The lexical semantics of *much*: conversion from intervals to degrees

Julian Grove (juliang@uchicago.edu)
The University of Chicago

- Degree modifier *much*: an illustration of the lexical semantics of *much* in general.
- What accounts for contrasts in felicity like the following?

(1) a. a much read book
b. # a much written book

- Main claim:
  - *much* measures the degree to which a property holds of subparts of an object. This explains contrasts like (1).
- Data:
  - The interpretation of deverbal adjectives modified by "degree-modifier" *much*.

1 The distribution of degree-modifier *much*

1.1 Kennedy and McNally (2005)

- Gradable adjective meanings are of type $\langle d, \langle e, t\rangle\rangle$; their domains define scales:
  - Lower-closed: [0, 1)
  - Upper-closed: (0, 1]
  - Fully closed: [0, 1]
  - Open: (0, 1)
- Degree-modifier *much* is restricted to minimum-standard adjectives (same as adjectives with lower-closed scales (Kennedy, 2007)).

(2) Minimum-standard adjectives
a. a much criticized book
b. a much needed vacation
c. a much praised teacher

(3) Open-scale adjectives
a. # a much surprised face
b. # a much worried parent
c. # a much frightened child

- Only a 'counting events' reading is available (if it is).

- Why is *much* restricted to modification of minimum-standard adjectives?
  - $[\![much]\!] = \lambda G_{\langle d, \langle e, t\rangle\rangle}\lambda x_e.\exists d_d[d \text{ !!}> \textsc{min}(S_G) \wedge G(d)(x)]$ (Kennedy and McNally, 2005, p. 373, ex. (78))
  - Denotation makes reference to a scale minimum. (!!> is a contextually determined relation: greater than by a high degree.)

1.2 Two potential problems for the analysis

- Ungrammatical with non-deverbal minimum-standard adjectives.

(4) a. * much wet
b. * much open
c. * much dirty

- Infelicitous with fully-closed-scale adjectives.

(5) a. # a much documented event
b. # a much written novel
c. # much done meat

- Only a 'counting events' reading is available (if it is).

2 Analysis: *much* converts properties into measure functions

2.1 Proposal

- I propose for *much* the denotation in (6).

(6) $[\![much]\!] = \lambda P_{\langle s, t\rangle}\lambda e_s.\textsc{length}(\{d_d \mid \exists e'_s\colon e' \leq e \wedge P(e') \wedge \mu(e') = d\})$

  - LENGTH is a (partial) function from convex intervals of degrees to their lengths.
    - $\textsc{length} = \{\langle \alpha, \beta\rangle \in \mathcal{P}(D_d) \times D_d \mid \forall d_d \forall d'_d \forall d''_d[[d \in \alpha \wedge d'' \in \alpha \wedge d < d' < d''] \rightarrow d' \in \alpha] \wedge \beta = \textsc{max}(\alpha) - \textsc{min}(\alpha) \wedge \beta > 0\}$
    - The first conjunct ensures that it is only defined on convex sets.

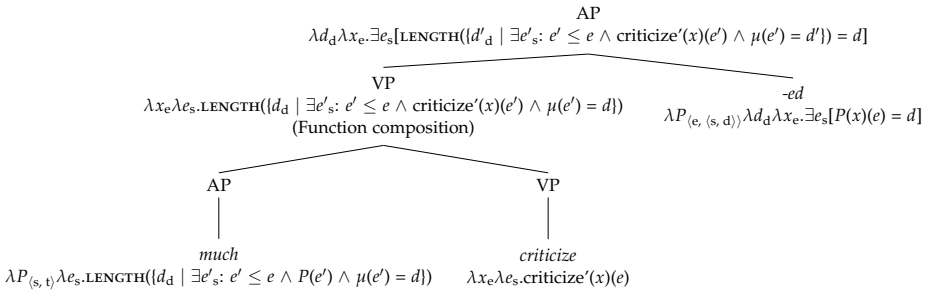
    - ∗ The output is the greatest degree in the set minus the least degree—intuitively the set's "size" or "length".
    - ∗ The last conjunct ensures that its range constitutes an open scale.
        - · The interpretation of *much* in its bare form is determined contextually (Kennedy, 2007).
  - μ...
    - ∗ A contextually-determined homomorphism (w.r.t. $\vee_{D_s}$ and +) from D_s to D_d.
    - ∗ It must be monotonic (Schwarzschild, 2002, 2006). *much food*: in terms of weight or volume; not in terms of temperature.
  - Intuitively, *much* takes a property of events and returns a measure function that measures the degree to which the property holds of subevents.

- Deverbal adjective formation:
  - Denotation of the stativizer *-ed* from Baglini (2012).

    (7) $[\![\text{-}ed]\!] = \lambda P_{\langle e, \langle s, d\rangle\rangle}\lambda d_d \lambda x_e.\exists e_s[P(x)(e) = d]$

- A derivation is illustrated in (8) for *much criticized*, as in (2a) above.

(8)



- What does (8) mean?
  - A gradable property measuring criticism events associated with an object.
  - Some homomorphisms μ:
    - ∗ Mapping to duration: 'criticized for a long time'.
    - ∗ Mapping to cardinality (if the event is a plurality (Link, 1983)): 'criticized many times'.
    - ∗ Mapping to cardinality of agent: 'criticized by many people'.

2.2 Two other types of derived scales: some incremental theme verbs and verbs without a source of scalarity

- How are deverbal adjective scales derived, according to Kennedy and McNally (2005)? Event structure of verb → Scalar structure of adjective.
  - Minimum-standard deverbal adjectives (e.g., *criticized*): derived from atelic verbs.
  - Fully-closed-scale deverbal adjectives (e.g., *written*): derived from incremental theme verbs.
    - ∗ Infelicitous with *much*: #*much written*.

2.2.1 Certain incremental theme verbs

- However, not all deverbal adjectives derived from incremental theme verbs are infelicitous with modification by *much*. Check out (9). (My underlining.)

(9) a. A much-read copy of "Selected Poems by Langston Hughes."
(Photo caption at http://www.latimes.com/features/books/jacketcopy/la-et-jc-say-hello-to-national-poetry-month-20-001,0,4327232.photo)

b. I remember Phil playing me a Paco del Gastor bulería track off a much copied cassette and my hair kind of stood on end, it was such a shock, the incredible way he played.
(http://www.flamencoproject.com/r_broadbank.html)

c. Esplanade Avenue is a much traversed and well known boulevard in the City of New Orleans.
(http://www.leagle.com/decision/195120051So2d149_1175)

d. And not just finding that great image, but also showing a much photographed place in my own distinct way.
(http://www.cdsporch.org/archives/16459)

e. The composition, commissioned by Olson's Voices of Mel Olson chorale, has become a much-performed favourite over the years.
(http://en.wikipedia.org/wiki/John_Rutter)

- These adjectives can be diagnosed as making use of fully-closed scales, despite felicitous modification by *much*.

(10) a. a {completely, fully, 100%, half} read copy
b. a {completely, fully, 100%, half} copied cassette
c. a {completely, fully, 100%, half} traversed boulevard
d. a {completely, fully, 100%, half} photographed place

e. a {completely, fully, 100%, half} performed favorite

- What's the difference? These types of events can be iterated.
- Possibly, such adjectives ambiguously make use of one of two scales:
  - Based on the part structure of the theme.
    - This is what fully-closed-scale modifiers target (see (10)).
  - Based on part structure of plural event, deriving upper-open scales.
    - This is what *much* targets (see (9)).
- But, the noun phrases in (11) are unambiguous. (*slightly* is, in principle, compatible with upper-open scales.)

(11) a. a slightly read copy
(✓small number of pages, #small number of readers)
b. a slightly copied cassette
(✓small portion of cassette, #small number of copies)
c. a slightly traversed boulevard
(✓small number of feet, #small number of travelers)
d. a slightly photographed place
(✓small number of photographs, #small number of photographers)
e. a slightly performed favorite
(✓small portion of piece, #small number of performers/shows)

- Open question: what is the source of scalarity in (9), given that it isn't obviously available from the adjective itself (e.g., (11))?

2.2.2 Verbs without a source of scalarity

- That verbs which seem to lack a source of scalarity result in poor stative passives is noted in Baglini (2012).

(12) a. # the (slightly, partly, ...) considered topic
b. # the (slightly, partly, ...) seen interview
c. # the (slightly, partly, ...) noticed phenomenon
d. # the (slightly, partly, ...) reached for lipstick
e. # the (slightly, partly, ...) raised analogy

- These verbs lack lexical scales.

(13) a. The soup cooled {slightly, halfway, completely}.

b. He washed the dishes {slightly, halfway, completely}.
c. # They considered the topic {slightly, halfway, completely}.
(non-partitive reading)
d. # She saw the dot {slightly, halfway, completely}.
e. # They noticed the dot {slightly, halfway, completely}.
f. # He reached for the lipstick {slightly, halfway, completely}.
g. # She raised the analogy {slightly, halfway, completely}.

- But, they become fully acceptable as stative passives with modification by *much*. (My underlining.)

(14) a. A different approach to the much considered topic of women and Islam.
(http://www.linahashim.com/?page_id=949)
b. And, of course, there's the much-seen FoxNews.com interview, ...
(http://www.publishersweekly.com/pw/by-topic/industry-news/bookselling/article/58662-this-week-s-bestsellers-august-12-2013.html)
c. ...thereby contributing greatly to the much noticed global warming phenomenon.
(http://ejournal.sedinst.com/index.php/agser/article/viewArticle/249)
d. I think it's going to be a much reached for lipstick on summer days for sure xo
(http://www.tattooedtealady.com/2013/04/my-first-chanel-lipstick.html)
e. No different to the much raised analogy of leasing vs owning a car.
(http://forums.adobe.com/message/5364775)

- The adjectives in (14) inherently lack the scale with which they are interpreted, as shown by the unacceptability shown in (12) and (13).
- The adjectives in (9) inherently lack the scale with which they are interpreted, as shown by the unavailability of this interpretation in (11).
- Where are these interpretations coming from? *much*.

2.2.3 *read* vs. *written*

- Following the derivation in (8), *much read* and #*much written* would have the truth conditions in (15).[1]

[1] Although there are arguments that the thematic relation of incremental theme verbs is contributed by the theme itself (Rappaport Hovav, 2008; Bochnak, 2010, To appear; Kennedy, 2012), I assume here that it is part of the meaning of the verb to simplify the illustration.

(15) a. $[\![much\ read]\!] = \lambda d_{\mathrm{d}} \lambda x_{\mathrm{e}}.\exists e_{\mathrm{s}}[\textsc{length}(\{d'_{\mathrm{d}} \mid \exists e'_{\mathrm{s}}\colon e' \leq e \wedge \mathrm{read}'(x)(e') \wedge \mu(e') = d'\}) = d$

b. $[\![much\ written]\!] = \lambda d_{\mathrm{d}} \lambda x_{\mathrm{e}}.\exists e_{\mathrm{s}}[\textsc{length}(\{d'_{\mathrm{d}} \mid \exists e'_{\mathrm{s}}\colon e' \leq e \wedge \mathrm{write}'(x)(e') \wedge \mu(e') = d'\}) = d$

- But, (15b) will always be undefined.
  - *write*: strictly incremental theme relation (Krifka, 1998).
  - Properties of a strictly incremental theme relation θ_{SINC}:
    - θ_{SINC} characterizes a one-to-one relation between objects and events.
    - For any x_{e} and cumulative $P_{\langle \mathrm{s,\,t}\rangle}$, $\lambda e_{\mathrm{s}}.P(e) \wedge \theta_{\mathrm{SINC}}(x, e)$ always has singular reference.
  - But, *much* relies on an open scale—intervals of length zero are not permitted.
  - *read*: non-strictly-incremental theme relation (Krifka, 1998).
  - Properties of a non-scrictly-incremental theme relation θ_{INC}:
    - Any given part of a non-strictly-incremental theme may be the theme of more than one event.
    - For any x_{e} and cumulative $P_{\langle \mathrm{s,\,t}\rangle}$, $\lambda e_{\mathrm{s}}.P(e) \wedge \theta_{\mathrm{INC}}(x, e)$ can have plural reference.

2.2.4 Intervals?

- Question: is an interval really necessary?
  - Alternative: $[\![much]\!] = \lambda e_{\mathrm{s}}.\mu(e)$.
    - See Wellwood et al. (2012) and Wellwood (2012) for a similar proposal cast in terms representing gradable properties as relations.
  - Yes.
    - Requiring μ to be a homomorphism doesn't prevent *much* from occuring with strictly incremental theme verbs. These verbs have structured domains too....

(16) a. John wrote too much. (temporal interpretation)
b. # John wrote the book too much.[2]

- Predictions of the interval account: choices for μ

[2] See Gawron (2007), who takes the unacceptability of modification of incremental theme VPs by *more* (**write the book more*) as evidence for the VP lacking a degree argument.

(17) a. a much read novel
(✓read many times)
(✓read by a large number of people)
(#read for a large amount of time)

b. a much considered opinion
(✓considered many times)
(✓considered by a large number of people)
(✓considered for a large amount of time)

(18) Meanwhile, my mother left for the grocery store. I had given her a much-considered list of the foods I wanted. (My underlining.)
From *Burnt Bread and Chutney: Growing Up Between Cultures—A Memoir of an Indian Jewish Girl*, by Carmit Delman, Balantine Books, 2002, pp. 111-112.

- For all these choices, μ is monotonic! What's the difference between (a) and (b)?
  - *read x* denotes an accomplishment; it is atomic. *consider x* denotes an activity; it is not (necessarily) atomic.
  - The third interpretation of (a) fails to satisfy the convexity presupposition of LENGTH, assuming time is dense.[3] The corresponding interpretation of (b) satisfies it.

3 Conclusion

- *much* changes the interpretations available for stative passives that it modifies by making use of the property of events denoted by the underlying verb.
- It makes verbs that are otherwise unacceptable as stative passives fully acceptable by converting their denotations into measure functions.
  - Supports previous proposals that stative passives crucially make use of measure functions (Koontz-Garboden, 2011; Baglini, 2012).
- It fails to combine with strictly incremental theme verbs because of their singular reference (i.e., presupposition failure).
- Other uses of *much*?
  - The denotation can be generalized. See Wellwood et al. (2012); Wellwood (2012) and Appendix A.

[3] In contrast, the first two interpretations satisfy convexity w.r.t. the cardinality function, though see Fox and Hackl (2006), who argue against this assumption.

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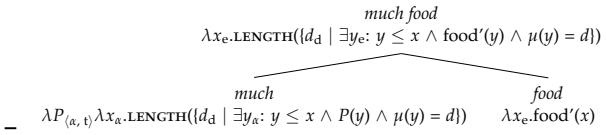
Appendix

A Other uses of *much*

- Instead of what was proposed above, the denotation of *much* could be generalized.

  (19) $[\![much]\!] = \lambda P_{\langle \alpha, t \rangle} \lambda x_{\alpha}.\textsc{length}(\{d_d \mid \exists y_{\alpha}\colon y \leq x \wedge P(y) \wedge \mu(y) = d\})$

- *much food*



B Semantically vacuous *much*

- This section argues against analyses of *much* assuming it is semantically vacuous, there only to satisfy selectional requirements. See, for example, Corver (1997); Neeleman et al. (2004); Solt (2010, 2013).
- Neeleman et al. (2004), in particular, argue that *much*-support with non-adjectival predicates results from the selectional requirements of their 'Class I' degree modifiers, as (20a)-(c) illustrate. (d) shows that their 'Class II' modifier *somewhat* doesn't allow *much*-support. Other Class II modifiers are, e.g., *a little*, *a bit*, and deadjectival adverbs like *incredibly*.

(20) a. John is fond of Sue. Maybe he is even {too, very} *(much) so.
b. Mike is {too, very} *(much) taller than Sam.
c. John likes Sue {too, very} *(much).
d. John is likes Sue somewhat (*much).

- Two domains of data cast doubt on this explanation, specifically with respect to the degree modifier *very*.

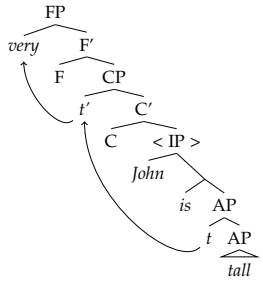
B1 Fragment answers

- The following question-answer paradigm appears to track the classification of degree modifiers into selecting heads and adjuncts in Neeleman et al. (2004).

(21) A: How tall is John? B:
a. Very, A little, A bit, Incredibly.
b. Too, So, This, That *(tall).

- Except for *very*, the degree words in (21) fall into Class II via the diagnostic involving *much*-support.
- Class I degree words (as diagnosed by *much*-support), except for *very*, are poor fragment answers.
- This contrast receives a straightforward explanation if:

– *very* is a Class II (adjunct) degree modifier, and
– we adopt Merchant (2004)'s analysis of fragment answers.



(22)

- Movement is phrasal: licit with phrasal degree modifiers (21a), but not selecting heads (2b), unless the occur with the adjective.[4]
- That movement is the source of the explanation for this contrast is supported by its sensitivity to island effects.

(23) A: Do you wonder who is tall? B:
a. * Very.
b. * Somewhat.
c. * A bit.
d. * So tall.

- And to Binding Principles A and B.[5]

(24) A: How proud does John think Bill is? B:
a. Too proud of himself. (*himself* = Bill; *= John)
b. Too proud of him. (*him* = John; *=Bill)

B2 A constraint on prenominal modification

- Many studies have addressed the following phenomenon (Bresnan, 1973; Bowers, 1975, 1987; Hendrick, 1990; Kennedy and Merchant, 2000; Matushansky, 2002, a.o.).

[4] An ellipsis account, in which *very* simply licenses ellipsis of its adjectival complement, is not possible without restricting it to environements involving fragment answers.

(1) Mary is tall, and John is very *(tall), too.

[5] See Merchant (2004) for a range of tests diagnosing movement.

(25) a. Sam drives {too, so, this, that} cramped (of) a car.
b. * Sam drives a {too, so, this, that} cramped car.

- In general, degree modifiers that force inversion to the DP periphery are poor fragment answers.
- This is explained by assimilating (b) to a more general constraint on prenominal modification, implemented, for example, as the head-final filter (Williams, 1982; Di Sciullo and Williams, 1987).
  - Non-head-final phrases are ungrammatical in pre-NP position.
  - If a degree modifier is a selecting head, the phrase it projects is head-initial.
- This contrast again diagnoses *very* (and other degree modifiers studied by Neeleman et al. (2004)) as an adjunct, as it is grammatical (only) in a pre-NP position.

(26) Sam drives a {very, somewhat, incredibly} cramped car.

- Conclusion: *very* is diagnosed as an adjunct by two tests, a hard result to explain if *much*-support is always driven by morphosyntactic factors.
  - Alternative: *much*-support with *very* is semantically motivated. *much* introduces the required degree argument.