiling event consists of one or more smiling events whose agents are atoms. This entails that each child smiled.)

(35) All the ants are numerous smiled.
Failing presupposition: $\forall s[\text{numerous}(s) \rightarrow s \in {}^*\lambda s' \left(\begin{array}{l} \text{numerous}(s') \wedge \\ \text{Atom}(\text{holder}(s')) \end{array} \right)]$
(Every state of being numereus consists of one or more states of being numerous whose holders are atoms.)

(36) a. All the safari participants saw thirty zebras. **cumulative*
b. All the safari participants saw zebras. *✓ cumulative*

(37) **Failing presupposition:** $\text{SR}_{\text{agent, Atom}}([\![\text{see thirty zebras}]\!])$
(Every see-thirty-zebras event consists of subevents whose agents are atoms and in each of which thirty zebras are seen.)

(38) **Satisfied presupposition:** $\text{SR}_{\text{agent, Atom}}([\![\text{see zebras}]\!])$
(Every event in which at least one zebra is seen consists of subevents whose agents are atoms and in each of which at least one zebra is seen.)

(39) *atelic : telic :: mass/plural : count :: distributive : collective*

For more information

Lucas Champollion (2015), "Stratified reference: the common core of distributivity, aspect and measurement" (target article). *Theoretical Linguistics*, 41(3-4): 109-149. doi.org/10.1515/tl-2015-0008

Lucas Champollion (2015), "Refining stratified reference" (replies to commentaries). *Theoretical Linguistics*, 41(3-4): 223-240. doi.org/10.1515/tl-2015-0015

Lucas Champollion, "Parts of a whole: Distributivity as a bridge between aspect and measurement." To appear in March 2017 at Oxford University Press.