The Lexical Semantics of *Much*: Conversion from Intervals to Degrees
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Introduction *Much* poses a well-known puzzle—it can act like a nominal quantifier, as in (1a), as an adverbial modifier of predicates, as in (b), as a supporter of degree morphology occurring with pro-form *so*, as in (c), as a degree modifier, as in (d), and as a differential argument of comparatives, as in (e).

(1) (a) Much food was available at the party. (d) The award was much deserved.
(b) The bill is very much under scrutiny. (e) Mike is much taller than Sam is.
(c) John is generous—in fact, too much so.

Many analyses have assumed an essentially dummy-element role for at least some uses of *much*, in which its main purpose is to support degree morphology (Bresnan, 1973; Corver, 1997; Neelman et al., 2004). Others have attributed to it a contentful semantics (Kennedy and McNally, 2005, a.o.), though few proposals have attempted to unify all of its uses under a single analysis (see Wellwood et al. (2012) for an analysis of the nominal and verbal domains, as well as Rett (2006) and Solt (2013) for comprehensive analyses of Balkan languages and English, respectively). In this paper, I give such a unified account, proposing for *much* the denotation in (2).

(2) \[ [\textit{much}] = \lambda D \langle d, t \rangle \langle e, t \rangle \lambda x. \exists I \langle d, t \rangle [D(I)(x) \land \text{MAX}(I) - \text{MIN}(I) \geq d] \]

In prose, *much* takes a gradable predicate of individuals whose degree argument is instead a degree-interval argument, and converts this predicate back into one involving degrees. A similar proposal is found in Solt (2013), who assumes that *much* takes as its argument a property of degrees, but it differs in two respects: (a) The present approach involves no instance of QR—*much* must be base-generated next to a predicate making use of intervals, and so may not occur with, e.g., ordinary gradable adjectives; and (b) (2) attributes to *much* a contentful semantics making reference to a minimum of the interval it manipulates. Both aspects of the present proposal are an advantage, letting it restrict *much* to just those environments containing predicates with interval arguments allowing for minima.

Differential *Much* Schwarzschild (2002, 2005, 2006) argues from the distribution of measure phrases (MPs) that they characterize sets of degrees (“intervals”); Schwarzschild (2005) notes that MPs occur both as the differential argument of a comparative and the degree argument of a cross-linguistically variable class of adjectives (5 pounds heavier and 5 feet tall vs. *5 pounds heavy, *5 dollars expensive), and proposes that the class including *tall* may type-shift its argument from degrees to intervals. I follow his proposal that comparatives make use of intervals, allowing composition with *much*, as in (1e), though not with ordinary adjectives, ruling in *much taller*, but ruling out *much heavy* and *much tall* (the latter because, although it occurs with MPs, its domain contains no minimum degree).

Degree-word *Much* Kennedy and McNally (2005) illustrate a taxonomy of deverbal gradable adjectives, according to which an adjective’s classification (relative, minimum/maximum standard) is a consequence of the telicity of the underlying verb. As they show, *much* occurs with minimum standard adjectives (*much praised* vs. *much surprised*), which they account for by making reference to a minimum in its semantics. However, their analysis falls short of fully characterizing its behavior as a degree modifier, since as they note, it may only combine with deverbal minimum standard adjectives: e.g., *much dirty, *dangerous, *wet. On the current analysis, *much* characterizes intervals, whereas non-deverbal minimum standard adjectives have degree arguments, resulting in a type-mismatch. On the other hand, I propose that deverbal minimum standard adjectives have interval arguments characterizing the set of degrees of “completion” of the underlying event, resulting in computability with *much*. A deverbal adjective like *praised*, for example, has the denotation in (4) (*e*, the type of events).

(3) \[ [\textit{praised}] = \lambda I \langle d, t \rangle \lambda x. \exists e' [\forall d [I(d) \rightarrow \exists e'[e' \leq e \land \text{PRAISE}(e')(x) \land \mu_{\text{DIM}}(e') = d]]] \]

\(\mu_{\text{DIM}}\) will be a contextually-determined mapping from subevents to degrees (for example the number of people involved in, or the duration of, the event). As Kennedy and McNally (2005) note, just those verbs containing incremental themes result in deverbal adjectives with upper-closed scales (e.g., *completely loaded*,...
written, *praised, *needed). However, since their denotation for much makes reference to a minimum degree, which such verbs also have, they lack an explanation for the fact that much is incompatible with these verbs (e.g., much *loaded, *written). On the present account, assuming an underlying verb is atelic (an activity in the case of praised), it will support the use of the interval seen in (4), resulting in compatibility with much. On the other hand, adjectives derived from incremental theme verbs could not occur with much because the semantics of the underlying verb does not support the use of the interval seen in (4) (e.g., a writing-the-book subevent is not also a writing-the-book event). We therefore gain an explanation for the restriction to minimum-standard deverbal adjectives from the interval-based semantics of much, given denotations like (4).

‘Quantifier’ Much I follow Solt (2013) (and others) in assuming a version of the proposal that the nominal domain contains a measure function MEAS measuring a gradable quantity of the mass individual predicated of by a noun. The dimension of measurement may correspond to, e.g., mass or volume, depending on the context (represented by ‘µDIM’ in (5)).

\[
\text{(4)} \quad \text{[MEAS]} = \lambda P_e \lambda I_{d,t} \lambda x \forall d' [I(d') \rightarrow \exists x' [x' \leq x \land \mu_{\text{DIM}}(x') = d' \land P(x')]]
\]

The result of (5) after composing with a mass-noun denotation is a predicate with a degree-interval argument which then combines with much.

Further arguments and conclusion I also provide two arguments for the semantic contentfullness of much based on the distribution of modifiers requiring much-support. Neelman et al. (2004) take the obligatory occurrence of their ‘Class I’ degree words (very, too, so, ...) with much outside of adjectival modification contexts to satisfy a selectional requirement. I present evidence from the domain of fragment answers (6) and degree inversion (7) suggesting that very is in fact an adjunct rather than a selecting head; on the other hand, it requires much-support because its semantics requires it to modify phrases with degree, rather than interval, arguments in their denotations.

(5) A: How tall is John?
  B: {Very, Somewhat, A little, A bit, Incredibly, Too *(tall), So *(tall), This *(tall), That *(tall)}.

(6) a. Mike drives too cramped (of) a car to fit our instruments.
   b. * Mike drives a too cramped car to fit our instruments.

As it turns out, all those degree words that obligatorily invert as in (7) are illicit fragment answers. I claim this is because they are functional heads, and therefore may neither move to the clause periphery to permit ellipsis (6), since movement is phrasal (Merchant, 2004); nor may they occur as pre-nominal NP modifiers, due to the Head-Final Filter (Williams, 1982). Very, which is a licit fragment and does not invert, therefore is inherently a degree modifier, and therefore requires much-support in just those environments providing interval arguments.

In conclusion, I provide an analysis that accounts for the distribution of much across categories, motivating a unified semantics.