

## 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<sub>i</sub> .....  $[_{DP}$  d<sub>i</sub> 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<sub>i</sub> .....  $[_{DP}$  d<sub>i</sub> 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)  $[[\text{-er than}]] = n$

❖ And now another contrast:

- (38) a. [QP fewer than 3]  
 b. POS<sub>i</sub> ..... [QP d<sub>i</sub> few]

⇒ Hypothesis: The QP in (38a) – but not that in (38b) – can undergo a shift from type <dt,t> to type d, and thus be interpreted *in situ* in a structure of the form in (32)

### 7. Few vs. Many

- A contrast remains between *few* and *many*

- (6) a. We spent a busy few weeks preparing for the expedition  
 b. \*We spent a busy many weeks preparing for the expedition
- (7) a. A lucky few students received fellowships  
 b. \*A lucky many students received fellowships

- Recall also:

- (4) a. A few students presented at the workshop  
 b. \*A many students presented at the workshop

- And:

- (14) a. Few people drank 10 bottles of wine ✓Distrib ✗ Cum  
 c. A few people drank 10 bottles of wine ✓Distrib ✓ Cum

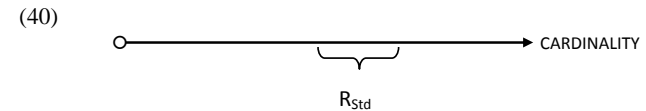
- Observation: while *few* is typically context-dependent, (a) *few* in the above examples has a context-independent interpretation – a small number in the absolute sense

- o Suggests that there is a separate context-independent *few*, which behaves like a cardinal numeral in allowing *in situ* interpretation

- (39) A few students attended  
 $\exists x[\text{student}(x) \wedge \mu_{\text{DIM}}(x) = d_{\text{few}} \wedge \text{attended}(x)]$

(cf. \*A few students ever attended)

- A reason for the contrast with *many* is also suggested – while some values (those close to 0) could be considered *few* regardless of context, what qualifies as *many* is necessarily determined by context



- I leave open how a representation of the form in (39) can be derived compositionally from the basic entry for *few* in (35)

### 8. Summary – and Questions

- ❖ We observe a range of subtle patterns and contrasts in the availability of cumulative readings and other single unit interpretations with Q-adjectives and cardinal numerals

- ❖ I have suggested that these relate to the existence of two possibilities for where the quantity word is interpreted: can it be interpreted *in situ*, or only as a degree quantifier with higher scope that binds a variable in its base position?

- ❖ Question: do these patterns hold up cross linguistically, and if not, what does that tell us?

- (41) Meine Damen und Herren, in wenige Minuten erreichen wir Osnabrück...

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