Uncovering the Scale: On the Interaction between the Semantics of Roots and Functional Structure

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1. Constraining the Distribution of Roots

A perennial challenge for research on the syntax-lexicon interface is capturing the distribution of contentful words in syntax. A sentence can be syntactically well-formed but nonetheless infelicitous because the terminal element under N, V or A is incompatible with its syntactic environment. In frameworks such as Government and Binding or Principles and Parameters, it was thought that syntactic structure projects from lexical structure, and lexical requirements of terminal elements determine the syntactic contexts into which they can be inserted. However, research in the past three decades has revealed that lexically contentful terminal elements are found in syntactic environments which do not in any intuitive sense seem to be projected from lexically encoded information. This challenges the idea that syntactic structure is projected from lexical structure. In more recent frameworks that adopt the idea that words are built in the syntax from a lexically contentful root and surrounding functional structure (FS), the challenge can be formulated as follows: what constrains the distribution of roots in surrounding FS configurations, explaining (in)compatibility of terminal elements with syntactic context? We can distinguish broadly between two approaches in the current literature, each of which captures certain observational generalizations. I term the first the *Free Distribution Approach* (FDA cf. Rappaport Hovav 2017), represented in the work of Acedo-Matellán and Mateu (2014), Acquaviva (2014), and most forcefully and eloquently by Borer (2005). In this approach, roots distribute freely in FS. Focusing on the distribution of verbs, this approach captures what has been called the 'elasticity of verb meaning,' the fact that verbs are often found in diverse syntactic contexts with concomitant ranges of meaning. The basic idea behind the FDA is that FS is associated with skeletal semantic interpretation, which determines major interpretive properties traditionally associated with the verb itself. An example, based on Borer (2005), is given in (1).

(1) a. My car has a siren.
b. The alarms sirened throughout the raid.
c. The factory sirened midday.
d. The police sirened the Porsche to a stop.
e. The police car sirened the daylights out of me. (based on Borer 2005: 69)

Intuitively, the concept 'siren' refers to a kind of instrument that emits a piercing sound, often for the purposes of communicating a nonverbal message. In (1a) the root is in a nominal environment and in (b-e) it is in varying verbal environments. There seems to be a constant meaning associated with the root, while major aspects of the interpretation of the structure are derived from the semantic contribution of FS. For example, (1e) expresses that the sirening of the police car caused a result, expressed in the small clause (SC). The SC is not licensed by the root √*siren*, but rather by the surrounding FS.

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I contrast the FDA with what I term the *Semantic Interface Approach* (SIA), represented in the work of Harley (2005), Levin (2017), Levinson (2007), Rappaport Hovav and Levin (1998) and Rappaport Hovav (2017). The empirical motivation for this approach is the fact that, despite the wide range of syntactic contexts in which a root can occur, its distribution is nonetheless constrained. For example, Rappaport Hovav and Levin (1998) show that the distribution of *result* roots is much more constrained that the distribution of *manner* roots. It is assumed that roots come with a basic semantic classification which constrains their distribution in FS; the semantics encoded in roots can be monotonically augmented by FS (or alternatively, by the event structure template).[1] The semantic elements which determine this classification are considered the grammatically privileged semantic elements of roots. Harley (2005) and Levinson (2007) assume that roots come classified as predicates of entities, events or states (<e,t>, <s_s,t> or <s_e,t> respectively). Result roots are identified as <s_s,t>. Rappaport Hovav and Levin (1998) assume a richer semantic classification for roots. In both approaches the aforementioned constraints on the distribution of result roots follows from constraints on the integration of states into event/functional structure.

The FDA recognizes that it basically over-generates and that structures with incompatible roots and FS have to be filtered out. But it considers this filtering to be *non-grammatical* in essence. Borer (2005) articulates this clearly:

> "… there is … no direct interface … between the conceptual system and the grammar, … properties of concepts do not feed directly into the determination of any grammatical properties … [The use of a] substantive listeme … will return a meaning based fundamentally on its conceptual value…A grammatical structure will return an interpretation… based on combinatorial, computational principles of interpretation assignment, as linked with the structural and the formal-semantic properties of functional vocabulary and syntactic structure … **[in] the 'making sense' component: a cognitive place, neither the grammar nor the conceptual system, the two outputs are matched.** In the event of a mismatch, the grammar will always prevail … The interpretation [of] the conceptual component … will stretch … within the confines of the concept … so as to match the rigid interpretational constraints circumscribed by the grammar … The more the conceptual system stretches, the more the utterance will appear 'odd' or metaphoric, … the oddity may be so extreme that it becomes difficult to distinguish from straightforward … ungrammaticality ..." (Borer 2005: 8-9, bold mine)

However, absent an articulated theory of this 'making sense' component, we have no explanation for specific constraints we may discover on the distribution of roots in FS. Some constraints do seem non-grammatical in nature, as Borer suggests, but it appears that there are also constraints which are more grammatical in nature; this paper will be devoted to one such constraint. The constraints which are grammatical in nature, I argue, come from the interaction between the privileged semantic properties of roots and FS. Returning to the SIA, an important question is whether there is a principled way to determine what may function as such a privileged semantic element. The suggestions of Harley (2005) and Levinson (2007) above make eminent sense if we assume that the semantic elements in FS have to combine, say by Function Application, with roots to derive denotations of the familiar sort in formal semantics. Continuing in their spirit, I make the following suggestion in this paper:

[1] This account clearly assumes that the meaning of structures with roots and functional heads is compositionally derived. Much of the literature in Distributed Morphology concentrates rather on unpredictable meanings associated with roots (under the rubric of *allosemy*) and the consequences these unpredictable meanings have for the representation of roots (e.g., papers in Doron 2014). In such cases, it is impossible to identify an invariant contribution of a root. However, I argue that if our goal is to understand the interaction between roots and FS, it is much more productive to study cases in which the contribution of the root *is* invariant; these cases allow us to isolate the respective contribution of the FS and the root and to study the interaction between them. Even roots with invariant meaning across different FS configurations may have specialized meanings in certain contexts, but these contexts teach us less about the interaction between roots and FS.

(2) **Root-Functional Structure Interface Hypothesis** (RFSIH): The privileged elements of meaning encoded in roots are *just those that are directly encoded in or directly interact with functional heads of syntax*. Roots and functional heads share a limited vocabulary which regulates the integration of roots into syntactic structure, and serves as the interface between conceptual and grammatical structure.

This paper will support the RFSIH by examining minimal contrasts between the well-studied class of degree achievement verbs (DAs) and a less well-studied class of locative verbs, referred to as *cover* verbs. The verbs in the two classes are shown to have a basic stative core, yet they interact differently in surrounding FS, particularly in causative alternation environments, and display distinct aspectual potential. I suggest that the lexically encoded scale structure present in the roots of DAs but absent in the roots of *cover* verbs is responsible for the contrast, since the relevant functional head responsible for the contrast can combine only with scale-encoding roots. The case study illustrates a constraint on the interaction between roots and functional structure which is specifically grammatical in nature, thus supporting SIA over FDA.

2. Degree Achievements and *CompV*

A standard analysis of DAs, focusing for now on deadjectival DAs, has a state root as predicate of a small clause complement of the categorizer *v* (e.g., Alexiadou, Anagnostopoulou and Schäfer (AAS) 2015).

(3) The door opened. [v_{CAUSE} [the door √OPEN]] (AAS: 29)

The assumption is that when *v* has a state-denoting root in its complement, *v* contributes eventivity in the form of an unbounded process. The unbounded process is interpreted as *leading to* the result state denoted by the root (Ramchand 2008): a causative change of state. Both transitive and intransitive variants have causative semantics, read off the same structure.[2] However, the literature has provided us with a more nuanced understanding of the semantic contribution of FS to the state root in DAs. Many authors (Deo, Francez & Koontz-Garboden (DFKG) 2013, Gawron 2006, Koontz-Garboden 2010, Rappaport Hovav 2014, Sweetser 1997) have pointed out that DAs have a variety of non-eventive uses, for which the *v* cannot be said to introduce eventivity. (4-7) are examples of such non-eventive uses of DAs, classified according to the subtypes in DFKG.

(4) The skirt narrows at the bottom. (RH 2014: 14) (Spatial extent reading)
(5) The plot thickens in chapter three. (DFKG: 100) (Abstract extent reading)
(6) The trees gradually thin out until there is no longer a canopy above you.[w] (Kind reading)
(7) The groove between the nose and upper lip flattens with increased prenatal exposure to alcohol. (DFKG: 98) (Functional reading)

The use of the simple present in these examples rather than the present progressive is indicative of stative uses; other diagnostics of stativity apply as well (see references cited). All accounts agree that these stative uses derive from the same representation as eventive uses. For example, the eventive and the stative uses show the same aspectual behavior, as I now illustrate. A DA based on an open scale adjective takes only atelic temporal/spatial modifiers when appearing with no specified measure phrase, in both eventive and stative uses:

(8) a. The canyon widened for/*in two millennia (eventive)
b. The canyon widens for/*in ten miles.[3] (stative)

[2] This is similar in spirit to the telic pairs <e>, <s> of Higginbotham 2009; see also Ramchand (2008).
[3] *The canyon widens in three miles* also has the interpretation that after a lapse of three miles the canyon begins to widen. This is comparable to the 'event delay' reading on the eventive use (Kearns 2007), and is not the relevant interpretation since it doesn't distinguish between telic and atelic predications.

When such a DA appears with a specified measure phrase, only telic temporal/spatial modifiers are appropriate, both in the stative and eventive uses:

(9) a. The road narrowed six meters in ten years/*for ten years (eventive)
b. The road narrows six meters in ten miles/*for ten miles. (stative)

A DA based on an upper bounded scale adjective takes a default telic temporal/spatial modifier in both uses:

(10) a. The tire flattened in five minutes. (eventive)
b. The road flattens (out) in six miles. (stative)

Furthermore, DAs with both stative and eventive uses show the repetitive/restitutive ambiguity with *again*:

(11) a. The crack widened again. (eventive)
b. The road widens again. (stative)
i. was wide, then not wide and then returned to wide state (restitutive)
ii. increased in width in two places (Koontz-Garboden 2010; DFKG) (repetitive)

The insight behind analyses of these DAs is that both eventive and stative uses encode that there is an increase in the degree to which the scalar property denoted by the adjective holds of an entity at two points along an axis in some correlated domain. In the prototypical eventive use, the DA describes a change in the value of the encoded scalar property between two points in *time*. In the case of (4) above, the verb describes that there is a change in the value of the degree of narrowness between two points along the length axis of the skirt. In (5) the ordered chapters of a book constitute the axis and in (7) it is the ordered degrees of exposure to alcohol. Only change along the temporal axis yields an eventive reading; otherwise a stative change reading is derived. Koontz-Garboden (2010) calls the stative change reading a *dynamic stative*, a term I adopt.

How are DAs, along with their interpretation, derived from the root? The structure in (3) has the verb derived directly from the root via *v*. In the cases of DAs with adjectival bases, however, the question arises as to whether the verb is derived via the adjective. Some deadjectival DAs, such as *sweeten*, show overt morphological derivation, and we can consider this indicative. I follow Bobaljik (2012) in assuming that DAs are not only derived from the adjective, but rather from the comparative form of the adjective (an idea hinted at in Kennedy and Levin 2008). The motivation for Bobaljik is the observation that when a language has a suppletive form for the comparative, in the overwhelming number of cases the DA based on such an adjective is derived from the suppletive form as well (Bobaljik 2012: 170).

I follow much work in assuming that adjectives are measure functions which map from the domain of individuals to degrees on a scale (the scale lexicalized by the adjectival root). Kennedy (1999) and Svenonius and Kennedy (2006) suggest that the comparative form of the adjective is a difference function built on a measure function which returns the difference in degree of a gradable property for some entity and a standard of comparison. Kennedy and Levin (2008), consider DAs to be a special kind of difference function – a measure of change function – that returns the difference in degree of the gradable property of the *same entity* at two points in time, thus bringing in an event variable. However, in light of the discussion earlier in this section, we must refine this and say that the measure of change function returns the difference in degree to which a scalar property holds of the same individual at two points along an axis in some domain, the time being one such domain.[4] Comparison of the degree to which a scalar property holds of the same individual at two points on some axis is always interpreted as *scalar change* (Kennedy and Levin 2008), whether the change is eventive or not. Morphologically, as

[4] See DFKG for a formal account along these lines, which does not, however, address the morphological derivation of DAs. In their account the change is not predicated of an individual, but rather of a generalized individual concept (*gic*); I ignore this aspect of the analysis in the present discussion but it is likely that it needs to be integrated into a complete analysis.

argued by Bobaliijk, the DA is derived from the comparative form of the adjective[5]. Semantically, I suggest that the measure of change function which the verb expresses is derived from the difference function of the comparative adjective by binding the comparandum argument (the standard of comparison) to the argument the verb is predicated of to ensure that the degrees being compared hold of the same individual. Given this property, it can be considered a kind of 'reflexivization' operation. This operator must also bring in the correlated axis, since clearly the degree to which a property holds of the same individual can only be compared in two situations or two parts of the same situation.[6]

I call the operator which performs this reflexivizing operation on the comparative *CompV*. It can be considered one instance of a verbalizer (*v*), one which is restricted to attaching to a base with a comparative structure. In English, there is usually no morphological exponent for this morpheme, but it does show up in some DAs, as in *sweeten* and *lengthen*. In fact, this reflexivizing operation must involve a change in category since any lexical item expressing scalar change must be categorized as a verb in English. (12) provides the structure I assume for de-adjectival DAs and the informal characterization of the semantic contribution of each constituent. The root lexicalizes the properties of the scale: the dimension, polarity and structure ((upper/lower-) open, closed). The categorizer *a* brings in the measure function (MF) associated with this scale; the comparative forms a difference function (DF), while *CompV* performs the said reflexivization operation (Refl) and brings in the associated axis (A).

(12) [[[[root] *a*] *comp*] *compV*]
scale MF DF Refl&A

The 'semantic signature' of *CompV* according to this analysis is that it derives DAs of both eventive and stative dynamic 'flavors.' This property is also displayed by non-derived DAs such as *age, sink, increase, decrease, melt, rise, fall, thaw,* etc. with no adjectival base. They, too, have eventive and stative dynamic interpretations (see 13-15) and also display the same aspectual properties as the de-adjectival DAs (16). Some of them show the repetitive/restitutive ambiguity shown by their de-adjectival counterparts[7]: when uttering (17) devout Christians do not mean that Jesus was resurrected twice.

(13) Ants increase as you move to the south. (kind)
(14) The boiling point of water decreases with altitude. (functional)
(15) Further on, the cliff sinks to a mere bank. (spatial)
(16) a. The prices rose for six weeks. (open scale, default atelic modifier)
b. The prices rose 20% in ten days. (open scale, telic modifier with specified measure)
(17) Jesus rose again. (restitutive)

These data indicate that it is the verbalizer that brings in the varying axes giving rise to the stative/eventive ambiguity. If these properties are diagnostics for *CompV*, the data also indicate that the semantics of *CompV* can be directly encoded in roots, and, more generally, that the semantics associated with FS can be encoded in roots, as argued extensively by Beavers and Koontz-Garboden (2020). I return to this issue in §5.

The analysis presented in this section makes a prediction, formulated in (18)

(18) *CompV* can **ONLY** be affixed to structures with lexically encoded scalar semantics.

[5] The analysis leaves unexplained why we do not normally see the regular form of the comparative, and only the suppletive forms of the comparative. As Bobalijk shows, the same question arises in the case of superlatives, which he argues to be derived from the comparative, which is transparent only in the suppletive form.

[6] Cf. **John is taller than himself*. Because the comparandum argument is bound, it cannot be expressed in a *than* clause: **The potato soup cooled than the tomato soup*; **The soup cooled than it was*. See Bobalijk (2012:181).

[7] Some non-derived DAs appear not to have this ambiguity: *The soup thawed again* can only have a repetitive meaning according to my intuitions and those of other native speakers I have consulted. It is as yet not clear how to account for these discrepancies between different non-derived DAs.

(18) is a consequence of the analysis in which *CompV* operates on the comparative morpheme, which itself can only attach to an adjective built on a root which encodes a scale (see 12).

(18) may seem trivial; however, it helps solve a puzzling contrast between DAs and *cover* verbs.

3. The Puzzling Behavior of Locative Statives – *Cover* Verbs

Cover verbs are transitive locative verbs with a theme argument as subject and a location argument as object. *Cover* verbs share properties with Dowty's (1979) interval statives (verbs such as *sit, stand, lie, sprawl, dangle, hover* and others), which also take a theme and location as arguments. Verbs in the latter class express the location argument in a subcategorized PP (19a) rather than as direct object (19b); see Rappaport Hovav (2017). Other *cover* verbs include *block, obstruct, surround, blanket, shroud* and *coat;* they are drawn from two of Levin's (1993) classes (*fill*-verbs, a subclass of verbs of putting, and verbs of contiguous location, a subclass of verbs of existence).

(19) a. [The sheet] $_{\text{theme}}$ is lying on [the sofa] $_{\text{location}}$.
b. [The sheet]$_{\text{theme}}$ is covering [sofa]$_{\text{location}}$

Some (Kratzer 2000, Rothmayr 2009) have claimed that these verbs are stative causatives as in (20):

(20) [$_{\text{VoiceP}}$ snow [Voice' [$_{\text{vP}}$ v$_{\text{CAUSE}}$ [$_{\sqrt{\text{P}}}$ $\sqrt{COVER}$ [$_{\text{DP}}$ the mountains]]]]]

However, recent work on these verbs (García-Pardo 2019; Rappaport Hovav 2018, 2019; Wilson 2019) has shown that the subject of the stative transitive is not an external argument; see these references for justification. Here I merely point out that an external argument can be added to the stative transitive structure, precluding a reasonable causative analysis for the stative transitive. As shown in (21) these verbs have a stative use, an inchoative use and a causative use.

(21) a. Snow covers these mountains all year. (stative)
b. Snow slowly covered the mountains.[8] (inchoative)
c. The storm covered the mountains with snow. (causative)

I assume that the stative transitive is the basic variant – I call it the stative core – since one can compositionally derive the inchoative and the causative from the stative; it is not at all clear how to derive the stative from the others. I assume that this stative core is unaccusative, leaving room for a cause subject:

(22) [$_{\text{VoiceP}}$ voice [*v* [snow $\sqrt{COVER}$ the mountains]]][9]

On the face of it, the triad in (21) is parallel to the well-known triads of consisting of adjectives and related inchoative and causative DAs (23), discussed intensively over the years, beginning with Lakoff (1965), McCawley (1971), and continuing with Dowty (1979) and many others; the difference is that with *cover* the stative core is a transitive verb rather than an adjective.

(23) a. The crack is wide. (stative)
b. The crack widened. (inchoative)
c. The aftershocks widened the crack. (causative)

However, the inchoative form of *cover* displays a puzzling feature: it systematically lacks all the dynamic stative readings that DAs display. The (b) examples below only have eventive uses. They all lack any

[8] Not all choices of argument yield a felicitous inchoative use: #*The tablecloth slowly covered the table*. Intuitively, the subject has to have some internal source of energy for the inchoative to be felicitous.
[9] The question arises as to the source of case marking for the direct object. Wilson (2019) suggests that there is a silent P which assigns case here.

reading in which there is a difference in degree of covering between two points on a correlated non-temporal axis, readings available to the DAs in the (a) examples.

(24) a. Near the northern tip, the road narrows considerably. (Spatial extent reading)
b. Near the northern tip, snow covers the mountains. (≠covers more of the mountains)
(25) a. The trees gradually thin out until there is no longer a canopy above you.[w] (Kind reading)
b. Moss covers the trees towards the waterfall. (≠ more moss, or covers more of the trees)
(26) a. Fish ears grow with increased CO2. (DFKG: 102) (Functional reading)
b. Fungus covers the tissue with increased moisture. (≠ more fungus; ≠ covers more of the tissue.)

Concomitantly, the stative uses of *cover* verbs differ from stative readings of DAs aspectually, since the former are not dynamic statives like the latter. First, with stative uses of *cover* verbs, measure phrases have simple measure interpretations, not difference interpretations, while dynamic stative uses of DAs have difference interpretations: (27b) does not mean that the road narrowed and is three feet wide, but rather that it became narrower by three feet.

(27) a. Snow covers the mountain *(for) three miles. (measure interpretation)
b. The road narrows three feet. (difference interpretation)

Second, specified measure phrases telicize dynamic stative uses of DAs (licensing *in*-temporal phrases – 26a), but do not telicize *cover* verbs (26b).

(28) a. The road narrows three feet in two miles.
b. The snow covers half the mountain for /*in half a kilometer.

Furthermore, stative uses of *cover* verbs display only a repetitive reading with *again*, not a restitutive reading:

(29) a. The road widens again. (repetitive and restitutive)
b. Snow covers the road again. (repetitive only)

Recall two conclusions from §2. First, the semantic signature of *CompV* is that it derives changes of state with both dynamic stative and eventive readings. Since the inchoative use of *cover* verbs (21b) lacks the dynamic stative readings, we can conclude that it is not derived by *CompV*. Second, (18) asserts that *CompV* only attaches to roots with encoded scales. I suggest, then, that the dynamic stative readings of *cover* verbs are not available precisely <u>because</u> their roots do not encode scalar semantics. The next section is devoted to supporting the assertion that *cover* verbs do not encode scale structure.

4. *Cover* Verbs Do Not Encode Scale Structure

To support the claim just made about the semantics of *cover* verbs, I compare the non-dynamic stative variants of these verbs (which by hypothesis do not encode scale structure), with the non-dynamic stative core of DAs – gradable adjectives – which are universally recognized as encoding scale structure. I contrast their behavior with respect to their compatibility with measure phrases and comparative structures, both of which depend on scale structure.

Gradable adjectives appear with measure phrases (30). In contrast, measure phrases do not sit comfortably on *cover* verbs (31); they need to form a constituent with the direct object (32):

(30) The table is thirty inches tall.
(31) a. *The rug covers the floor three tiles/inches.
b. *The table is three inches covered.
(32) a. Three tiles of the floor are covered.
b. Three inches of the table are covered.

Gradable adjectives appear with a range of comparative XPs:

(33) a. The table is taller than the desk.
b. The table isn't as tall as the desk.
c. The table is too tall for the kids to eat on.
d. The table is so tall that it is unusable as a dining room table.

In contrast, comparative phrases with *cover* verbs are distinctly odd; they are fine, however, when directly modifying the direct object:

(34) a. ??The red cloth covers the table more than the green cloth. (OK covers [more of the table])
b. ??The red cloth doesn't cover the table as much as the green cloth. (OK as much of the table)
c. ??This hat covers your head too much. (OK too much of your head)

The roots of *cover* verbs, then, do not lexicalize any scale structure; this is the reason that *CompV* does not attach to them, and to this I attribute the lack of dynamic stative readings for these verb. However, this hypothesis needs to be reconciled with the observation that *cover* verbs appear with adverbials that are classic hallmarks of scale structure, specifically diagnosing a closed scale:

(35) a. The cloth covers the table half-way.
b. The cloth covers the table completely/fully/entirely.
c. The cloth covers the table slightly.

I suggest that *cover* verbs should receive an analysis which is similar to that suggested for incremental theme (IT) verbs in Kennedy (2012), based on Rappaport Hovav (2008). Rappaport Hovav (2008) first suggested that despite variable telicity which is often calculated on the basis of scale structure (Kennedy and Levin 2008), IT verbs do not themselves lexicalize scales; the variable telicity they display is calculated on a scale structure introduced by the direct object. Kennedy (2012) points out that IT verbs do not appear in comparative structures or with measure phrases.

(36) a. ??Jones wrote the paper more than Smith did.
b. ??Jones didn't write the paper as much as Smith did.
c. ??Jones wrote the paper too much.
d. ??Jones wrote the paper two sections.
e. ??Jones wrote the paper so much that Smith barely had to do anything. (Kennedy 2012: 114)

As in the case of *cover* verbs, the degree constructions are fine when they combine with the direct object:

(37) a. Jones wrote more of the paper than Smith did.
b. Jones didn't write as much of the paper as Smith did.
c. Jones wrote too much of the paper.
d. Jones wrote two sections of the paper.
e. Jones wrote so much of the paper that Smith barely had to do anything. (Kennedy 2022: 115)

In both cases, the degree expressions measure how much of the extent of the denotee of the direct object participates in the event. Incremental theme verbs express a homomorphic relation between the temporal development of an event of change and the part structure of an argument (Dowty 1991; Jackendoff 1996; Krifka 1992; Tenny 1994). The basic meaning of *cover*, however, is a non-dynamic stative – there is no temporal development – it is homogenous down to the smallest interval. Nonetheless, I suggest that the object serves as a measure. Consider a 4m long cloth covering a 2m long table. Half the cloth covers the entire table. We describe this situation as in (38), not (39):

(38) The table is fully covered. (not half covered).
(39) The cloth half-covers the table. =
The cloth covers half of the table. ≠
Half of the cloth covers the table.

Consider, additionally, the fact that a "half-cover" covers half a car; it is not a covering half of which covers a car. These observations support the analysis of the direct object as a measure. The semantics of *cover* verbs involves a homomorphism from the measure (i.e. object/location argument) to its other (theme) argument such that each portion of the measure argument necessarily corresponds to a portion of the theme argument.

(40) $\forall x,y\ [\text{cover}\ (x,y) \leftrightarrow \forall y' <_p y\ [\exists x' <_p x\ \Lambda\ [\text{cover*}\ (x',y')]]]$[10]

The homomorphism licenses the scalar modifiers, despite the fact that *cover* verbs do not have a lexically encoded scale and do not appear with *CompV*.

The analysis, however, leaves unexplained how the *eventive* inchoative use of *cover* verbs is derived. Recall that for DAs, the eventive inchoative use is just one instantiation of a more general reading derived from *CompV*. But I have argued that *CompV* does not attach to *cover* verbs. However, the literature recognizes a second way of deriving changes of state, in particular from stative predicates. All stative verbs can be used in English without any morphological marking to express a change of state:

(41) a. I understand what you are saying. (stative)
b. I gradually understood what people were saying to me. (inceptive)
(42) a. I owned three apartments. (stative)
b. After my Dad died, I suddenly owned three apartments. (inceptive)

I suggest that whatever mechanism is responsible for this general phenomenon is responsible for the eventive COS interpretation of *cover* verbs. Support for this suggestion come from the fact that changes of state derived in this way have only eventive readings, making them different from DAs derived by *CompV*, which can be either stative or eventive.

5. Grammatically Relevant Semantic Properties of Roots

I now return to the question posed at the beginning of this paper: what constrains the distribution of roots in FS? On the FDA view, roots distribute freely and the interpretation of FS is always imposed on the combination of root and functional categories. Roots sometimes have to accommodate to the interpretation imposed by FS. If that were the case, we would expect *cover* verbs to 'accommodate' to the semantics of *CompV*, and thus show dynamic stative readings. There is nothing semantically odd about the dynamic stative readings which *cover* verbs would show if they semantically accommodated to *CompV*. *Near the northern tip, snow covers the mountains* cannot mean that as one approaches the northern tip snow covers more of the mountain, though the meaning is coherent; it is just the meaning the sentence would have if *cover* combined with *CompV*. The fact that *cover* verbs do not accommodate to the meaning of *CompV*, strongly suggests that there is a *grammatical* constraint preventing the association of *CompV* with *cover* verbs. I have identified the absence of scalar semantics as the source of this constraint. This in turn suggests that lexically encoded scale structure is grammatically relevant and that, more generally, that roots can encode elements of meaning which serve as the interface with grammar. The relatively parsimonious approach in Harley (2005) and Levinson (2007), in which roots are associated with the semantic types $\langle e,t\rangle$, $\langle s_s,t\rangle$ and $\langle s_e,t\rangle$ cannot distinguish between the roots of DAs, and the roots of *cover* verbs since they would both be classified as predicates of states. The difference between them is that the former have lexically encoded scale structure while the latter do not.

[10] A similar analysis of the covering relation is presented in Jackendoff (1996), where the homomorphic relation is captured by his 'axial sp-binding' (structure preserving binding). *cover** here is shorthand for the specific topological relation holding between the theme and location (measure) argument, something along the lines 'overlay' such that every part of the measure is in the 'overlay' relation to some part of the theme argument.

The approach adopted here is still in the spirit of Harley and Levinson, based on the idea that roots have to compose with the semantics associated with functional elements, by semantic processes like Function Application which are sensitive to semantic type. It is perhaps not surprising that notions such as scale structure and scalar change are grammatically relevant – there are functional items which directly encode or interact with such properties. Therefore, I repeat the proposal set forth at the outset:

(43) **Root-Functional Structure Interface Hypothesis**: The privileged components of meaning encoded in roots which are grammatically relevant are just those elements of meaning which are also encoded in or which directly interact with FS.

(43) helps solve a conceptual problem which Borer (2005) underscores, namely, that functional items and substantive vocabulary are creatures of very different sorts; it is, then, not entirely clear how they link up. The substantive vocabulary items (here, roots), writes Borer, "…are creatures born of perception and conceptualization, representing an intricate web of layers upon layers of a complex perceptual structure and emerging world knowledge, concepts which come to represent it, the reflection upon these concepts, and so on" (p. 8). None of this richness and complexity is found in functional structure, with its very lean and rigidly interpreted vocabulary. How do these systems interface? The suggestion here is that the two systems nonetheless share a limited vocabulary which serves as the interface between these two different kinds of systems, monitoring the match between them.

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