Differential Degrees and Cross-Categorial Measure-Phrase Modification

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1 Introduction

The starting point:

(1)   a. Clyde is six feet taller.
       b. Clyde is taller by six feet.

(2)   a. Clyde is six feet tall.
       b. *Clyde is tall by six feet.

What accounts for this contrast? How do *by* measure phrases work?

A larger issue, to which the contrast in (1–2) is related:

(3)   a. six feet tall
       b. 40 years old
       c. 20 minutes long

(4)   a. six feet taller
       b. 40 years older
       c. 20 minutes longer

Measure phrases of the sort in (3) are often taken to be prototypical. But in fact, measure phrases of the sort in (4)—ones that occur with comparatives—may be more basic.[1]

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[1] Schwarzschild (2005) most directly; also Kennedy & Levin (to appear) on 'measure of change' in degree achievements and Svenonius & Kennedy (2006) on a corresponding adjectival syntax.

Goals:

- develop an account of the grammar of *by* measure phrases in their adjectival use, and ultimately perhaps more widely
- use this to approach broader questions about measure-phrase modification more generally

Roadmap:

- argue that facts about *by* measure phrases—and other kinds of measure phrases, too—suggest measure phrases are differential by default
- some background in degree semantics
- consider some theoretical tools for approaching the problem here
- the proposal: differential degrees are discontinuous extents
- wild speculation

2 Some Data

2.1 By *Measure Phrases*

By MPs occur in a number of syntactic categories:

(5)   a. Floyd is taller than Clyde by six inches.
       b. This board is longer by six inches.

(6)   a. Floyd was late by 15 minutes.
       b. That book is overdue by six days.

(7)   a. The soup cooled by several degrees.
       b. The meeting was delayed by an hour.

(8)   a. The flight is behind schedule by two hours.
       b. The gas station is past the intersection by about a mile.
       c. The arrow is above the target by a few inches.

These are categories that generally accommodate ordinary (bare) MPs—in one form or another—as well:

(9)   a. Floyd was 15 minutes late.
       b. That book is six days overdue.
       c. Floyd is six inches taller than Clyde.

(10) a. The soup cooled several degrees.
      b. The meeting was delayed an hour.

(11) a. The flight is two hours behind schedule.
      b. The gas station is about a mile past the intersection.
      c. The arrow is a few inches above the target.

But it's not the case that *by* MPs and bare MPs occur with exactly the same predicates.

AP contrasts:

(12) a. Floyd is six feet tall.
      b. *Floyd is tall by six feet.

(13) a. The meeting is an hour long.
      b. *The meeting is long by an hour.[3]

(14) a. Clyde is 40 years old.
      b. *Clyde is old by 40 years.

VP contrasts:

(15) a. Floyd slept six hours.
      b. *Floyd slept by six hours.

(16) a. Norma talked an hour.
      b. *Norma talked by an hour.

In PP, *by* MPs and bare MPs seem to have a similar distribution. Possible exceptions:

(17) a. The meeting was half an hour ago.
      b. *The meeting was ago by half an hour.

(18) a. The monkey was two meters from the tree.
      b. *The monkey was from the tree by two meters.

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[3]In the right contexts this may have a 'too long' interpretation on which it's grammatical.

The common thread: *by* MPs do 'differential measurement'.

- in comparatives, obviously differential
- with 'inherently comparative' adjectives like *overdue*, *early*, *late* (Kennedy 2001, Schwarzschild 2006), measuring difference from a standard
- in (the relevant) PPs, measuring relative to a reference point (e.g. *behind, past, above*)
- in VPs, measuring difference from a standard (in degree achievements like *cool*, what Kennedy & Levin to appear call 'measure of change')

2.2 *Possible Connections to* Slightly *and* Somewhat *(and Maybe 'Lexicalized' MPs)*

Slightly and *somewhat* also have a cross-categorial distribution. These are licensed in a some of the contexts where *by* MPs are licensed, but in many places where bare MPs are *not* licensed:

Adjectives:

(19) a. Floyd is $\begin{Bmatrix} \text{slightly} \\ \text{somewhat} \end{Bmatrix}$ taller than Clyde.
      b. Floyd is taller than Clyde by several feet.

(20) a. This box is $\begin{Bmatrix} \text{slightly} \\ \text{somewhat} \end{Bmatrix}$ too wide.
      b. This box is too wide by a few centimeters.

These are good only under a 'tall/wider than suitable' or 'too tall/wide' interpretation:

(21) a. *Floyd is $\begin{Bmatrix} \text{slightly} \\ \text{somewhat} \end{Bmatrix}$ tall.
      b. *Floyd is tall by several feet.

(22) a. *This box is $\begin{Bmatrix} \text{slightly} \\ \text{somewhat} \end{Bmatrix}$ wide.
      b. *This box is wide by a few centimeters.

Verbs:

(23) a. The soup cooled {slightly / somewhat}.

  b. The soup cooled by several degrees.

(24) a. The meeting was delayed {slightly / somewhat}.

  b. The meeting was delayed by an hour.

(25) a. *Floyd slept {slightly / somewhat}.

  b. *Floyd slept by six hours.

(26) a. *Norma talked {slightly / somewhat}.

  b. *Norma talked by an hour.

Prepositions:

(27) a. The flight is {slightly / somewhat} behind schedule.

  b. The flight is behind schedule by two hours.

(28) a. The gas station is {slightly / somewhat} past the intersection.

  b. The gas station is past the intersection by about a mile.

(29) a. The arrow is {slightly / somewhat} above the target.

  b. The arrow is above the target by a few inches.

(30) a. *The meeting was {slightly / somewhat} ago.

  b. *The meeting was ago by half an hour.

(31) a. *The monkey was {slightly / somewhat} from the tree.

  b. *The monkey was from the tree by two meters.

So *slightly* and *somewhat* are at least plausibly differential in the same sense that *by* MPs are. Taking this view would entail having to explain examples like (32), though:

(32) a. Floyd is {slightly / somewhat} {ugly / insane}.

  b. This law is {slightly / somewhat} {ridiculous / stupid}.

Certain apparent bare MPs—*a little, a bit*—seem to behave roughly as *slightly* and *somewhat* do. These apparent MPs seem lexically fixed in some way:

(33) a. {a little / a bit} ugly

  b. *{a small amount / not a lot / a lot} ugly

  c. {a little bit / a tiny bit / *a small bit / *an extremely little bit} ugly

Their distribution is broadly similar to that of *by* MPs:

(34) a. Floyd is {a little / a bit} taller than Clyde.

  b. This box is {a little / a bit} too wide.

(35) a. *Floyd is {a little / a bit} tall.[4]

  b. *This box is {a little / a bit} wide.

(36) a. The flight is {a little / a bit} behind schedule.

  b. The gas station is {a little / a bit} past the intersection.

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[4]Again, these are only good on a 'too tall' reading.

c. The arrow is $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$ above the target.

(37) a. *The meeting was $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$ ago.

b. *The monkey was $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$ from the tree.

These lexical MPs differ from *slightly* and *by* MPs in their behavior in the verbal domain:

(38) a. The soup cooled $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$.

b. The meeting was delayed $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$.

(39) a. Floyd slept $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$.

b. Norma talked $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$.

I don't know why there should be this difference between the behavior of lexicalized MPs and *slight/somewhat*. More generally, lexicalized MPs give rise to various idiosyncrasies that deserve separate consideration.[5]

The generalizations in this section are more brittle and elusive, but: some reasons to think *slightly, somewhat* and *a little bit* like (prefer? must?) do differential measurement. They're *always* good in comparatives.

2.3 *Schwarzschild's Bare MP Observations*

Schwarzschild (2005): Adjectives in general permit bare MPs with the comparative, but there are many that do *not* permit MPs with the non-comparative[6] form:

(40) a. *6 lbs heavy/light
b. *30 degrees hot/cold/warm
c. *80 mph fast/slow
d. *$5 cheap/expensive
e. *2 inches big/small
f. *3 shades dark/light
g. *50 decibels loud/soft
h. *$106 rich/poor
i. *20 IQ points intelligent/stupid
j. *2 percentage points likely
k. *2 degrees acute
l. *200 pounds fat/thin
m. *The winds are 25 mph strong.
n. *30 miles close/far/near
o. *600 watts powerful
p. *20 points popular

These are all good in the comparative.

So: MPs are possible with comparative adjectives in general, but not necessarily with corresponding non-comparative forms. Again, they seem to do differential measurement.

2.4 *Beyond English*

A number of languages allow MPs with comparatives and with PPs, but do *not* allow them with non-comparative PPs.[7]

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[5]For example, *a great deal* and *a lot* are somewhat odd with some PPs (*a great deal behind schedule* vs ?*a great deal past the intersection*), and *much* seems largely restricted to AP (??*Floyd slept much*, ??*much past the intersection*). Schwarzschild & Wilkinson (2002) suggest that degree *much* is essentially a kind of mass quantifier, like determiner *much*, and Schwarzschild (2006) discusses mass quantifiers in the adjectival domain more broadly; Kennedy & McNally (2005) suggest that *much* is sensitive to whether a standard normally defaults to the bottom of a scale.

[6]I will try to avoid the terms 'positive' and 'absolute' for ordinary morphologically simple non-comparative forms of adjectives here, because (frustratingly) both terms are actually ambiguous in this context. This entails using 'non-comparative' to include 'non-equative', 'non-excessive', etc.

[7]This section exists largely because of data from Ai Matsui, Olga Eremina, and Ania Łubowicz. Schwarzschild (2005) notes the comparative/non-comparative asymmetry in French, Bosque (1999) in Spanish, Snyder et al. (1995) in Japanese; Matushansky (2002) notes the PP/AP asymmetry in Russian and French.

Non-comparative APs:

(41) POLISH:
      *dwa metry duży
       two meters big

(42) JAPANESE:
      *kono nekutai-wa 65-inchi nagai
       this   necktie-TOP 65-inch long

(43) RUSSIAN: (after Matushansky 2002)
      *(na) dva metra vysokij
       (on) two meters tall

(44) FRENCH: (Schwarzschild 2005)
      *grand de 1,27m
       big   of 1.27m
       '1.27 meters tall'

Comparatives:

(45) POLISH:
      dwa metry większy
      two meters bigger

(46) JAPANESE:
      kono nekutai- wa ano nekutai- yori 5-inch nagai
      this tie-   TOP that tie-   than 5-inch long
      'This tie is 5 inches longer than that tie.'

(47) RUSSIAN:
      na 20 samtimetrov vyshe
      on 20 centimeters taller
      '20 centimeters taller'

(48) FRENCH: (Schwarzschild 2005)
      *plus grand que Marie de 2 centimetres
       more big   than Marie of 2 centimeters
       '2 centimeters bigger than Marie'

PPs:

(49) POLISH:
      a. kilka   metrów przed szczytem
         several meters   from summit
      b. dwa metry ode   mnie
         two meters from me

(50) JAPANESE:
      a. Wells Hall- wa koko- kara 500 fiito hanarete- iru
         Wells Hall- TOP here- from 500 feet away-   be
         'Wells Hall is 500 feet away from here'
      b. kaigi-   no 10- ppun   mae
         meeting- GEN 10 minutes before

(51) RUSSIAN:
      a. (v) 10 metrov za   perekrestkom
             10 meters behind intersection
      b. v metrax ot   perekrestka
         in meters from intersection
         'some distance from the intersection'

(52) FRENCH: (Matushansky 2002)
      à 10 mètres de   l'intersection
      at 10 meters from the-intersection

So: cross-linguistic data groups comparatives with PPs, excluding non-comparative APs. Same common thread: MPs are systematically possible where there is differential measurement.

2.5   *Generalizations and Conclusions So Far*

- *by* MPs and related degree modifiers are possible with comparative APs, PPs, and some VPs, but *not* with non-comparative APs

- bare MPs are possible with comparative APs, but not with many non-comparative APs that one might have expected to permit them

- in a number of languages, MPs are possible with comparative APs and PPs but *not* with non-comparative APs

- more generally, then, MPs in comparative APs and PPs and some VPs form a natural class that *excludes* those that modify non-comparative APs

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- MPs in non-comparative APs are the marked case, not only relative to MPs in comparatives (as Schwarzschild 2005 suggests) but also relative to MPs in other syntactic categories as well

- MPs tend to do differential measurement (in some languages and for *by* MPs, this is the *only* option)

3   Theoretical Background

3.1   *Degree Semantics in a Nutshell*

Gradable adjectives can be understood in terms of *scales*.[8] Representations of measurement on the scales are *degrees*.
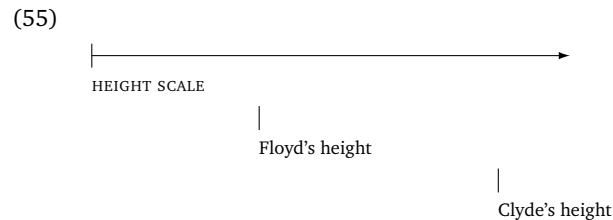
(53)   Clyde is taller than Floyd.

     'The degree of Clyde's height is greater than the degree of Floyd's height.'

(54)   Your coffee maker is more expensive than mine.

     'The degree of your coffee maker's expensiveness is greater than the degree of my coffee maker's expensiveness.'

A natural way of thinking about it:

(55)

HEIGHT SCALE

Floyd's height

Clyde's height

Non-comparative gradable adjectives are *vague*:

(56)   a. Floyd is tall.
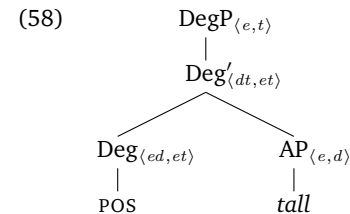   b. Your coffee maker is is expensive.

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[8]Formally, a dense linearly-ordered set of points.

How expensive do you have to be to be expensive? How tall to be tall? Common way to cope with this: these compare relative to a contextually-provided standard:[9]

(57)   Floyd is taller.

     'Floyd is taller than the standard for tallness (that we have in mind).'

Interpreting the extended AP (in the spirit of Kennedy 1997 and subsequently, with some modifications; the syntax is in the spirit of Abney 1987, Corver 1990, and Grimshaw 1991):
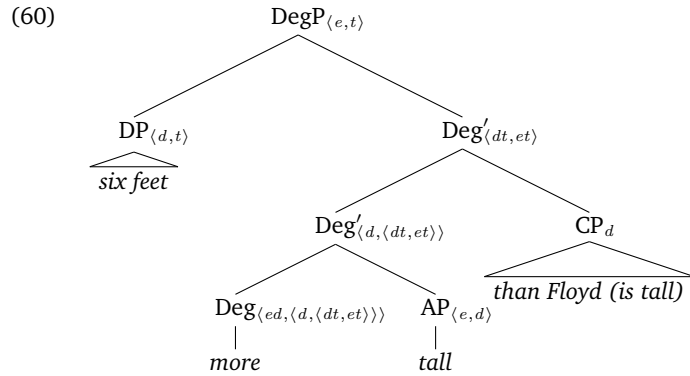
(58)

$$\text{DegP}_{\langle e,t \rangle}$$

$$|$$

$$\text{Deg}'_{\langle dt,et \rangle}$$

$$\text{Deg}_{\langle ed,et \rangle} \qquad \text{AP}_{\langle e,d \rangle}$$

$$| \qquad\qquad |$$

$$\text{POS} \qquad\quad tall$$

(59) $[\![\,tall\,]\!]$
     $= \lambda x \;.\; tall(x)$
     $= \lambda x \;.\;$ the degree to which x is tall
   $[\![\,\text{POS}\,]\!] = \lambda a_{\langle e,d \rangle} \lambda x \;.\; a(x) \geq d_s$
     (where d_s is the standard for tallness)
   $[\![\,\text{POS}\;tall\,]\!]$
     $= \;[\![\,\text{POS}\,]\!]\,([\![\,tall\,]\!])$
     $= \lambda x \;.\; tall(x) \geq d_s$

This has to be complicated further to accommodate a measure phrase. One option is to distinguish an MP-introducing cousin of POS, MEAS (Svenonius & Kennedy 2006; more on this below).

A differential comparative:[10]

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(60)

```
                    DegP⟨e,t⟩
                   /        \
              DP⟨d,t⟩        Deg'⟨dt,et⟩
             /                /       \
          six feet      Deg'⟨d,⟨dt,et⟩⟩      CP_d
                        /        \           \
              Deg⟨ed,⟨d,⟨dt,et⟩⟩⟩   AP⟨e,d⟩    than Floyd (is tall)
                   |              |
                  more           tall
```

(61) $⟦\,more\,⟧ = \lambda a_{⟨e,d⟩}\lambda d\lambda m_{⟨d,t⟩}\lambda x\ .\ m(a(x) - d)$
$⟦\,than\ Floyd\ (is\ tall)\,⟧ = tall(Floyd)$
$⟦\,six\ feet\,⟧$
    $=\ \lambda d\ .\ six\text{-}feet(d)$
    $=\ \lambda d\ .\ d$ is six feet long
$⟦\,six\ feet\ more\ tall\ than\ Floyd\ (is\ tall)\,⟧$
    $=\ ⟦\,more\,⟧(⟦\,tall\,⟧)(⟦\,than\ Floyd\ (is\ tall)\,⟧)(⟦\,six\ feet\,⟧)$
    $=\ \lambda x\ .\ ⟦\,six\ feet\,⟧(⟦\,tall\,⟧(x) - ⟦\,than\ Floyd\ (is\ tall)\,⟧)$
    $=\ \lambda x\ .\ ⟦\,six\ feet\,⟧(tall(x) - tall(Floyd))$
    $=\ \lambda x\ .\ six\text{-}feet(tall(x) - tall(Floyd))$

Important departure from what is usual in such a system: I'm treating the MP as denoting a property of degrees rather than a degree. (This reflects that MPs are quantificationally weak: *most feet* and *Floyd's height* are not possible MPs. See Schwarzschild 2005, 2006 and references there for further arguments.)

3.2 *Degrees are Extents*

Thinking of degrees as *points* has a number of disadvantages. Another possibility is to think of them as *intervals* on a scale. Lots of people have suggested this (Kennedy 2001, Schwarzschild & Wilkinson 2002, Seuren 1984, 1978, von Stechow 1984, and in another form Faller 1998, 2000, Winter 2005, Zwarts 1997, Zwarts & Winter 2000):
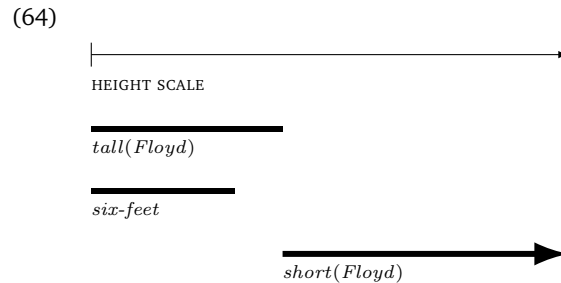
(62)
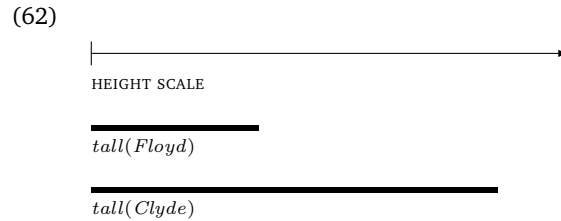
Kennedy (2001) points out two really nice things that construing degrees as intervals ('extents') buys.

NEGATIVE ADJECTIVES   Account of the incompatibility of negative adjectives with MPs:

(63) a. six feet tall
      b. *six feet short

Degrees of tallness can be measured, as illustrated in (64):

(64)

Degrees of shortness are degrees of 'not-tallness'. Strictly speaking, they are on another scale, with the ordering reversed.

Floyd is six feet tall requires that $tall(Floyd)$ contain the (positive) 'yardstick interval' $six\text{-}feet$. But $short(Floyd)$ *can't* contain this yardstick interval: it's not on the same scale. Even if it were, the sentence would necessarily come out false.[11]

_____

[11]Except in the independently bizarre case that involves a height of 0.

CROSS-POLAR ANOMALY   Account of cross-polar anomaly:[12]

(65)   a. ?Alice is shorter than Carmen is tall.
        b. ?New York is safer than Chicago is clean.
        c. ?A Volvo is safer than a Fiat is dangerous.

Even if the tallness scale and the shortness scale were identical—they aren't—cross-polar anomaly would still be expected to be odd in this framework. Comparatives can be understood as claiming that one interval contains another. But a degree of tallness would never normally contain a degree of shortness (and vice versa):[13]

(66)

HEIGHT SCALE

$short(Alice)$

$tall(Carmen)$
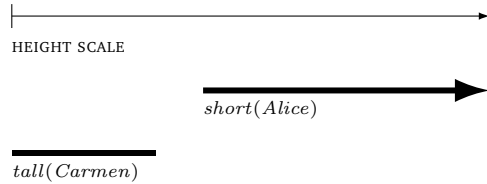
4   Theoretical Tools and the Problem at Hand: Points, Intervals, and Degree Morphemes

4.1   *Schwarzschild (2005): Points vs Intervals*

Schwarzschild (2005) proposes an understanding of the unmarked character of MPs in comparatives, which I will build on below.

The core intuition:

(67)   'If the purpose of a measure phrase is to describe a gap, and comparatives necessarily entail the presence of a gap, it is no surprise that they fit together so snugly.'

To implement this, he treats measure phrases as predicates of intervals on a scale (nothing new, in light of the above):[14]

(68)   a. John is two inches taller than Mary.

        b. $two\text{-}inches'\left(\begin{bmatrix} \text{MAX}\{d : tall'(m, d)\}, \\ \text{MAX}\{d : tall'(j, d)\} \end{bmatrix}\right)$

        c. 'the size of the interval from Mary's height to John's height is two-inches'

He treats adjectives themselves as predicates of *points* on a scale. Thus (69a) is correctly predicted to be ill-formed:

(69)   a. *Mary is 50 pounds heavy.
        b. $\exists d[heavy'(m, d) \wedge 50\text{-}pounds'(d)]$

If d is a point, $50\text{-}pounds'(d)$ will be undefined (because $50\text{-}pounds'$ is a predicate of intervals); if d is an interval, $heavy'(d)$ will be undefined (because $heavy'$ is a predicate of points).

What to do for (70), which for the same reasons is also predicted to be bad?:

(70)   a. *Mary is 5 feet tall.
        b. $\exists d[tall'(m, d) \wedge 5\text{-}pounds'(d)]$

He proposes a lexical rule:

(71)   HOMONYM RULE, from degrees to intervals:

        If *A* has meaning A' that relates individuals to degrees then *A* has a secondary meaning relating individuals to sets of degrees (intervals). The secondary meaning is given by: $\lambda I \lambda x . I = \{d : A'(x, d)\}$

(72)   Homonym Rule applies to *tall, wide, deep, thick, old, long, high*

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[12]There is a distinct reading on which these are good for many speakers that involves 'comparison of deviation', in Kennedy's phrase.

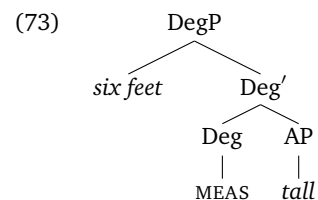[13]So long as the tallness is finite and the shortness non-maximal.

[14]I've changed his logical representation here by replacing some operators with their definitions. I've also changed his $UpLim$ upper-limit predicate to MAX, which I think will do the same thing, given that he assumes in this paper that $tall$ is a predicate of points on a scale rather than intervals.

This correctly predicts that MPs in comparatives should be basic, and that MPs in positive forms are marked and require special machinery.

Also, gives substance to the tendency to talk about 'differential(degree)s' as though they were an ontologically distinct object from ordinary degrees.

4.2 *Degree Morphemes*

Svenonius & Kennedy (2006)'s syntax for MP modification:

(73)

```
           DegP
          /    \
    six feet   Deg′
              /    \
           Deg      AP
            |        |
          MEAS      tall
```

A null degree head MEAS[15] specifically for introducing MPs.

Makes possible explanations in terms of syntactic terms of MP distribution:

- Why not *six pounds heavy*? MEAS doesn't select *heavy*.
- Why no MPs with positive adjectives in some languages? MEAS doesn't select comparative morphology in some languages.[16]
- Why *by* MPs possible where bare MPs aren't? *By* MPs aren't introduced by MEAS.

A related idea: Kennedy & Levin (to appear) observe that in degree achievements, measurement is inherently differential:

(74)   The gap boats widened six inches.

This doesn't mean that the gap came to be six inches.

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[15]Kennedy & Levin (to appear) call it μ.

[16]Another option: distinguish specialized degree morpheme for positive adjectives (Kennedy 1997, 2007, Kennedy & McNally 2005, elsewhere).

Both comparatives and degree achievements involve 'a difference function with a scale whose minimal element—the 'derived zero'—corresponds to the degree introduced by' the standard of comparison. 'One of the general properties of this morpheme, however, is that it can always combine with difference functions.'

4.3 *Worries*

On the points vs. intervals approach: How to reconcile the point-based degree semantics of adjectives with arguments that degrees are *always* intervals (Kennedy 2001, Schwarzschild & Wilkinson 2002, among others)?

In particular: If positive *tall* and *short* are predicates of points on a scale, we lose Kennedy (2001)'s explanation of **five feet short* and of cross-polar anomaly.

On the degree-morpheme approach:

- The notion of a 'difference function' is pretty intuitive, but why would measure phrases (or their associated degree head) tend to *insist* on this? Why would the default/unmarked case be to measure on a *derived* scale, and the special/marked case be to measure on a basic scale? Shouldn't it be the reverse?
- Secondary concern: it is not MPs themselves that require differential measurement, so it's not clear that this reflects that this is more basic than the alternative (if both require additional degree morphology).

5 Differential Degrees as Discontinuous Extents

5.1 *Sorts of Degrees*

Desiderata:

- ontological (sortal) distinction between differential and 'ordinary' degrees, as in Schwarzschild (2005)
- preserving Kennedy (2001) satisfying account of *tall* vs. *short*
- preserving Schwarzschild (2005)'s satisfying account of why MPs by default do differential measurement

One way of thinking about the problem: We'd like for *both* ordinary and differential degrees to be intervals, as in (75):

(75)

HEIGHT SCALE

$tall(Floyd)$

$tall(Clyde)$

$tall(Clyde) - tall(Floyd)$
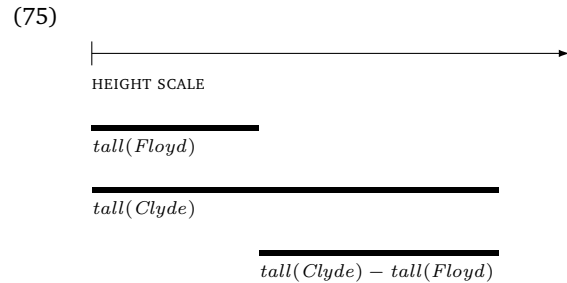
But we'd like to do this in a way that allows making a sortal distinction between differential and ordinary degrees.

The representation in (75) *does* allow making such a distinction: differential degrees are those that start measuring in the middle of a scale.

But why would MPs *prefer* to measure from the middle, rather than from an endpoint? Why would they be so perverse? (A version of the question above: Why would MPs prefer 'derived' scales?)

An answer: Take the intuition that measure phrases are 'predicates of gaps' (McConnell-Ginet 1973, Schwarzschild (2005)) *very* seriously. A differential degree is not an interval in the middle of a scale, as in (75), but rather the *gap* between two intervals in a scale, as in (76):

(76)

HEIGHT SCALE

$tall(Floyd)$

$tall(Clyde)$

$tall(Floyd) \cup -tall(Clyde)$
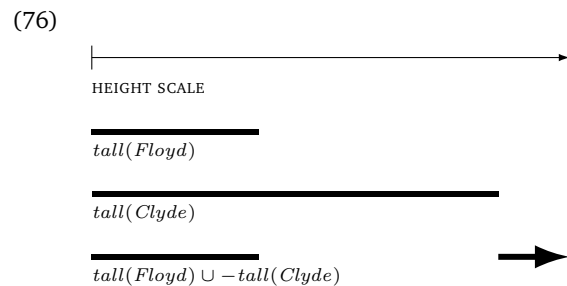
So why do MPs insist on measuring from somewhere other than the bottom of a scale (or else, on measuring on a derived scale)?

They don't. They just require two (nonzero) intervals to measure the distance between.

This is broadly compatible the Kennedy (2001) conception, since all degrees would still involve intervals. Differential degrees would involve two intervals or—another way of thinking about it—an empty gap interval on a scale.[17]

Sortal typology of degrees:

- positive degree: (usually finite) interval on a scale starting at the bottom
- negative degree: (often non-finite) interval on a scale extending to the top
- differential degree: a gap in a scale between two intervals; the union of a positive and a negative degree

Measure phrases can thus be predicates of a distinct sort of degree, as Schwarzschild (2005) would have it—differential degrees. Thus makes a sortal distinction without resort to a point-based notion of degrees.

5.2 *Differential Comparatives*

(77)   Clyde is ten centimeters taller than Floyd.

A relatively standard conception of what this means would interpret this as (78):

(78) $ten\text{-}centimeters(tall(Clyde) - tall(Floyd))$

On the approach suggested here, it would instead be as in (79):

(79) $ten\text{-}centimeters(tall(Floyd) \cup -tall(Clyde))$

Assuming a syntax in which there are no additional degree heads beyond the comparative morpheme and a Kennedy (1997)-style adjective semantics:

_____

[17]This also preserves the idea that measure phrases measure something 'mass-like', with non-atomic part structure (Schwarzschild 2005, 2006).

(80)

Tree:
- DegP$_{\langle e,t\rangle}$
  - DP$_{\langle d,t\rangle}$
    - *six feet*
  - Deg'$_{\langle dt,et\rangle}$
    - Deg'$_{\langle d,\langle dt,et\rangle\rangle}$
      - Deg$_{\langle ed,\langle d,\langle dt,et\rangle\rangle\rangle}$
        - *more*
      - AP$_{\langle e,d\rangle}$
        - *tall*
    - CP$_d$
      - *than Floyd*
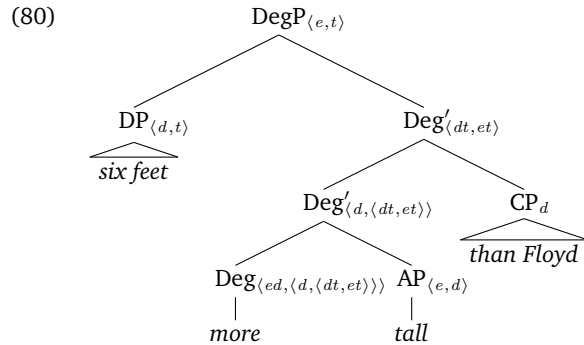
(81) $\llbracket\, tall\,\rrbracket = \lambda x\ .\ tall(x)$
$\llbracket\, more\,\rrbracket = \lambda a_{\langle e,\,d\rangle}\lambda d\lambda m_{\langle d,\,t\rangle}\lambda x\ .\ m(d\cup -a(x))$
$\llbracket\, than\ Floyd\,\rrbracket = tall(Floyd)$
$\llbracket\, more\ tall\ than\ Floyd\,\rrbracket$
  $= \lambda m_{\langle d,\,t\rangle}\lambda x\ .\ m(tall(Floyd)\cup -tall(x))$
$\llbracket\, six\ feet\,\rrbracket = \lambda d\ .\ six\text{-}feet(d)$
$\llbracket\, six\ feet\ more\ tall\ than\ Floyd\,\rrbracket$
  $= \lambda x\ .\ six\text{-}feet(tall(Floyd)\cup -tall(x))$

Comparative morphology values case in MPs, but it's perfectly happy not to in their absence.

Non-comparative adjectives that are 'inherently' comparative—*overdue, late, early*—just lexicalized a comparative morpheme. Their denotation provides differential degrees directly:

(82)   Clyde is twenty minutes late.

(83)

TIME SCALE

$late(Clyde)$

Consequently, an MP is possible here, yielding the expected interpretation:
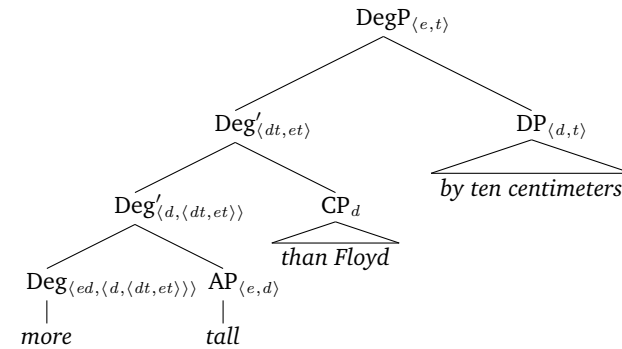
(84) $twenty\text{-}minutes(late(Clyde))$

5.3 By *Phrases*

By MPs can have exactly the same denotation as the corresponding bare MPs:

(85)   Clyde is taller than Floyd by ten centimeters.

(86)

Tree:
- DegP$_{\langle e,t\rangle}$
  - Deg'$_{\langle dt,et\rangle}$
    - Deg'$_{\langle d,\langle dt,et\rangle\rangle}$
      - Deg$_{\langle ed,\langle d,\langle dt,et\rangle\rangle\rangle}$
        - *more*
      - AP$_{\langle e,d\rangle}$
        - *tall*
    - CP$_d$
      - *than Floyd*
  - DP$_{\langle d,t\rangle}$
    - *by ten centimeters*

(87) $\llbracket\, more\ tall\ than\ Floyd\ by\ ten\ centimeters\,\rrbracket$
  $= \lambda x\ .\ \llbracket\, by\ ten\ centimeters\,\rrbracket(tall(Floyd)\cup -tall(x))$
  $= \lambda x\ .\ ten\text{-}centimeters(tall(Floyd)\cup -tall(x))$

5.4 *Non-Comparative Adjectives*

What to make of non-comparative adjectives?

In cases where the measure phrase is not possible—as is the case for many measure phrases and in many languages—nothing special needs to be said, beyond some form of some typical assumptions (for this kind of syntax):[18]
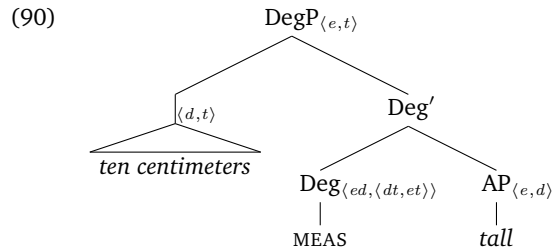
---

[18]The standard is represented here for simplicity as just d_s. See e.g. Kennedy (2007) for a more serious implementation.

(88)

$$\text{DegP}_{\langle e,t\rangle}$$

Deg$'_{\langle e,t\rangle}$

Deg$_{\langle ed,et\rangle}$ AP$_{\langle e,d\rangle}$

POS   *heavy*
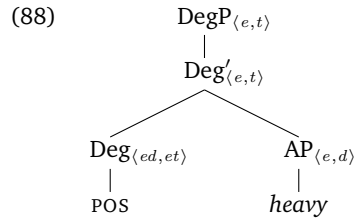
(89) $[\![\,\text{POS}\,]\!] = \lambda a_{\langle e,\,d\rangle}\lambda x \, . \, a(x) \geq d_s$

MPs are impossible here for straightforward type-theoretic reasons. Even apart from that, $heavy(x)$ could not be measured, since it isn't a differential degree.

How to account for the marked cases where an MP *is* possible with a positive adjective? Something like the MP-licensing head of Svenonius & Kennedy (2006):

(90)

$$\text{DegP}_{\langle e,t\rangle}$$

$\langle d,t\rangle$ Deg$'$

ten centimeters

Deg$_{\langle ed,\langle dt,et\rangle\rangle}$ AP$_{\langle e,d\rangle}$

MEAS   *tall*

A syntactic assumption: MEAS requires that its specifier be filled by an MP. (Possibly better understanding: By something in need of case licensing).

(91) $[\![\,\text{MEAS}\,]\!] = \lambda a_{\langle e,\,d\rangle}\lambda m_{\langle d,\,t\rangle}\lambda x \, . \, m\left(\begin{array}{c} -a(x) \, \cup \\ \text{MIN}(\text{SCALE}(a(x))) \end{array} \right)$

         (where $\text{SCALE}(d)$ is the scale on which d is located)
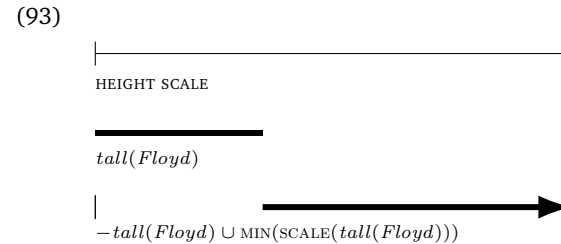
This is a weird denotation:

- Why the extrinsic reference to the bottom of the scale?
- What independent reason to manipulate $tall(x)$ at all in this way?

Good!

(92) $[\![\,\textit{six feet}\ \text{MEAS}\ \textit{tall}\,]\!]$
     $= \ [\![\,\text{MEAS}\,]\!]\,([\![\,\textit{tall}\,]\!])\,([\![\,\textit{six feet}\,]\!])$
     $= \ \textit{six-feet}\left(\begin{array}{c} -tall(x) \, \cup \\ \text{MIN}(\text{SCALE}(tall(x))) \end{array} \right)$

This 'builds' a differential degree roughly as in (93):[19]

(93)

HEIGHT SCALE

$tall(Floyd)$

$-tall(Floyd) \cup \text{MIN}(\text{SCALE}(tall(Floyd)))$

So why *six feet tall* but not *tall by six feet?:

- POS *tall by six feet* is uninterpretable for both type-theoretic and sortal reasons
- MEAS *tall by six feet* is syntactically ill-formed (because MEAS requires an MP in its specifier)

Given the type-theoretic aspect of this story and its syntactic assumptions, it essentially embodies Svenonius & Kennedy (2006). The important additional work that the sortal distinction is doing at this point is:

- it provides an understanding of what is odd about *tall by six feet independent of these syntactic and type-theoretic assumptions, since it *requires* that something special be done to render *tall* compatible with MP modification
- it requires the additional operation that renders *tall* compatible with MP modification to be fairly odd—not outlandishly so, but enough to reflect its markedness

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[19]The little glob below should actually have no (non-infinitesimal) width.

5.5 *Negative Adjectives and MPs*

(94) a. six feet tall
      b. *six feet short

Let's suppose *short* could combine with MEAS:

(95) $[\![\,six\;feet\;\text{MEAS}\;short\,]\!]$
      $= [\![\,\text{MEAS}\,]\!]\,([\![\,short\,]\!])([\![\,six\;feet\,]\!])$
      $= six\text{-}feet\begin{pmatrix} -short(x)\;\cup \\ \text{MIN}(\text{SCALE}(short(x))) \end{pmatrix}$

As before, *six feet* can't measure on the scale of shortness inherently, because its 'yardstick' is positive. But even if it could, (95) would be odd.

If the scale of shortness has its ordering reversed, there would be no 'bottom' to this scale (one can be arbitrarily non-tall) and (95) would give rise to failure of presupposition because $\text{MIN}(\text{SCALE}(short(x)))$ would be undefined.

But even if we take the bottom of the scale of shortness to be defined and the same as the bottom of the scale of tallness, (95) would not be defined:

(96)

HEIGHT SCALE

$tall(Floyd)$

$short(Floyd)$

$-short(Floyd)\cup\text{MIN}(\text{SCALE}(short(Floyd)))$
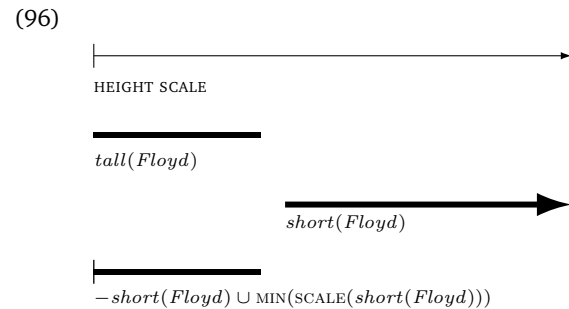
As this representation reflects, this fails to build a differential degree. There is no gap between two intervals for the MP to measure. (In fact, $-short(Floyd) \cup \text{MIN}(\text{SCALE}(short(Floyd)))$ would emerge as identical to $tall(Floyd)$.)

5.6 *Cross-Polar Anomaly*

(97) a. ?Floyd is shorter than Clyde is tall.
      b. ?Clyde is taller than Floyd is short.

It will be easier here (given the denotation provided above) to consider instead (98):

(98) ?Clyde is ten centimeters taller than Floyd is short.

Predicted meaning:

(99) $ten\text{-}centimeters(short(Floyd) \cup -tall(Clyde))$

As for Kennedy (2001), this would be undefined because $tall(Floyd)$ and $short(Floyd)$ are on distinct scales.[20]

Even setting this aside, though, (99) would be undefined. If (100a) were the case, (99) would be equivalent to (100b):

(100) a. $-tall(Clyde) = short(Clyde)$
       b. $ten\text{-}centimeters(short(Floyd) \cup short(Clyde))$

(101)

HEIGHT SCALE

$short(Floyd)$

$short(Clyde)$

$short(Floyd) \cup short(Clyde)$
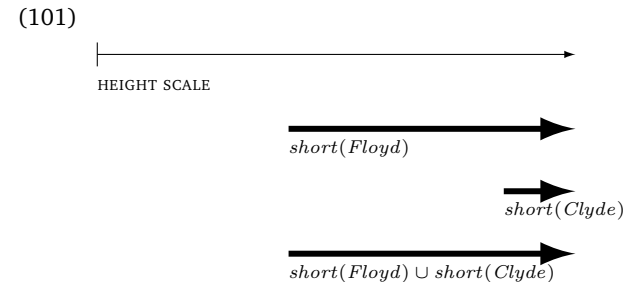
Once again, $ten\text{-}centimeters$ would not receive a differential degree to apply to. There is no 'gap' in $short(Floyd) \cup short(Clyde)$, as (101) reflects. It would actually be identical to $short(Floyd)$.

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[20]Or in any case $short(Floyd) \cup -tall(Clyde)$ would not represent any degree, since it would be on no single scale.

5.7 *Differences From Kennedy Ontology*

In general, the advantages of Kennedy (2001)'s account carry over.

But in a certain sense, this may actually improve on that story:

- in the original story, it is actually important that *short* and *tall* measure on *distinct* scales, identical apart from opposite orderings

- it is also important that the 'yardstick' used by MPs be positive, so on the same scale as *tall* but not *short*

- without distinct scales, Kennedy still predicts necessary falsehood, but not directly ill-formedness

- with differential degrees, though, the relevant sentences emerge as ill-formed even if *short* and *tall* are on the same scale.

6 Some Elaborations

6.1 *Any Headway Toward* Slightly?

Possibly.

The problem again: *slightly* and *somewhat* often seem to want to do differential measurement, as in comparatives, inherently-comparative APs, PPs, and VPs. But at other times, they seem happy not to:

(102) a. Floyd is $\left\{\begin{array}{l}\text{slightly}\\\text{somewhat}\end{array}\right\}$ taller than Clyde.

     b. Floyd is taller than Clyde by several feet.

(103) a. This box is $\left\{\begin{array}{l}\text{slightly}\\\text{somewhat}\end{array}\right\}$ too wide.

     b. This box is too wide by a few centimeters.

(104) a. *Floyd is $\left\{\begin{array}{l}\text{slightly}\\\text{somewhat}\end{array}\right\}$ tall.

     b. *Floyd is tall by several feet.

(105) a. *This box is $\left\{\begin{array}{l}\text{slightly}\\\text{somewhat}\end{array}\right\}$ wide.

     b. *This box is wide by a few centimeters.

(106) a. Floyd is $\left\{\begin{array}{l}\text{slightly}\\\text{somewhat}\end{array}\right\}\left\{\begin{array}{l}\text{ugly}\\\text{insane}\end{array}\right\}$.

     b. This law is $\left\{\begin{array}{l}\text{slightly}\\\text{somewhat}\end{array}\right\}\left\{\begin{array}{l}\text{ridiculous}\\\text{stupid}\end{array}\right\}$.

The crucial element here may be that *slightly* always measures relative to a standard, not to the bottom of a scale. This *is* differential measurement. What's special about *ugly*, *insane*, etc. is that their standard value defaults to the bottom of the scale (Kennedy & McNally 2005).

One way to spell this intuition out and cope with *ugly*: A distinct degree word, TOO, that measures relative to a standard and yields differential degrees.

(107) $[\![\,\text{TOO}\,]\!] = \lambda a_{\langle e,\,d\rangle}\lambda d\lambda m_{\langle d,\,t\rangle}\lambda x \, . \, m(d_s \cup -a(x))$

This means roughly 'more than the contextually-provided standard'.

(108) $[\![\,slightly\,]\!] = \lambda d \, . \, small(d)$
      $[\![\,slightly\ \text{TOO}\ ugly\,]\!] = \lambda x \, . \, small(d_s \cup -ugly(x))$

This would also allow *slightly tall* only on the 'too tall' reading:

(109) $[\![\,slightly\ \text{TOO}\ tall\,]\!] = \lambda x \, . \, small(d_s \cup -tall(x))$

If TOO requires its specifier to be filled, *tall by six feet* should still be ill-formed—as would *ugly by a little bit*.

Why a null head rather than a type-shift or coercion operation?:

- too complicated to be a type shift

- plausibly a coercion operation; there'd then be coercion in *slightly ugly*, though—not inconceivable, since coercion might be cheaper in some cases than in others, for some yet-to-be-made-explicit but imaginable pragmatic reasons

- either coercion or type-shift would require explanation of why this won't rescue *tall by six feet*

- methodological preference

6.2 *How About* a Little?

A little and *a bit* are idiosyncratic:

(110) a. $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$ ugly

  b. *$\left\{\begin{array}{l}\text{a small amount}\\\text{not a lot}\\\text{a lot}\end{array}\right\}$ ugly

  c. $\left\{\begin{array}{l}\text{a little bit}\\\text{a tiny bit}\\\text{*a small bit}\\\text{*an extremely little bit}\end{array}\right\}$ ugly

What's special about them: they're marked lexically as case-theoretically independent (come with case features valued lexically, as Larson 1985 suggests for DP adverbials).

If TOO doesn't assign case to its specifier, it would be compatible with *a little* and *a bit* just as it is with *slightly* and *somewhat*, even though it is incompatible with (ordinary) bare MPs:

(111) a. $\left\{\begin{array}{l}\text{a little}\\\text{a bit}\end{array}\right\}$ TOO tall

  b. $\left\{\begin{array}{l}\text{slightly}\\\text{somewhat}\end{array}\right\}$ TOO tall

  c. *$\left\{\begin{array}{l}\text{six feet}\\\text{a small amount}\end{array}\right\}$ TOO tall

  d. *TOO tall $\left\{\begin{array}{l}\text{six feet}\\\text{a small amount}\end{array}\right\}$

Case problems rule out (111c); the empty specifier rules out (111d).

Of course, *a little* and *a bit* will still be expected to be good in comparatives and other differential environments.

7 Wild Cross-Categorial Speculation, Briefly

7.1 *In VP*

Needs to be worked out, but the analytical direction is:

- verbs like *delay* and *exceed* license *by* MPs because they are

inherently comparative, like *overdue* and late; they directly provide differential degrees

- degree achievements (*cool, grow*, etc.) license *by* MPs because they are structurally comparative-like (Kennedy & Levin to appear)

- **weigh by six pounds* is analogous to **tall by six feet*; *weigh* in not inherently comparative, and it gets no help from the comparative-like syntactic structures involved in degree achievements

7.2 *In PP*

These are all good with bare MPs, as (111) reflects, and with *by* MPs as well:

(112) a. The gas station is (two blocks) $\left\{\begin{array}{l}\text{past}\\\text{beyond}\end{array}\right\}$ the intersection.

  b. The coffee table is (two feet) $\left\{\begin{array}{l}\text{in front of}\\\text{behind}\end{array}\right\}$ the sofa.

  c. The meeting is (15 minutes) $\left\{\begin{array}{l}\text{after}\\\text{before}\end{array}\right\}$ class.

  d. The bird is (15 feet) $\left\{\begin{array}{l}\text{above}\\\text{below}\end{array}\right\}$ the farm.

All in a particular sense sense inherently comparative, much as *early* and *late* are. All involve measurement that can be construed as involving the middle of a scale (rather than an interval that includes an endpoint)—that is, as involving a differential degree:

- In the case of *past, beyond, in front of, behind, above*, and *below*, the scale seems to start at the speaker (point-of-view 'pivot').

- The scale for *after* and *before* seems to either be open on both ends.

PPs that don't have this property tend *not* to allow MPs (sentences modeled after Zwarts & Winter 2000 and Winter 2005):

(113) a. *The gas station is two blocks around the intersection.
  b. *The coffee table is two feet on the sofa.

c. *The meeting is 15 minutes at six.
d. *The bird is 15 feet near the farm.

In these cases, either there is no obvious single-dimensional scale or the scale seems to start at the reference point provided by the object.

8   Final Remarks

Summary:

- MPs tend to occur in differential structures, not only across language, but also across categories
- even in English, as *by* MPs reflect, positive adjectives that take bare MPs are unusual
- to model this, a sortal distinction should be made between ordinary and differential degrees—without sacrificing the advantages of interval-based degree semantics
- MPs can be understood as predicates of differential degrees inherently
- differential degrees can be construed as gaps on a scale
- construing differential degrees this way allows degrees in general to be intervals
- it avoids the otherwise mysterious situation in which MPs prefer to measure on derived scales or from non-zero points on a scale

Some remaining questions:

- how does this carry over to PP and VP (beyond speculation)?
- potential connections to nominal measurement?
- further scale structure questions:
    - the difference between open and closed intervals (and scales) figures prominently in the lexical semantics of various adjectives and verbs (Kennedy & McNally 2005, Kennedy & Levin to appear, less directly Rotstein & Winter 2001, Yoon 1996)
    - differential degrees can be built out of open or closed intervals

- what lexical semantic distinctions might this give rise to?
- might this help in accounting for e.g. telicity facts?

References

Abney, Steven. 1987. *The English Noun Phrase in Its Sentential Aspect*. Doctoral dissertation, MIT, Cambridge, MA.

Bosque, Ignacio. 1999. 'El sintagma adjetival: Modificadores y complementos del adjetivo: Adjetivo y participio'. In Ignacio Bosque & Violeta Demonte (eds.), *Gramática Descriptiva de la Lengua Española*, vol. 1, chap. 4, pp. 217–310. Espasa Calpe, Madrid.

Corver, Norbert. 1990. *The Syntax of Left Branch Extractions*. Doctoral dissertation, Tilburg University.

Faller, Martina. 1998. 'A vector space semantics for dimensional adjectives'. In *ESSLLI 1998 Student Session Proceedings*.

Faller, Martina. 2000. 'Dimensional adjectives and measure phrases in vector space semantics'. In M. Faller, S. Kaufmann, & M. Pauly (eds.), *Formalizing the Dynamics of Information*. CSLI Publications, Stanford.

Grimshaw, Jane. 1991. 'Extended projection'. In *Lexical Specification and Lexical Insertion*. Erlbaum, Hillsdale, New Jersey.

Kennedy, Christopher. 1997. *Projecting the Adjective: The Syntax and Semantics of Gradability and Comparison*. Doctoral dissertation, UC Santa Cruz. Published in 1999 by Garland, New York.

Kennedy, Christopher. 2001. 'Polar opposition and the ontology of 'degrees''. *Linguistics and Philosophy* **24**(1), 33–70.

Kennedy, Christopher. 2007. 'Vagueness and grammar: the semantics of relative and absolute gradable adjectives'. *Linguistics and Philosophy* **30**(1), 1–45.

Kennedy, Christopher & Beth Levin. To appear. 'Measure of change: The adjectival core of degree achievements'. In Christopher Kennedy & Louise McNally (eds.), *Adjectives and Adverbs: Syntax, Semantics, and Discourse*. Oxford University Press, Oxford.

Kennedy, Christopher & Louise McNally. 2005. 'Scale structure, degree modification, and the semantics of gradable predicates'. *Language* **81**(2), 345–381.

Larson, Richard. 1985. 'Bare-NP adverbs'. *Linguistic Inquiry* **16**, 595–621.

Matushansky, Ora. 2002. 'Tipping the scales: The syntax of scalarity in the complement of seem'. *Syntax* **5**(3), 219–276.

McConnell-Ginet, Sally. 1973. *Comparative Constructions in English: A Syntactic and Semantic Analysis*. Doctoral dissertation, University of Rochester.

Rotstein, Carmen & Yoad Winter. 2001. 'Partial adjectives vs. total adjectives: Scale structure and higher-order modification'. In *Proceedings of the Amsterdam Colloquium*.

Schwarzschild, Roger. 2005. 'Measure phrases as modifiers of adjectives'. In *L'adjectif*, *Recherches Linguistiques de Vincennes*, vol. 35, pp. 207–228.

Schwarzschild, Roger. 2006. 'The role of dimensions in the syntax of noun phrases'. *Syntax* **9**(1), 67–110.

Schwarzschild, Roger & Karina Wilkinson. 2002. 'Quantifiers in comparatives: A semantics of degree based on intervals'. *Natural Language Semantics* **10**(1), 1–41.

Seuren, Pieter. 1984. 'The comparative revisited'. *Journal of Semantics* **3**, 109–141.

Seuren, Pieter A. M. 1978. 'The structure and selection of positive and negative gradable adjectives'. In *Proceedings of the Chicago Linguistics Society (CLS) (Parasession on the Lexicon)*.

Snyder, William, Ken Wexler, & Dolon Das. 1995. 'The syntactic representation of degree and quantity: Perspectives from Japanese and child English'. In Raúl et al Aranovich (ed.), *Proceedings of the West Coast Conference on Formal Linguistics (WCCFL) 13*. CSLI, Stanford.

von Stechow, Arnim. 1984. 'Comparing semantic theories of comparison'. *Journal of Semantics* **3**, 1–77.

Svenonius, Peter & Christopher Kennedy. 2006. 'Northern Norwegian degree questions and the syntax of measurement'. In Mara Frascarelli (ed.), *Phases of Interpretation*, *Studies in Generative Grammar*, vol. 61. Mouton de Gruyter, Berlin.

Winter, Yoad. 2005. 'Cross-categorial restrictions on measure phrase modification'. *Linguistics and Philosophy* **28**(2), 233–267.

Yoon, Youngeun. 1996. 'Total and partial predicates and the weak and strong interpretations'. *Natural Language Semantics* **4**(3), 217–236.

Zwarts, Joost. 1997. 'Vectors as relative positions: A compositional semantics of modified PPs'. *Journal of Semantics* **14**(1), 57–86.

Zwarts, Joost & Yoad Winter. 2000. 'Vector space semantics: A model-theoretic analysis of locative prepositions'. *Journal of Logic, Language and Information* **9**, 171–213.

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