

Some Puzzles about Q-Adjectives, Contrasts and Cumulative Readings*

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0. Overview

Subject of today's talk: a set of (I believe) related contrasts and puzzles, involving:

- Adjectives of quantity (Q-adjectives) *many* and *few*
- Cardinal numerals
- Cumulative interpretations
(Cf. Solt 2006, 2007a, 2007b, 2009 for treatment of some of these facts)

I sketch out an account within the framework of a degree-based semantics of quantity

1. The puzzles

Parallels between *few*, *many* and cardinal numerals

- (1) a. Few students presented at the workshop
b. Many students presented at the workshop
c. Three students presented at the workshop
- (2) There are few/many/three/*every/*most students on the program
- (3) The few/many/three students who presented (cf. *the every/most students)

Few vs. *many* (+ cardinal numerals)

- (4) a. A few students presented at the workshop
b. *A many students presented at the workshop
c. *A three students presented at the workshop
- Why not treat *a few* as an idiom?
- (5) a. A very few students presented at the workshop
b. An incredibly few collectors have the good fortune to own one

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Few (+ cardinal numerals) vs. *many*

- (6) a. My parents visit every few weeks
b. *My parents visit every many weeks
c. My parents visit every three weeks
- *Many/few/three lucky students* vs. **lucky many/few/three students*. But...
- (7) a. We spent a busy few weeks preparing for the expedition
b. *We spent a busy many weeks preparing for the expedition
c. We spent a busy three weeks preparing for the expedition
- (8) a. A lucky few students received fellowships
b. *A lucky many students received fellowships
c. A lucky three students received fellowships

Cardinal numerals vs. *few/many* :

- Cumulative/Distributive readings:

- (9) a. Three boys ate seven apples [Krifka '99] ✓Distrib ✓Cum
b. Few boys ate seven apples ✓Distrib ✗ Cum
c. Many boys ate seven apples ✓Distrib ✗? Cum
- (10) a. Three potatoes are (is?) enough to make a soup ✓Distrib ✓Cum
b. Few potatoes are (is?) enough to make a soup ✓Distrib ✗ Cum
c. Many potatoes are (is?) enough to make a soup ✓Distrib ✗ Cum
- But....
- (11) A few potatoes are (is?) enough to make a soup ✓Distrib ✓Cum

- Specific indefinite readings

- (12) a. If three relatives of mine die, I'll inherit a million dollars (Reinhardt '97)
✓ There are 3 specific relatives s.t. if they (all) die, I get rich
b. If few relatives of mine die, I'll inherit a million dollars
✗ There is a specific small group of relatives s.t. if they all die I get rich
c. If many relatives of mine die, I'll inherit a million dollars
✗? There is a specific large group of relatives s.t. if they all die I get rich
- But....
- (13) a. If a few relatives of mine die, I'll inherit a million dollars
✓ There are a few specific relatives s.t. if they (all) die, I get rich

Few vs. fewer

- (14) a. Few people drank 10 bottles of wine ✓Distrib ✗ Cum
 b. Fewer than 10 people drank 10 bottles of wine ✓Distrib ✓ Cum
 c. A few people drank 10 bottles of wine ✓Distrib ✓ Cum
- (15) a. Few of our employees do 90% all of the work ✓Distrib ✗ Cum
 b. Fewer than 10 of our employees do 90% all of the work ✓Distrib ✓ Cum
 c. A few of our employees do 90% all of the work ✓Distrib ✓ Cum
- (16) b. *John finished his degree in few years
 a. John finished his degree in fewer than 6 years
 c. John finished his degree in a few years

2. Observation

Many of these patterns involve the interpretation of a plurality as a single unit:

- Cumulative readings
 - Every *n* weeks/days/etc.
 - o Chunk time into units of *n* days/weeks/etc. and quantify over chunks
- (17) For every 10 cups of coffee you buy, you get one free
- A lucky three students, etc.
- (18) a. We spent three long days painting the house
 - Individual days 'long', but not necessarily consecutive
 b. We spent a long three days painting the house
 - A single unit of three days
- (19) a. The essay consisted of five eloquent paragraphs separated by pages of gibberish
 b. ?The essay consisted of an eloquent five paragraphs separated by pages of gibberish
- ⇒ Question reduces to the constrains on when a plurality can receive a single unit interpretation

3. Framework

- Degrees as a basic type (type *d*)
 - o Number as degree (dimension = cardinality)
- Quantity words denote degrees (cardinal numerals) or quantifiers over degrees (*many/few*)

(20) $[[\text{three}_d]] = 3$

(21) a. $[[\text{many}]] = \lambda I_{<dt>.R_{Std} \subseteq I$
 b. $[[\text{few}]] = \lambda I_{<dt>.R_{Std} \subseteq INV(I)$

where R_{Std} is a context-dependent range that serves as standard of comparison, and $INV(I)$ is the join complementary interval (set of degrees) to I (cf. Heim 2006)



- Degrees linked to individuals via functional head Meas

(23) $[[\text{Meas}]] = \lambda x \lambda d. \mu_{DIM}(x) = d$

- Put together:

(24) Three students attended

a. SS: $[[[DP [MeasP [QP \text{three}]] \text{Meas students}]] \text{attended}]]$
 b. $[[\text{Meas students}]] = \lambda d \lambda x. *student(x) \wedge \mu_{DIM}(x) = d$
 $[[\text{three Meas students}]] = [[\text{Meas students}]] ([[\text{three}]])$
 $= \lambda x. *student(x) \wedge \mu_{DIM}(x) = 3$
 $[[\text{three Meas students attended}]] =$
 $= \exists x[*student(x) \wedge \mu_{DIM}(x) = 3 \wedge \text{attended}(x)]$

(25) Few students attended

a. SS: $[[[DP [MeasP [QP \text{many}]] \text{Meas students}]] \text{attended}]]$
 LF: $[QP \text{many}]_1 [[DP [MeasP t_1 \text{Meas students}]] \text{attended}]]$
 .
 b. $[[[t_1 \text{Meas students attended}]]] =$
 $= \exists x[*student(x) \wedge \mu_{DIM}(x) = d_1 \wedge \text{attended}(x)]$
 $\rightsquigarrow \lambda d_1. \exists x[*student(x) \wedge \mu_{DIM}(x) = d_1 \wedge \text{attended}(x)]$
 $[[\text{many}_1]]([[t_1 \text{Meas students attended}]]) =$
 $= R_{Std} \subseteq \{d: \exists x[*student(x) \wedge \mu_{DIM}(x) = d \wedge \text{attended}(x)]\}$

4. Applied to Cumulative Readings (*many/few* vs. cardinal numerals)

- ❖ Two locations where a numerical expression can be interpreted: ‘low’ (*in situ* within the DP; (26a)) or ‘high’ (after raising at LF; (26b))

- (26) a. $[_{DP}$ three Meas potatoes]
 b. many/few_i $[_{DP}$ d_i Meas potatoes]

⇒ Hypothesis: The DP in (26a), but not that in (26b), can be interpreted cumulatively

- Cumulative interpretation requires that the DP be semantically complete, without variables that are bound from outside of it – hence *three potatoes* can be interpreted cumulatively, while *many/few potatoes* cannot

5. Extensions (*many* vs. cardinal numerals)

A lucky three students, etc.

- ❖ The single-unit interpretation (cf. (18), (19)) and the requirement for the indefinite article (in parallel to singular count nouns) suggests that noun phrases of this form are semantically singular

- (27) a. a lucky three students b. *lucky three students

- ❖ Can be modeled via group formation operator \uparrow of Landman (2004), which maps pluralities into the corresponding group atoms (cf. Solt 2007)

- (28) $a \sqcup b \sqcup c$ is a plural individual, the “sum” of a , b and c
 $\uparrow(a \sqcup b \sqcup c)$ is interpreted as “ a , b and c as a unit,” an atom in its own right

- ❖ Derivation:

- (29) $[[\text{three Meas students}]] = \lambda x. *student(x) \wedge \mu_{DIM}(x) = 3$
 $[[\text{lucky}]] = \lambda x_{ATOM}. x$ is lucky
 $[[\text{lucky three Meas students}]] =$
 $= [[\text{lucky}]] \cap \uparrow([[\text{three Meas students}]])$
 $= \lambda y_{ATOM}. lucky(y) \wedge \exists x[*student(x) \wedge \mu_{DIM}(x) = 3 \wedge y = \uparrow x]$

- ❖ Hypothesis: group atom formation operator \uparrow cannot apply to an expression containing a variable bound externally, hence *a lucky three students* vs. **a lucky many students*

- (30) $*Op_i \dots \uparrow(\dots d_i \dots)$

Every three weeks, etc.

- ❖ Involve the creation of new atoms (e.g. *3 weeks* as an atomic unit) via \uparrow operator?
 - Consistent with occurrence of *every*, otherwise found only with singular nouns (cf. *every week* vs. **every weeks*).

6. Few vs. Fewer

- ❖ Returning to a contrast between *few* and *fewer*:

- (14) a. Few people drank 10 bottles of wine ✓Distrib *Cum
 b. Fewer than 10 people drank 10 bottles of wine ✓Distrib ✓Cum

- ❖ By the above logic, *fewer than 10* in (14a) must (at least optionally) be interpreted *in situ*; that is, on the cumulative interpretation we have the structure in (31a), not that in (31b)

- (31) a. $[_{DP}$ fewer than 10 Meas people]
 b. fewer than 10_i $[_{DP}$ d_i Meas people]

- ❖ Perhaps something like this (cf. Krifka 1999):

- (32) $\exists x \exists y [\text{people}(x) \wedge \mu_{DIM}(x) = d^* \wedge \text{bottle-of-wine}(y) \wedge \text{drank}(x,y)]$,
 where $0 < d^* < 10$

- ❖ Evidence from NPI licensing: *fewer than n* (like *few*) licenses NPIs in both subject and predicate (33), suggesting it has semantic scope over both (cf. (25)). But on the cumulative reading, *fewer than n* no longer licenses NPIs (34):

- (33) a. Fewer than 10 people have ever tasted this wine
 b. Fewer than 10 people who have ever tasted this wine have purchased a bottle

- (34) Fewer than 10 people ever drank 10 bottles of wine ✓Distrib *Cum

- ❖ How to derive (32) compositionally? And why is an equivalent possibility not available in the case of *few* (and *many*)? A possibility based on the decomposition of Q-adjectives:

- (35) a. $[[\text{many}]] = \lambda d \lambda I. d \pm \text{gap} \subseteq I$
 b. $[[\text{few}]] = \lambda d \lambda I. d \pm \text{gap} \subseteq \text{INV}(I)$

- (36) $[[\text{POS}]] = \lambda I. R_{Std} \subseteq I$

- (37) $[[\text{-er than}]] = n$

