

Going postal: the architecture of English change of state verbs

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Abstract

We explore semi-productivity in the domain of the English change of state (CoS) verbs *become*, *get*, *fall*, *come*, *go*, *turn*, and *grow* that combine with adjectives to produce expressions of the form $V_{\text{CoS}}+\text{AP}$. Each of these verbs except *become* imposes certain presuppositions on the state denoted by the AP complement. Through a comprehensive search of the Web for expressions of this form we find that there is a wide disparity in terms of which adjectives appear with which verbs. Some of this disparity is due to the naturalness of imposing presuppositions on particular states, some is due to differences in what is common in discourse, and some is due to collocation. Even adjectives that are very close in meaning show very different frequencies of occurrence with the various CoS verbs. A large number of adjectives occur very rarely with any of these verbs, in patterns that do not appear to be predictable on the basis of semantic similarity. The creativity observed in the data suggests that while the language faculty encodes the statistics of experience for particular instances of particular CoS verbs and particular adjectives, it also allows for a potentially unbounded set of possible expressions characterized by the grammatical rule $\text{VP} \rightarrow \text{V AP}$.

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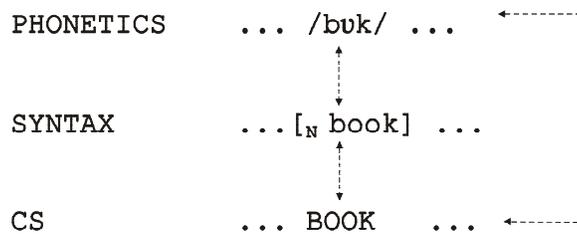
1. Introduction

The phenomenon of semi-productivity confronts us directly with the question of how a grammar is organized. It is apparent that there is a difference between general rules of grammar, with associated rules of interpretation, such as

(1) $VP \rightarrow V (NP) (PP)$

and lexical correspondences, such as (2).

(2)



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The traditional view is that sentences and phrases and their meanings are the province of the syntactic and semantic components, and words and their meanings are the province of the lexicon. The rules express regularity, and the lexical entries express idiosyncrasy.

The traditional division of the grammar into the rules and the lexicon assumes that there is a principled distinction to be made, but recent studies of constructions and related phenomena have called this traditional dichotomy into question (see, e.g., Kay and Fillmore 1999, Fillmore et al. 1988, Goldberg 1995, Goldberg and Jackendoff 2004, Goldberg 2006, Culicover 1999, Culicover and Jackendoff 2005). What appears to be the case is that there is a continuum of regularity, with individual words as in (2) at one end and rules such as (1) at the other.

When we enter this continuum, a number of questions arise that are not at issue under the earlier simple picture. Perhaps the most contentious is, What is a rule? If we say that (1) is a ‘rule’, do we mean that its theoretical status is qualitatively different from that of a more restricted ‘construction’, such as those illustrated in (3)-(7).

(3) The trolley squealed around the corner.

Meaning, ‘The trolley went around the corner squealing.’

(4) The more I drink the drunker I get.

(5) Off with his head!

(6) Easy come, easy go.

(7) Come Monday morning, you're not going to be laughing so much.

These cases, and there are many, are characterized by the fact that in one way or another, the interpretations are not determined by simple functions that combines the meanings of the parts according to the syntactic structure ('Fregean compositionality' – see Culicover and Jackendoff 2006). Each is idiosyncratic in some way. A native speaker knows not only how to create instances of each construction, but also which lexical items are appropriate in certain slots and which are not. To the extent that a construction does not range over all of the lexical items in a category such as V or N, it appears that we have an instance of semi-productivity, and in the limit, idiomaticity.

Semi-productivity is of course the norm in derivational morphology. Not all roots combine with all derivational morphemes, and the results of morphological derivation are not in general semantically transparent. The facts of syntactic semi-productivity suggest that the same may be true of syntax, to some extent. One might in fact argue that semi-productivity is the norm, and that even the apparently fully productive rules are simply the union of overlapping sets of semi-productive correspondences (see Bybee 2006; Bybee and Eddington 2006; Tomasello 2003).

On the one hand, it is difficult to see how one would argue on empirical grounds that there is any difference between a 'rule' in the classical sense of (1), and a set of constructions with 100% coverage over a lexical category. On the latter view, there is a construction [_{VP} V] for intransitive verbs (such as *die*), another [_{VP} V NP] for transitives that take a direct object argument (such as *destroy*), another [_{VP} V PP] for transitives that take an oblique object argument (such as *look at*), and so on. In the case of [_{VP} V PP]

there would actually be as many more specialized constructions as there are prepositions that are selected to mark an oblique object. On this view, the work that is traditionally done by a subcategorization feature in the lexical entry of a verb is done by associating the verb with a particular construction. The two approaches appear to be notational variants.

On the other hand, consider again the rule in (1). A group of semi-productive correspondences that do not fall under this general description are less natural than a cluster of correspondences that do. That is, we expect all semi-productive VP constructions in English to be verb-initial, to have the NP immediately after the V, and to have PPs etc. following that. It would be surprising to find a set of VP constructions in English such that each of the following ordering descriptions held for a different subset of the Vs, e.g.,

- (8) V_1 NP PP PP V_2 NP V_3 PP NP
 NP V_4 PP PP NP V_5 NP PP V_6

It is reasonable to take the position that statements such as (1) are correct generalizations about the language. On this view, it is costly, in the sense of markedness, for individual constructions to deviate from the general pattern. Precisely how to characterize this cost remains an open question. But if the basic observation is correct, positing the existence of such rules as part of a native speaker's knowledge of the language must play a central role in explaining why the language has the form that it does.

In this paper we address this question of how best to capture semi-productivity by looking at the architecture of a cluster of semi-productive correspondences that satisfy the description in (9), the English change-of-state (CoS) verbs that take predicate adjectival complements.

(9) $VP \rightarrow V_{\text{CoS}} AP$

These are of the general form

- (10) a. become angry
b. get heavy
c. turn red
d. grow rich
etc.

While there are clearly classes of adjectives that combine with each of the verbs, we argue that it is not an accident that they all fall under the syntactic pattern (9). The rule in (9) is a statement about the general structure of the language – in fact it is a special case of (11).

(11) $VP \rightarrow V AP$

which is a special case of (12).

(12) VP → V ...

The schema in (12) expresses the generalizations that the VP is headed by V, which presumably follows from UG, and that in English it is phrase-initial.

As we will see, the set of CoS constructions is quite diverse and idiosyncratic. We find that each verb imposes a particular semantic constraint on its complement. The most compatible V-Adj pairs are relatively frequent, since they express ‘natural changes’. However, the less compatible pairs are possible to the extent that it is possible to coerce the state denoted by the Adj to have the restriction required by the V.

An interesting point of comparison is the study of Bybee and Eddington 2006 (henceforth B&E). B&E look at how Spanish verbs that mean ‘become’ may combine with predicates to express change in a property. The distributional evidence from B&E’s corpus study shows that not all CoS verbs occur equally frequently with all predicates. For example, *quedarse solo* ‘to be left (become) alone’ is common in their corpus, while *quedarse seca* ‘to become dry’ is rare. On the other hand, *ponerse nervioso* ‘to become nervous’ is more common than *quedarse nervioso*, which does not appear in the corpus.

Spanish, like English, has the phrase structure [_{VP} V_{CoS} AP]. B&E’s corpus study shows that while there is a tendency for some verbs and adjectives to cooccur systematically, there are many cases in which an adjective occurs with more than one verb. In general, the distribution of adjectives over verbs is not even. Although the B&E corpus is relatively small (2 million words) and the number of tokens correspondingly small (1283), it appears that the unevenness of V_{CoS}+Adj distribution cannot be attributed

simply to frequency differences among the verbs and the adjectives individually. Moreover, some of the phrases that appear in the corpus, including *quedarse solo* and *ponerse nervioso* are strong collocations, what B&E (330) call ‘fixed expressions’. This is a way of saying that *solo*, for example, goes only with *quedarse*, and not with any of the other logically possible verbs.

The explanation that B&E put forward for the distribution of $V_{\text{CoS}}+\text{Adj}$ expressions in their corpus is one in which certain high frequency expressions function as central members of the set of possible expressions and other expressions cluster around them to the extent that they share features with them. An adjective is judged as being close to a central exemplar on the basis of semantic similarity. They write, “The best fit with the data is a model in which exemplars are stored and accrue strength on the basis of frequency while also being organized into categories around a central exemplar” (326).

The view that we take here is more or less compatible with that of B&E, but suggests a more articulated view of the representation of knowledge in the mind of the native speaker. At one level there are generalizations such as (1) and (9). At another level there is knowledge of the combinatorial properties of the individual verbs, expressed as part of their lexical representations. And at still another level, there is the representation of the frequency of particular combinations of forms based on the speaker’s actual linguistic experience. We find it plausible that this experience plays a role in the learner’s use of language even when the learner has more abstract constructions and rules at her disposal.

The structure of the rest of the paper is as follows. In §2 we elaborate further on the architectural issues discussed above. In §3 we summarize the basic properties of the

English CoS verbs, and argue that they impose certain semantic restrictions on their complements. §4 describes how these properties are exemplified in the materials in our corpus. §5 looks at the fuller range of possibilities for $V_{\text{CoS}}+\text{Adj}$ pairings, and argues that there are in principle no limits, given the possibility of coercion. This observation supports our claim that a rule such as (9) is a part of knowledge of English. §6 makes a proposal about the architecture of the linguistic system that yields the observed behavior in a natural way.

2. Grammatical architecture

We assume the following architecture of the grammar. As outlined in Culicover and Jackendoff 2005, constructions are represented in an extended lexicon, along with words and idioms. A lexical entry functions as a schema or rule that encompasses existing experiences and permits construction of new utterances. In turn, this schema along with others may be further abstracted into a still more general schema by replacing further dimensions of variation with variables. The result is a hierarchy of lexical entries, in which each layer consists of generalizations of items in the more specific layers below (the term used in HPSG and Construction Grammar is *inheritance hierarchy*). We conceive of UG as pre-specifying the highest, most general layer of the hierarchy. The gradual creation of lower, more specialized levels from idiosyncratic input is guided by the criterion that, if at all possible, lower levels should be specializations of the highest layer, so that the hierarchy is maximally coherent.

Crucially, the highest level of a hierarchy for a given lexical category in a language has the status of a general rule, for example

(13) $VP_{CoS} \rightarrow V_{CoS} AP$.

This rule subsumes more specialized constructions based on particular verbs, e.g.,

(14) $VP_{CoS/go} \rightarrow V_{CoS/go} AP$

(15) $VP_{CoS/get} \rightarrow V_{CoS/get} AP$

and so on.

On the view that we argue for here, these specialized rules are arrived at in the course of language acquisition as a consequence of specific linguistic experience, as outlined in Culicover and Nowak 2003 and Tomasello 2003. The primary linguistic experience consists of individual exemplars, each of which is recorded by the learner. The weights of exemplars, and the weights of their common properties, are adjusted on the basis of experience. At the point at which the space of exemplars involving a particular lexical item or category is sufficiently densely populated, the learner formulates a generalization (that is, a construction) that covers prior experience but may go beyond it with respect to potential exemplars. That is, the generalization covers cases that have not been encountered.

Crucially, the process of generalization does not lose the frequency information. But it does introduce possibilities that do not exist in the learner's experience. We would expect to find that while a learner's behavior shows that it has generalized beyond experience, this behavior reflects the frequency of individual exemplars (as collocations) and groups of exemplars (as constructions).

A critical question that arises from this perspective is what determines the direction and extent of generalization. To the extent that the lexicon is organized on the basis of semantic similarity, semantic similarity should be reflected in the frequency of the exemplars that occur in the learner's experience. For example, given that *crazy* and *nuts* are close in meaning, we would expect, other things being equal, that both would appear in the learner's experience with the same CoS verbs, as in *go crazy*, *go wild* and *go nuts*. The occurrence of such related exemplars will follow from any architecture in which semantic similarity leads to generalization of lexically based constructions over semantic classes. We would expect that when all of the APs that combine with a particular V_{CoS} in a learner's experience have some semantic property, there will be generalization to the class of all APs that have this property. So when a new adjective is introduced into the language that means 'crazy', we would expect generalization to this adjective as well. This in fact what we find in the case of *go postal*.⁴ This type of generalization is 'smooth', to the extent that it covers the entire semantic category.

The crucial case is one in which the APs that appear with a particular V_{CoS} do not happen to share a particular property. In this case the experience of the learner is 'uneven', in the sense that there may be subgroups of APs that cluster around a particular property, but not all do. The more diverse the semantic properties of the APs that occur with a given verb are, the more inclusive the generalization will be. But a more inclusive generalization does not rule out the existence of coherent clusters.

We argue on the basis of the corpus data that this picture is the correct one for the change of state verbs in English. Some of the CoS verbs impose particular semantic

⁴ We discuss the data regarding such cases in §5.

constraints on their complements, so the APs that combine with them express predicates of certain restricted classes. Other CoS verbs are more permissive, and in these cases, the range of possible AP complements is effectively unrestricted. There is clearly clustering based on semantic similarity, but there are also unique and unpredictable cases.

3. English CoS verbs

3.1. Huddleston & Pullum 2002

Huddleston and Pullum (2002, 264) provide the following observations about English CoS verbs. *Become* and *get* occur more or less freely with predicate complements. *Become* may occur with nominal and adjectival complements, while *get* is restricted to adjectival complements.

- (16) a. Robin $\left\{ \begin{array}{l} \text{became} \\ \text{got} \end{array} \right\}$ angry.
b. Robin $\left\{ \begin{array}{l} \text{became} \\ * \text{got} \end{array} \right\}$ a doctor.

Get is more informal than *become*, and more easily accommodates the existence of a volitional agent.

- (17) Robin tried not to $\left\{ \begin{array}{l} ?\text{become} \\ \text{get} \end{array} \right\}$ angry.

In addition, there are five other verbs of change-of-state which appear with selected adjectival complements.

- (18) a. fall asleep, ill, pregnant⁵, prey (to), sick, silent, victim, ...
 b. come loose, open, apart, right, true, ...
 c. go bad, mad, wrong, red (and other color terms), ...
 d. turn bad, nasty, sour, red (and other color terms), ...
 e. grow long, old, tall, tired, taller (and other comparatives), ...

While all of these verbs mean ‘become’ in some sense, they cannot all combine with all adjectives that denote states that an individual may acquire. *Become* appears to be relatively free, but the following examples all sound odd to the native speaker author. We give just one example for each verb at this point.

- (19) a. *fall sour b. *come false c. *go rough
 d. *turn happy e. *grow skinny

One possible explanation for the impossibility of these particular V+Adj combinations is frequency: we never hear them, so they sound bad. Moreover, they are not similar enough to robust cases that we do hear to allow us to use the robust exemplars to generalize to the less robust. We take this to be the essence of the proposal of B&E.

Another possibility is that these particular combinations are ruled out on the basis of meaning. For example, if *turn* selects colors and negative states, then **turn happy* will not occur because *happy* denotes neither a color nor a negative state. This may be part of

⁵ *Fall pregnant* appears to be more common in British English than in American English.

the story, but as we will see, the situation is somewhat more complex. What appears to be going on, in fact, is that each verb, except *become*, imposes some presuppositions on the state denoted by its complement. These presuppositions function as selection restrictions, in the sense that if a predicate is required to denote a state with feature [F] and it does not, there is a semantic clash. However, in this case the features are for the most part evaluative. So a speaker is able to use a given construction with a particular adjective Adj to the extent to which she intends to convey that the state denoted by Adj has the feature [F].

In the next section, we discuss the meaning restrictions imposed by these verbs.

3.2. Meanings

We begin with a comparison of *become* and *get*. These do not appear with the same set of adjectives. While *become* has a neutral meaning of ‘acquire a property’, *get* has the additional meaning that acquisition of this property involving loss of another (related) property in the same or related semantic field. Consider the examples in (20)-21).

- (20) a. It became $\left\{ \begin{array}{l} \text{obvious} \\ \text{apparent} \\ \text{evident} \end{array} \right\}$ that the theory wouldn't work.
- b. *It got $\left\{ \begin{array}{l} \text{obvious} \\ \text{apparent} \\ \text{evident} \end{array} \right\}$ that the theory wouldn't work.

While it is possible for a proposition to acquire the property of being obvious in the mind of an agent (20a) we do not think of the proposition as having another property in the

mind before it becomes obvious. Thus, a proposition cannot ‘get’ obvious (20b).

But a proposition that is already obvious may become more obvious. Hence *get* is possible with comparatives (21a). On the other hand, an animate object may have a property in the space of moods, strength or cleanliness and may move to a different property in the same space (21b) or to a different place on a particular scale (21c).

(21) a. It has gotten a lot $\left\{ \begin{array}{l} \text{more obvious} \\ \text{more apparent} \\ \text{more unfortunate} \end{array} \right\}$ as time goes on that the theory

won't work.

b. The monster got $\left\{ \begin{array}{l} \text{angrier} \\ \text{stronger} \\ \text{dirtier} \end{array} \right\}$.

c. The monster got $\left\{ \begin{array}{l} \text{angry} \\ \text{?strong} \\ \text{dirty} \end{array} \right\}$.

These observations are summarized in *i-ii*.

i. become

MEANING: acquire property P

ii. get

MEANING: move to a particular position P in a semantic field that contains P.

If these judgments are on the right track, they suggest a number of important things about CoS verbs. First of all, it is not surprising that a given adjective may appear with two (or more) such verbs. If an object has a certain property P and then acquires P', it necessarily becomes P'. So we find in these examples that the predicates that appear with *get* also appear with *become*. It is reasonable to hypothesize that this relationship will hold for any adjective that can appear with *get*. At the same time, if an adjective can appear with *become*, that does not mean that it will be able to appear with *get*, since it is possible to acquire a property P without previously having a related property.

Second of all, whether or not an object may or must have a related property prior to acquiring property P is not a matter of language, *per se*, but has to do with how we interpret states of affairs and properties in the world. In the case of the comparative, of course, there are no options available for us to interpret things. But in other cases it should be possible to coerce something that we do not conceive of in this way as having a prior property, by using the *get* construction. So, while the sentences in (20b) do not sound very natural, we might be able to say the following under certain circumstances.

(22) That the theory wouldn't work got painfully obvious.

We can imagine this sentence from the perspective of the scientist for whom the proposition that the theory **would** work was previously paramount in her mind, and then it gradually dawned on her through a series of unsuccessful experiments that the theory would not work.

The comparative, though, presupposes that the object or proposition in question is already somewhere on the scale; thus it can move to another position on the scale. Thus, while there are no instances of *get right-wing* in our data, examples such as the following can readily be found on the Web.

- (23) a. Funny how *you get more right-wing* as you get older.
b. Once someone is proved guilty I suddenly *get very right wing*.

Granting that this is the right way to look at things, the question of relative frequency takes on a somewhat different cast. $V_{\text{COS}}+\text{Adj}$ combinations that are incompatible with how we view the space of properties as they apply to various objects should have very low counts, occurring only through coercion. But when there are alternative ways to express the acquisition of some property, as in the cases we have already looked at, the frequencies may well reflect not only ways of talking about changes of state, but standard ways of thinking about them. This phenomenon has a distinctly aspectual character to it, that is, a varying-point-of-view.

Before moving on, we also note that there are uses of these verbs that are not entirely straightforward to categorize. For example, *get* may be used with adjectives that

refer to one's behavior in action, such as *get smart*, *get witty*, *get gentle*. We might take these cases to be adverbial, but there is also the sense that the individual behaving in this way, e.g. gently, is doing so in virtue of having acquired the corresponding property, e.g. gentleness. For present purposes we take these cases to be adverbial, with the CoS interpretation being a defeasible implicature; one can get gentle without being gentle, and so on.

The verb *get* is also used as an active or passive with result predicates, as in *get married* and *get paid*. These do not count as CoS in the sense that we are using it, since the change of state is, we assume, simply implicated by the event and is not part of the core meaning.

Consider now the verb *fall*. *Fall* appears to co-occur primarily if not entirely with adjectives that refer to a change to a 'marked', i.e. non-default, state. We put quotes around 'marked', because what constitutes 'marked' is subjective in the semantic domain – it depends on perception and belief. For example, *fall silent* (24a) refers to the situation in which the sound goes out of an individual or group, presupposing that it is 'normal' or 'unmarked' to be making some noise. *Fall dead* (24b) presupposes that the unmarked state is to be alive, *fall asleep* (24c) that it is unmarked to be conscious, *fall pregnant* that it is unmarked not to be pregnant, and so on. In this case, 'marked' seems to be something like 'worthy of mention'.

- (24) a. The room fell silent. [i.e. absence of noise]
b. The elephant fell dead. [i.e. absence of life]⁶

⁶ This may not be CoS, if the elephant actually falls. But we can say this about an elephant that is lying

- c. The child fell asleep. [i.e. absence of wakefulness]
- d. The patient has fallen sick again. [i.e. absence of health]
- e. The robe fell open. [i.e. absence of being tied]
- f. He can't get his sheep to fall pregnant, so he goes and sees a vet about it.⁷
[absence of infertility?]

In summary, we have *iii* for *fall*.

iii. fall
MEANING: acquire a marked property P

Turn appears to have two unrelated uses. One, exemplified in (25), refers to a change of state in which something moves to the negative end of a scale. So, for example, *turn bad* refers to movement towards the ‘bad’ end of the Goodness scale, *turn cold* refers to movement towards the ‘cold’ end of the Warmth scale, *turn nasty* to movement towards the ‘nasty’ end of the Niceness scale, and so on.

(25) turn { bad
bitter
cold
dark
nasty
sour
ugly
violent }

The other use of *turn* is with colors (26). These do not appear to implicate any

down, then we are justified in supposing that it is CoS.

⁷ <http://www.brisbanephotography.com/viewtopic.php?f=11&t=94&p=793>

positive or negative judgment.

- (26) turn {
black
blue
brown
gold
golden
green
gray
orange
pale
pink
purple
red
white
yellow

We distinguish these two cases as *turn*_{negative} and *turn*_{color}. *iv* summarizes the meanings of *turn*.

<p><i>iv. turn</i></p> <p>MEANING:</p> <p>(a) acquire property P that is a negative value on the scale</p> <p>(b) acquire a color</p>

Go as a CoS has two uses. One, which we refer to as *go*_{extreme}, pairs the verb with adjectives such as *bad*, *dark*, *flat*, *missing*, *insane*, *nuts*, and *postal*. These are exemplified in (27).

(27) go {
 bad
 black
 blind
 crazy
 dark
 dead
 dry
 flat
 insane
 mad
 missing
 nuts
 postal
 wild }

The other, which we refer to as *go*_{political}, pairs the verb with adjectives such as *green*, *conservative*, *Republican*, and *blue* (meaning, for example, Democratic). These are exemplified in (28).

(28) go {
 blue
 communist
 conservative
 Democratic
 Green
 Republican }

We rule out from the set of relevant cases the active *go*+Adj construction exemplified by *go global*, *go digital*, *go international*, *go professional*. This construction, which we call *go*_{arena} means ‘decide to perform at the Adj level/in the Adj arena’, and implicates change of state, but does not incorporate change of state as a core part of its meaning.

Finally, the form *go*+Adj also has an adverbial interpretation.

(29) a. go { casual
contemporary
dutch
hungry
slow }

b. come { armed
early
later
nearest
running }

We consider such cases as not being examples of CoS.⁸

We summarize the relevant meanings of *go* in *v.*

v. go

MEANING: acquire a dramatic or extreme property P.

Come is used to convey the idea that the property acquired is in some sense free, unencumbered or liberating, e.g. *come alive*, *come free*, and *come true*.

(30) come { alive
clean
free
loose
open
true }

⁸ Some of these cases may in fact be genuine instances of CoS. E.g., *go casual* could mean ‘become casual’ and *go dutch* could mean ‘become Dutch’. It is impossible to tell if this is the case without carefully examining all instances. As far as we can tell nothing crucial hinges on ruling them out.

Whether there is a single meaning that characterizes these uses, or whether there are two, is an open question.

As with *go*, there is an adverbial interpretation for *come*+Adj that must be excluded in our analysis of the data, e.g., *come early*, as well as a second predicational interpretation, e.g. *come naked*, etc. We summarize the meaning of *come* in *vi*.

vi. come

MEANING: acquire an unencumbered property P.

Surprisingly, perhaps, *come* and *fall* are not opposites, nor are *come* and *go*. *Come* expresses a positive property, *fall* expresses an unmarked property, and *go* expresses an extreme property. In a few cases *come* and *fall* apply in the same semantic domain. But what is unmarked is not typically construed as positive, and what is marked is not typically construed as negative (cf. *fall pregnant*), so the points of contact are not systematic. Hence we have cases such as the following (with native speaker judgments).

- (31) come alive / fall dead / go dead
come open / ?fall shut (but, fall apart) / ?go shut
come clean / *fall dirty / *go dirty

The verb *grow* conveys the notion of moving from one point on a scale to a higher point on that scale. For example, *grow big*, *grow older*, and *grow weary*.

(32) grow { better
big
closer
cold
large
larger
longer
older
rich
strong
stronger
tired
weary
worse }

We summarize the meaning of *grow* in *vii*.

<p><i>vii. grow</i></p> <p>MEANING: move to a higher point on the P scale</p>

The meanings attributed to the seven CoS verbs are summarized in Figure 1.

Verb	Meaning
<i>i. become</i>	acquire property P
<i>ii. get</i>	move to a particular position P in the semantic field that contains P
<i>iii. fall</i>	acquire a marked property P
<i>iv. turn</i>	(a) acquire property P that is a negative value on the scale (b) acquire a color

<i>v. go</i>	acquire a dramatic or extreme property P
<i>vi. come</i>	acquire a positive property P
<i>vii. grow</i>	move to a higher point on the P scale

Figure 1. Meanings of seven English CoS verbs

With these preliminary hypotheses about meaning in place, we are in a position to evaluate the extent to which the larger set of adjectives combines with these verbs in order to convey these meanings. What counts as a counterexample is a case in which a particular $V_{\text{CoS}}+\text{Adj}$ combination neither has the meaning associated with the construction in a natural sense, nor can we understand the phrase as having such a meaning as a consequence of coercion.

4. Meaning and distribution

As seen, there are six distinct CoS constructions in English, in addition to the fully productive *become*+Adj, which is the direct realization of the conceptual structure relation **ACQUIRE**(PROPERTY). The use of a given adjective with a given verb imposes upon the adjective the interpretation associated with that particular verb in that particular construction. This constructional meaning, crucially, is not a property of the adjective, although the property denoted by an adjective may turn out to be more or less compatible with a particular constructional meaning for pragmatic or conventional reasons.

4.1. The corpus

We collected data on the pairings of verbs with adjectives by searching the Web

for all instances of V+Adj for all seven verbs and a large number of the most frequent English adjectives. Briefly, the technique that we used was to determine the number of pages (**P**) for a phrase, such as *go postal*, sample the first hundred pages of the result of the search starting from the fiftieth page in order to reduce spurious hits due to advertising, etc., determine how many (**V**) of these hundred pages contain valid instances of the target expression, and then get an estimate of the total number of hits (**H**) of the phrase using the formula

$$(33) \quad \mathbf{H}=\mathbf{P}*\mathbf{V}/100$$

This calculation allows us to estimate in a very rough way the relative frequency of the various phrases.

If the data coming back from a query would contain no noise (that is, no false positives), **V** would be equal to 100, and the relative frequency of a phrase in the corpus would be just the number of pages with the target phrase, **P**. However, in actual practice there is considerable noise in the form of false positives. We must therefore filter out the false positives to the extent possible.

False positives consist of strings that contain the search string, but not with the desired syntactic structure. For example, *grow red* can be found in the string *grow red roses*, and is not a valid hit. To filter out false positives, each hit was assigned a POS (part of speech) annotation for each word, based on the BNC (British National Corpus) POS list. Then, each hit was tested against a set of rules which marked as noise those hits that obviously contained false instances of the target. For example, the adjective Adj_n

may immediately precede a noun (e.g. *smarter consumers*). A page containing the sequence *become*+Adj_n+N is not a valid example of *become smarter*, which is what we are looking for, and so it should be excluded from **V**. These rules eliminate a number of valid hits, but successfully eliminate a significant portion of the false hits. Comparative evaluation of the results with various rule sets suggest that the elimination of a limited number of valid hits does not significantly affect relative scores, although of course it does affect absolute scores. Our hypothesis is that the relative number of eliminated valid hits is roughly comparable across different phrases and hence is largely neutralized in the determination of relative frequency.

4.2. *The verbs are not synonymous*

We have claimed that the CoS verbs are not entirely synonymous, and have given some preliminary evidence regarding what the differences in meanings are. This claim is supported by the distributional evidence. If they all meant ‘become’, and nothing else, we would expect that the frequency distribution of each adjective with respect to each verb would reflect the overall frequency distribution of the adjectives independent of the adjectives. So, for example, if *black* occurs twice as often overall as does *blue* on the Web, then we would expect to find it occurring twice as often with respect to every CoS verb.

This clearly does not happen, as can be seen by simply comparing a few common adjectives. The frequencies of the verbs vary dramatically from adjective to adjective. Figure 2 shows the distribution of six color adjectives, normalized for their relative frequency in the BNC.⁹

⁹ The normalization was done by taking the frequency of each adjective $\text{Freq}(\text{Adj})$ as a percentage

name	<i>black</i>	<i>blue</i>	<i>green</i>	<i>red</i>	<i>white</i>	<i>yellow</i>
BNC count	3284	1554	1601	2170	3207	689
BNC freq	0.263	0.124	0.128	0.174	0.256	0.055
<i>all</i>	492	670	2202	1334	432	1860
to_become	53	43	61	108	72	184
to_get	29	90	92	54	26	50
to_turn	249	461	1347	792	278	1479
to_fall	3	2	4	4	3	8
to_go	145	69	653	354	41	121
to_come	4	3	5	4	3	2
to_grow	9	3	39	19	10	16

Figure 2. Distribution of color words

As can be seen, all of the color words occur more frequently with *turn* than with any of the other CoS verbs, and all occur to some extent with *become*, *get* and *go*. (We consider the very low numbers with *fall* and *grow* to be noise; see §3.2.) But the ratio of *turn green* to *become green* is much greater (22:1) than the ratio of *turn red* to *become red* (7:1).¹⁰

of the total, and the frequency of each V+Adj combination $\text{Freq}(\text{V+Adj})$ as a percentage of the total. We then computed

$$(i) \quad \frac{\text{Freq}(\text{V+Adj})}{\text{Freq}(\text{Adj})}$$

to get an estimate of what the $\text{Freq}(\text{V+Adj})$ if the adjectives were evenly distributed.

¹⁰ In general we avoid drawing any conclusions from the raw data about *go* because of the many

We can also rule out the possibility that each verb selects adjectives only on the basis of the semantic features of the adjectives. For simple cases this appears to be true, since *turn* co-occurs regularly with adjectives that refer to colors –

(34) turn { red
blue
green
brown
white
black
... }

– and *grow* co-occurs with comparatives.

(35) grow { taller
smarter
more intelligent
happier
bigger
smaller
thinner
... }

But the actual data shows a more complicated picture. A larger sample shows that a range of non-comparative adjectives also occur very frequently with *grow*. Figure 3 shows the frequency for a set of adjectives with *grow*. Of these adjectives, only two are comparatives. Note for example the very high frequency for *deaf*, *sober* and *sore*. (The column headed by **to_grow_rel** gives the percentage of the total $V_{\text{CoS+Adj}}$ instances for the given adjective that belong to forms of the verb *grow*.)

uses that *go* has in addition to CoS, particularly exhortations (e.g., “Go Blue!”).

name	all	grow	grows	grew	growing	grown	to_grow	to_grow_rel
<i>darker</i>	86110	3535	2662	0	3694	1427	11318	13.14%
<i>deaf</i>	37090	341	37	0	373	649	1400	3.77%
<i>hopeful</i>	4998	120	6	162	106	186	580	11.60%
<i>immune</i>	37367	793	87	152	241	1048	2321	6.21%
<i>restless</i>	91200	4710	1071	6570	5943	1395	19689	21.59%
<i>slower</i>	110238	6831	1382	2465	2945	696	14319	12.99%
<i>sober</i>	32163	69	59	286	25	57	496	1.54%
<i>sore</i>	49476	204	25	454	146	72	901	1.82%
<i>stout</i>	2324	276	58	221	639	284	1478	63.60%
<i>tedious</i>	48905	630	1189	237	197	225	2478	5.07%

Figure 3. Sample of adjectives with *grow*

In the next section we look more closely at the data in order to identify the most robust patterns. What we find is that certain expressions tend to be more frequent than others, and some have the status of collocations, in the sense that they have become conventionalized ways of saying ‘become P’. The more frequent an expression is, to that extent it ‘blocks’ the alternatives, much in the way that conventionalized morphological forms block otherwise productive alternatives. Since the sum of the frequencies for phrases containing a given adjective in the corpus must be 100%, the tendency of an adjective to occur more with some verb V means that it will occur less often with the others.

4.3. Robust collocations

First we look at the most frequently occurring adjectives with CoS verbs in Figure 4. The criterion is that the total number of phrases containing a given adjective be greater

than ½ million. The percentage shown in each cell is the percentage of the total $V_{\text{Cos}+\text{Adj}}$ hits for the given verb attributed to all forms of the verb at the top of the column.

name	all	become	get	turn	fall	go	come	grow
<i>involved</i>	3412051	26.4%	73.5%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>disenchanted</i>	2924101	99.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%
<i>available</i>	2754874	97.5%	0.1%	0.0%	0.0%	0.1%	2.2%	0.0%
<i>known</i>	1772587	98.6%	1.3%	0.0%	0.0%	0.0%	0.1%	0.0%
<i>aware</i>	1556341	98.9%	0.7%	0.0%	0.0%	0.0%	0.1%	0.3%
<i>ready</i>	1485757	3.3%	89.3%	0.0%	0.1%	0.1%	7.2%	0.0%
<i>better</i>	1357256	12.3%	76.6%	0.4%	0.4%	6.9%	0.5%	2.9%
<i>clear</i>	1246025	92.1%	4.2%	0.3%	0.1%	1.3%	1.7%	0.3%
<i>apparent</i>	1148869	99.8%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
<i>familiar</i>	1036910	89.9%	9.3%	0.0%	0.0%	0.0%	0.1%	0.6%
<i>older</i>	1017870	3.8%	58.7%	0.1%	0.0%	0.1%	0.0%	37.4%
<i>tired</i>	992200	7.3%	72.1%	0.0%	0.0%	0.1%	0.0%	20.5%
<i>worse</i>	955249	18.5%	72.9%	0.4%	0.0%	0.8%	0.1%	7.3%
<i>asleep</i>	929076	0.0%	0.2%	0.0%	99.5%	0.3%	0.0%	0.0%
<i>pregnant</i>	868243	65.3%	31.9%	0.0%	2.7%	0.0%	0.0%	0.0%
<i>interested</i>	836586	75.8%	23.5%	0.0%	0.0%	0.0%	0.0%	0.5%
<i>stuck</i>	795693	9.7%	90.1%	0.0%	0.0%	0.1%	0.1%	0.0%
<i>stranded</i>	775511	3.2%	96.8%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>sick</i>	774110	18.3%	71.6%	0.2%	7.6%	0.4%	0.1%	1.8%
<i>effective</i>	766505	99.7%	0.1%	0.0%	0.0%	0.1%	0.1%	0.0%
<i>necessary</i>	761043	99.7%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
<i>short</i>	748291	2.5%	3.5%	0.2%	76.1%	3.2%	13.6%	1.0%
<i>ill</i>	671323	59.5%	7.7%	0.1%	31.0%	0.8%	0.2%	0.7%
<i>due</i>	635822	50.8%	3.7%	0.7%	17.1%	2.1%	19.1%	6.6%

<i>accustomed</i>	624832	61.1%	16.9%	0.0%	0.0%	0.0%	0.3%	21.7%
<i>popular</i>	620174	93.9%	4.9%	0.0%	0.0%	0.1%	0.0%	1.1%
<i>true</i>	618556	7.1%	0.3%	0.2%	0.0%	0.5%	91.7%	0.2%
<i>lost</i>	589522	30.1%	68.6%	0.3%	0.2%	0.8%	0.1%	0.0%
<i>old</i>	572731	8.1%	45.5%	0.6%	0.0%	0.2%	0.1%	45.5%
<i>stronger</i>	564771	39.6%	23.3%	0.1%	0.0%	1.2%	0.2%	35.6%
<i>easier</i>	500306	63.7%	29.3%	0.8%	0.1%	2.5%	3.2%	0.4%

Figure 4. Adjectives with more than 1/2 million hits.

The table shows that many of the adjectives that appear most often in CoS constructions occur with more than one verb, and that the percentages vary, points that we explore in more detail as we proceed. What we note here is that with the exception of *go* and *come*, there are adjectives that appear predominantly or very often with one verb. For example, we have the following phrases.

- (36) get ready/better/tired/worse/stuck/stranded
fall asleep/short
come true
grow old/older

In order to find robust expressions we have to look not only at percentages but at raw numbers. A clue about where to look is given by *get pregnant* and *fall ill*, both of which constitute about 31% of the cases for their respective adjectives. The **H** for *get pregnant* in all verb forms is 276,812, and that for *fall ill* is 208,363. We define a **robust**

phrase as one for which **H** is greater than 100,000. For comparison purposes we also define a more inclusive category of **common** for adjectives that appear more than 30,000 times in the data. The robust and common phrases in the data are given in Figure 5.¹¹

Verb	Robust Adjectives	Common Adjectives
<i>get</i> ¹²	accustomed angry annoyed better bigger bored comfortable confused discouraged drunk easier excited frustrated harder high interested involved lost mad nervous old older pregnant rich scared serious sick smaller stronger stuck tired tough well wet worse	active anxious big boring burnt busier busy cheaper clean cold colder complicated confusing crazy creative curious dark darker depressed difficult dirty dizzy entangled expensive familiar fat fatter fit free full good hard healthy heavier higher hotter hungry ill impatient inspired interesting irritated jealous larger late lazy lonely long longer loose louder messy overwhelmed personal popular pretty restless rough shorter smart smarter soaked sore stale stressed

¹¹ In order to judge whether or not to include a given phrase, we determined using native speaker intuition whether it could be paraphrased by *become*+Adj. While we could have used cooccurrence in the database with *become* as a guide, we felt that intuition was at least as accurate and much more efficient.

¹² We removed all true *get* passives, such as *get hurt*, and all *get* actions, such as *get married*. We left in cases that are ambiguous, such as *get overwhelmed* and *get soaked*

		thinner tight tighter tougher tricky ugly warm warmer weaker wider wild worried
<i>turn</i>	green red	black blue brown pale sour violent white yellow
<i>fall</i>	asleep due short ill	dead flat free sick silent
<i>go</i> ¹³	astray bad bankrupt crazy mad missing wild	ballistic black blank bust cold dark dead dormant dry flat free insane limp numb quiet red silent smooth sour
<i>come</i>	alive clean loose true	available free undone
<i>grow</i>	accustomed old older stronger tired older weary	bigger bored cold deeper impatient large longer louder rich smaller strong weaker worse

Figure 5. Robust and common V+Adj phrases

These results substantially confirm our hypotheses about the meanings of the $V_{\text{CoS}}+\text{Adj}$ phrases, summarized in Figure 1. In particular, the adjectives with *fall* all denote a marked property, those with *turn* are either colors or negative, those with *go* are extremes, those with *come* are positive, and those with *grow* are higher points on the relevant scale.

The data in Figure 5 also falsifies the hypothesis that each $V_{\text{CoS}}+\text{Adj}$ combination

¹³ We excluded adverbial cases such as *go well* and *go public*, exhortations such as *go Blue*, and political assessments such as *go green*.

is *sui generis*, and that there are no systematic patterns. While the frequencies are not exactly the same from adjective to adjective, there is definitely a tendency of adjectives with similar meanings to appear with the same verb or verbs; So, for example, *turn* takes adjectives denoting color, and these adjectives seem to prefer to appear with *turn*, although they can go with other adjectives. This comes as no surprise – B&E found a similar result for Spanish.

5. Diversity

In the preceding section we provide data that show that adjectives that conventionally convey properties that are selected by the different CoS verbs tend to co-occur with these verbs. But the question remains open as to whether a given adjective can co-occur with a given verb when there is no natural match in features, and if so, to what extent.

The task of identifying the extent to which the adjectives may occur with more than one verb is more challenging than the task of finding robust and common expressions. This is because the number of false positives is so high. In order to verify that a positive value in a given cell actually corresponds to a valid $V_{\text{CoS}+\text{Adj}}$ expression, it is necessary either to look at the contexts, using a browser, or completely parse the corpus. Neither is feasible, so our assessment must be based on sampling.

In the next few sections we look at a range of data that shows the diversity of the distribution of $V_{\text{CoS}+\text{Adj}}$. In §5.1 we show that the distribution of occurrence even across fairly homogeneous semantic fields is uneven. In §5.2 we examine cases that are less than robust. In §5.3 we look at cases that are very rare, that is, with ten or fewer hits, but verified as valid instances.

5.1. Unevenness

Earlier we argued that there is a rule of the form (37) –

(37) $VP \rightarrow V AP$

–, that CoS verbs impose selectional restrictions on their complements, that the frequency of $V_{\text{CoS}}+\text{Adj}$ expressions will reflect these restrictions as well as the frequencies of the individual adjectives, and that certain expressions have reached sufficiently high frequency in actual usage to count as collocations.

The last two points can be demonstrated by looking at sets of adjectives within the same or neighboring semantic fields. The simplest case is that of color terms. We know already that *turn* selects color terms, but we have also found that color terms may occur with other CoS verbs. The following chart shows the distribution of the color terms with respect to *turn* and *become*. The X-axis shows the percentage of total hits for *become*, and the Y-axis the percentage of total hits for *turn*. Instead of a dense clustering at various positions in the space, we find that the preference for $\text{turn}+\text{Adj}_{\text{color}}$ versus $\text{become}+\text{Adj}_{\text{color}}$ varies widely.

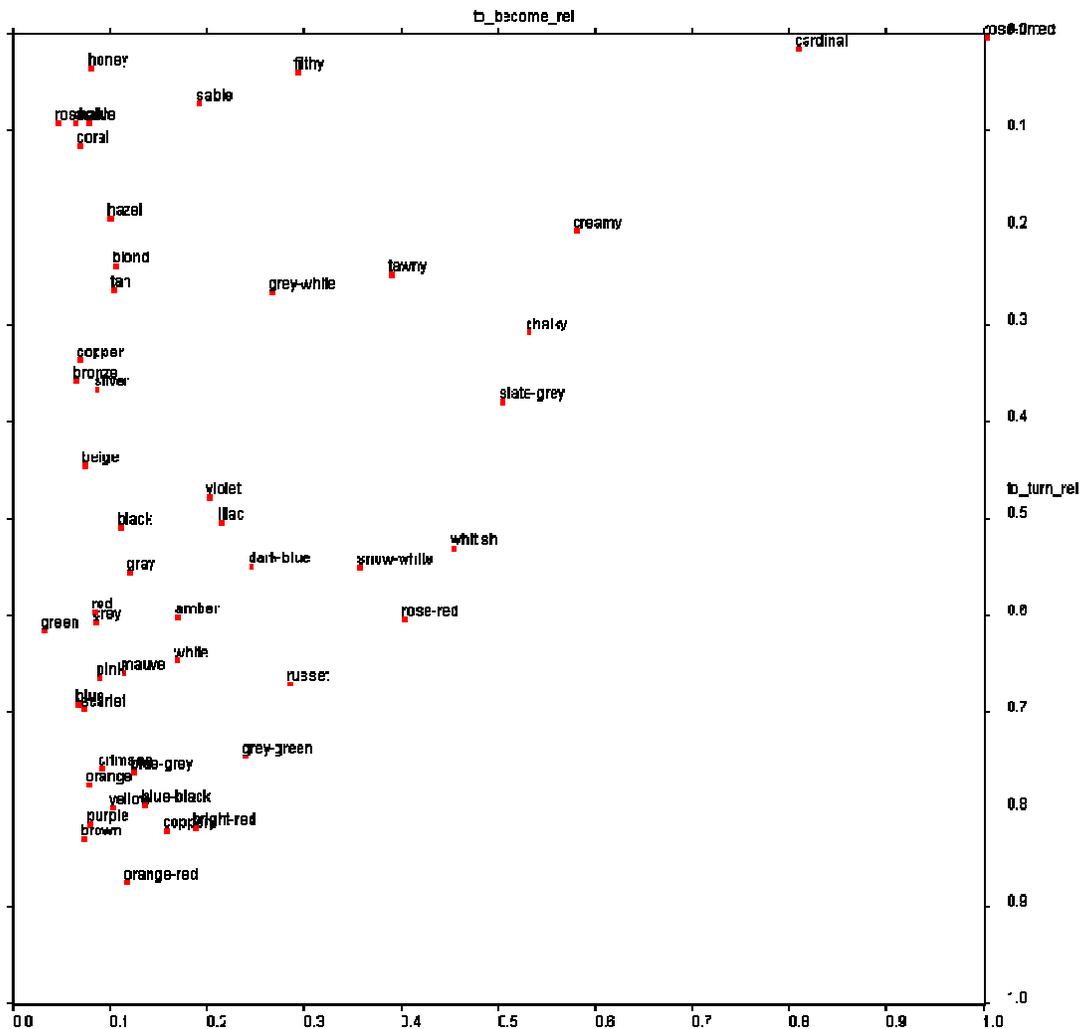


Figure 6. Percentage of *become* vs. *turn* for color terms

What this figure illustrates is that there is apparently no correlation between the share of the total for *turn*+Adj_{color} and *become*+Adj_{color}.

This variability holds even when we select only adjectives that denote varieties of a primary color such as *red*. We might expect that since they mean more or less the same thing, they would combine with the same frequency with *become* and *turn*. Figure 7 shows the total hits and percentage of the total for the adjectives *bright red*, *crimson*, *red*,

rose-red and *scarlet*.¹⁴ While *become crimson* and *become red* constitute about 8% of the total cases with the respective adjectives, we find that *turn crimson* constitutes about 75% while *turn red* constitutes about 59% of the total, and *go crimson* and *go red* are 9% and 27% respectively. And the distribution for *bright red* differs significantly from the distribution for *red*. On the other hand, *crimson* and *scarlet* distribute more or less the same.

name	<i>bright- red</i>	<i>crimson</i>	<i>red</i>	<i>rose- red</i>	<i>scarlet</i>
all	114	5821	231547	10	4220
to_become	21	513	18657	4	294
to_become_rel	18.42%	8.81%	8.06%	40.00%	6.97%
to_get	0	101	9362	0	172
to_get_rel	0.00%	1.74%	4.04%	0.00%	4.08%
to_turn	93	4391	137402	6	2923
to_turn_rel	81.58%	75.43%	59.34%	60.00%	69.27%
to_fall	0	7	715	0	9
to_fall_rel	0.00%	0.12%	0.31%	0.00%	0.21%
to_go	0	517	61435	0	608
to_go_rel	0.00%	8.88%	26.53%	0.00%	14.41%
to_come	0	5	686	0	29
to_come_rel	0.00%	0.09%	0.30%	0.00%	0.69%
to_grow	0	287	3290	0	185

¹⁴ We excluded *become cardinal* because of the nominal use of *Cardinal*.

to_grow_rel	0.00%	4.93%	1.42%	0.00%	4.38%
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Figure 7. Totals and percentages of total for terms meaning ‘red’

The question naturally arises at this point, Why do these frequencies vary so much? Here are the actual total hits and percentages for the three primary color adjectives with respect to all verbs.

Primary Colors			
name	<i>green</i>	<i>red</i>	<i>blue</i>
all	198283	170112	74689
to_become	7763	18657	5389
to_become_rel	4%	11%	7%
to_get	11764	9362	11147
to_get_rel	6%	6%	15%
to_turn	172508	137402	57277
to_turn_rel	87%	81%	77%
to_fall	531	715	205
to_fall_rel	0%	0%	0%
to_go	0	0	0
to_go_rel	0%	0%	0%
to_come	687	686	328
to_come_rel	0%	0%	0%
to_grow	5030	3290	343

to_grow_rel	3%	2%	0%
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Figure 8. Distribution of primary color terms

We zero out the values for *go* because there is a lot of noise in this category (cf. ‘*Go Blue*’). What we see is that both in absolute numbers and percentages,

- (38) *turn red* > *turn green* > *turn blue*
become green > *become red* > *become blue*

There is no reason to believe that these differences are of linguistic interest. Traffic lights turn red and green, this is a more common occurrence in the lives of many people than things that turn blue. Moreover, a light turning red is arguably more salient than a light turning green, since the consequences of not properly attending to the first are more serious than the consequences of not properly attending to the second.

Similar patterns hold for other groups of closely related words.

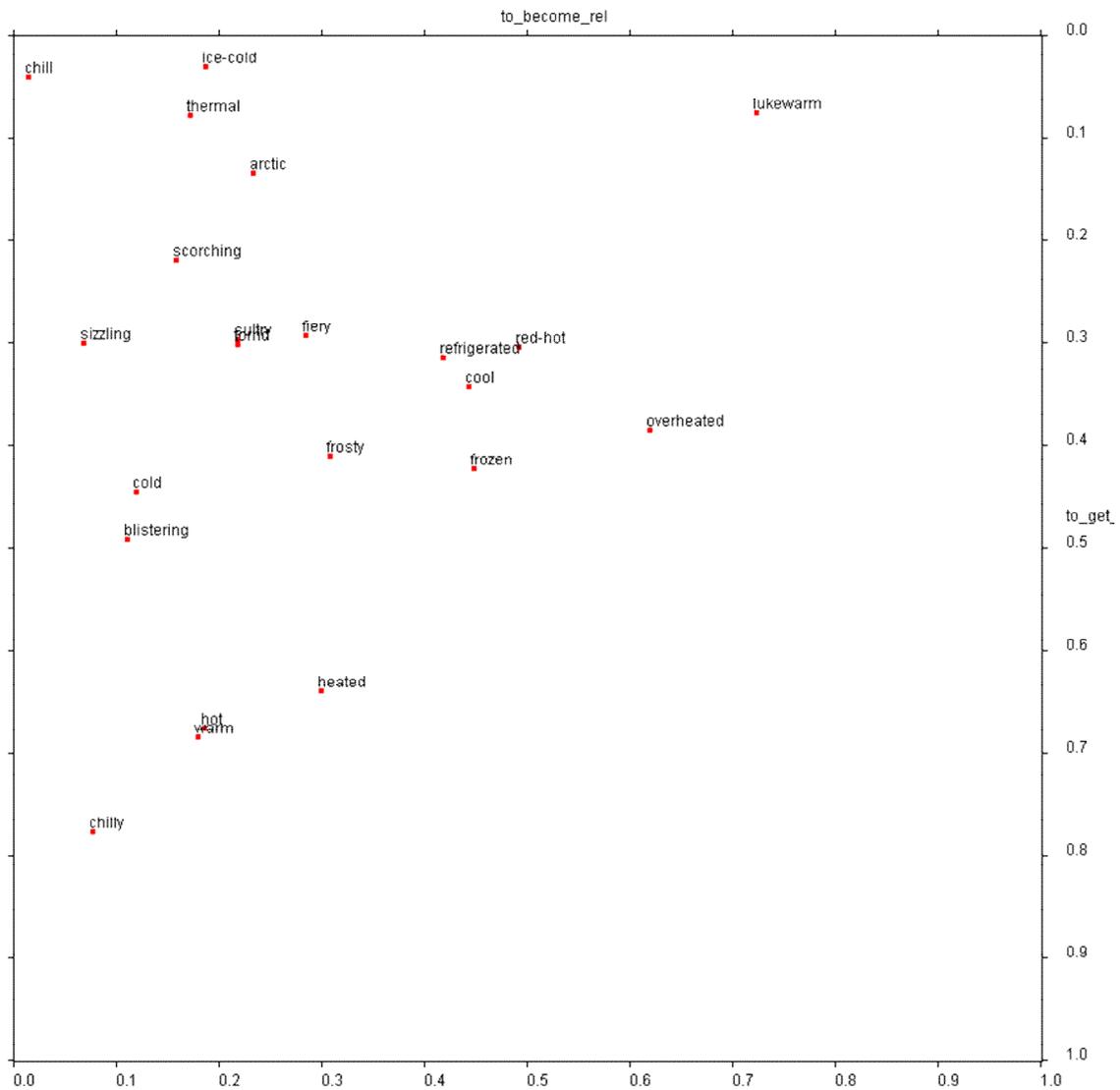


Figure 9. Percentage of *become* vs. *get* for temperature extremes

Even when we restrict ourselves to words denoting extreme heat, there is only modest clustering, as seen in Figure 10.

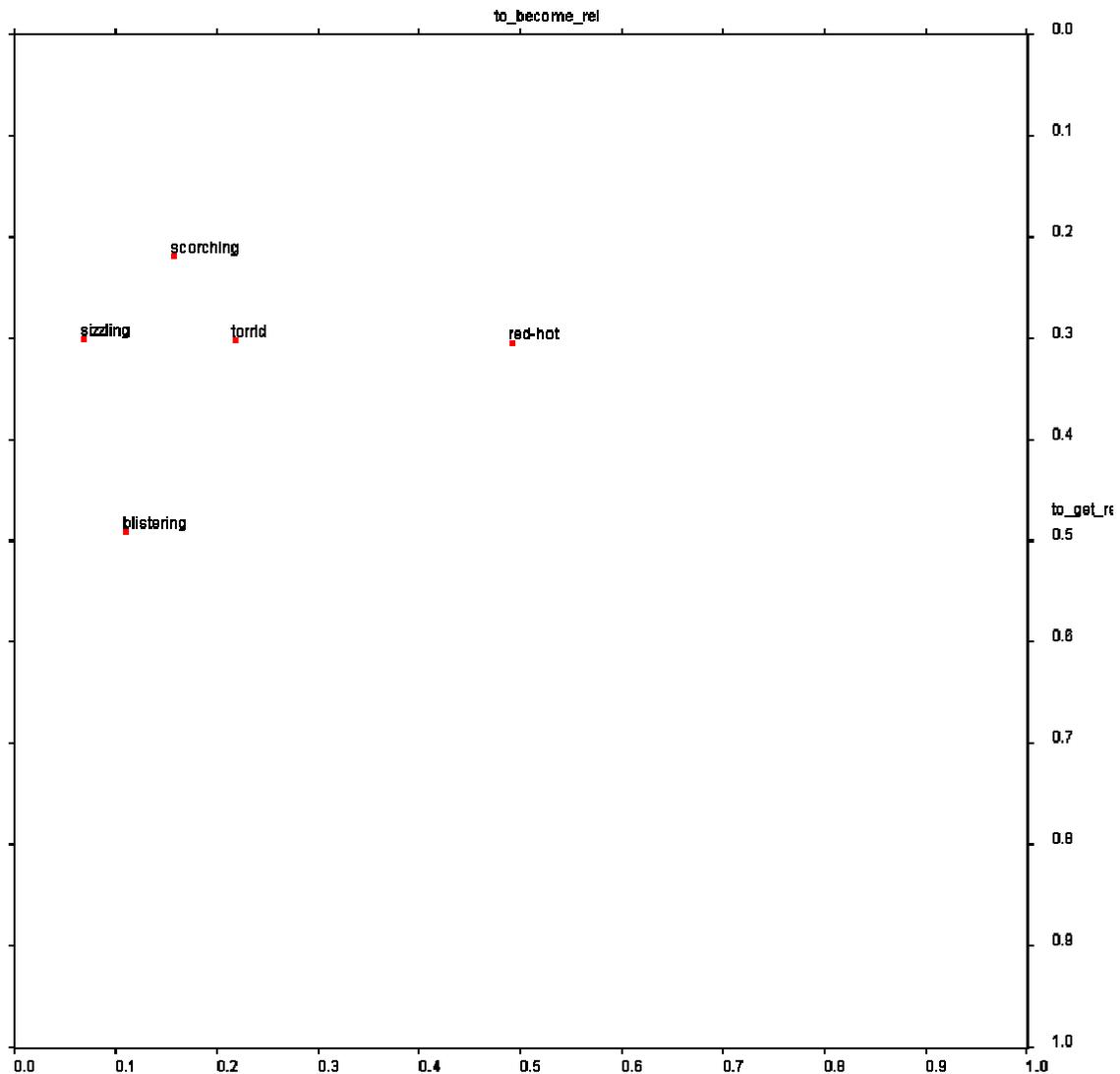


Figure 10. Percentage of *become* vs. *get* for terms denoting ‘heat’

We see, then, that the frequency of *become*+Adj₁ and *get*+Adj₁ does not predict the frequency of *become*+Adj₂ and *get*+Adj₂ even for adjectives that are very closely related in meaning. This point is illustrated further by Figure 11, which shows the very diverse percentages for *chalky*, *creamy*, *grey-white*, *snow-white*, *white*, *whiter*, *whitish*. Rather than cluster in some more or less compact region of the space, they are widely distributed.

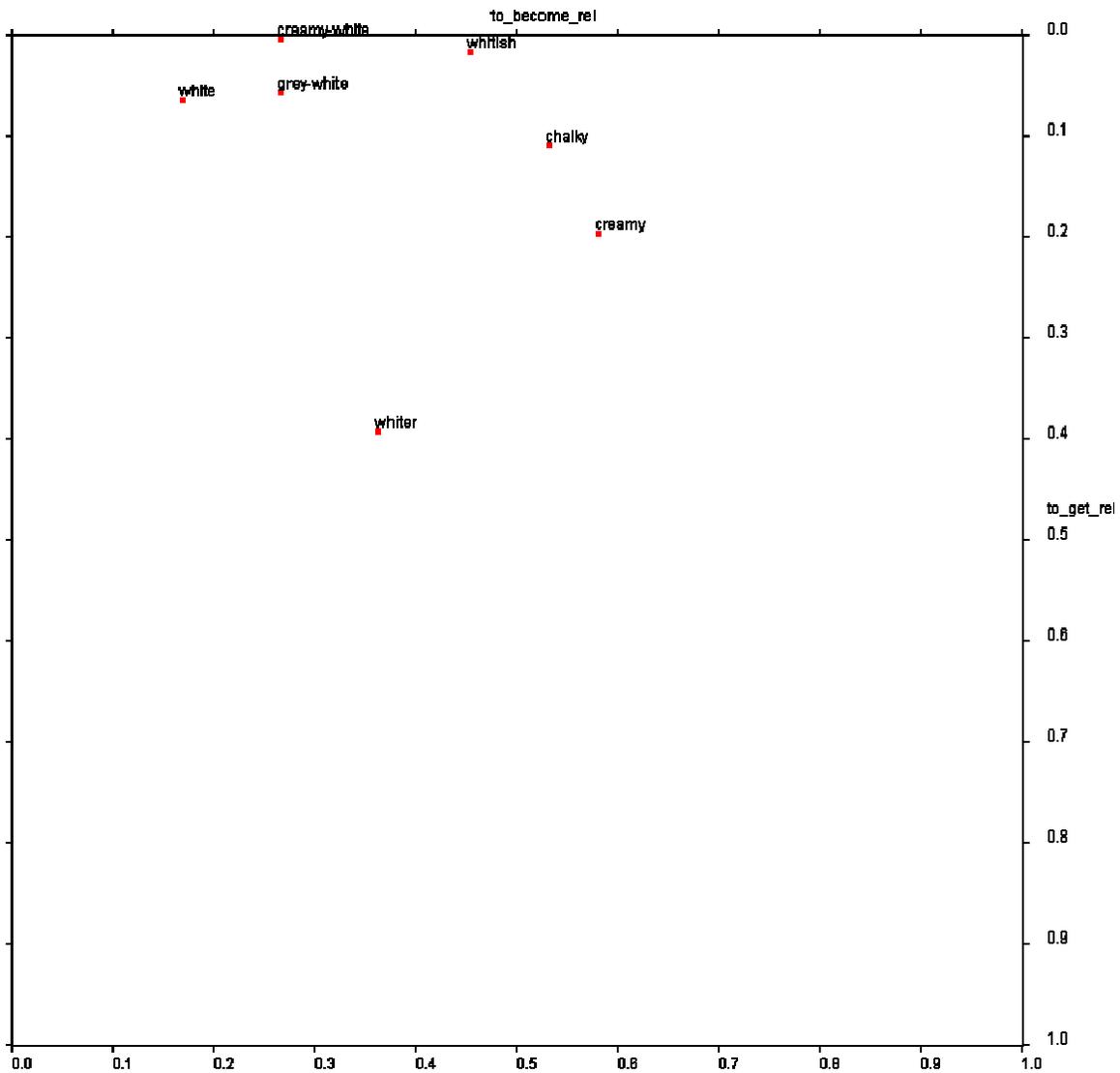


Figure 11. Percentage of *become* vs. *get* for terms denoting ‘white’

As suggested in our discussion of the primary colors, the differences in use and relative frequencies that we observe in this data are not linguistically interesting, but very likely reflect the irregularities of everyday experience. On this view, *turn red* is not ‘more grammatical’ than *turn blue*, but simply more used.

Consider, then, the extreme situation, where a particular expression occurs to the exclusion of all other possibilities, or where a particular expression never appears (which is a consequence of the first situation). In both cases, the form conforms to the general pattern. The methodological question is, Do we want to say that the non-existent forms are ‘ungrammatical’ simply because they do not occur in actual usage? As far as we can see, the claim that the grammar is nothing more than usage (cf. B&E) is reducible to this claim, for individual cases.

However, to say that these two notions, ungrammaticality and non-existence, are equivalent is to miss the generalization that is captured by the regular pattern V+Adj. Suppose that we have a form that is non-existent at some point in time, such as *grow embattled*. By the usage criterion, it is ungrammatical. The status of this case is intuitively quite different from that of **embattled grow*, which also does not occur in the data, and also does not fit the pattern V+Adj. In the first case, we would not be surprised to find a single instance suddenly appearing in the corpus, e.g.,

- (39) And what if, in addition to the sources which she does discuss, civic association, family, and religion **grow embattled** but prove indispensable to the cultivation of the virtues ... [<http://press.princeton.edu/chapters/i6565.html>]

But we would be quite surprised to say the least to find *embattled grow* in the course of normal discourse.

The next section establishes that $V_{CoS}+Adj$ is widely distributed over the space of pairs $\langle V_{CoS}, Adj \rangle$. The distribution is not uniform, as we have already seen, but it is not

restricted to a subregion, even a very large one. No matter what part of the space we visit, we seem to find at least a few instances. For practical reasons we cannot actually visit all regions of this space or give all of the data that we find. In the next few sections we try to give a representative picture.

5.2. *Occasional*

First, let us consider some expressions that do not necessarily count as ‘robust’, or ‘common’ in our sense, but nevertheless constitute valid instances of English constructions. We refer to these as ‘occasional’. For practical reasons, let us consider occasional expressions to be those whose number of hits is between 100 and 1000. By comparison, a collocation such as *get involved* has 3,412,051 hits (see Figure 4).

There are 1943 adjectives in our set that count as occasional for *get+Adj*, by our criterion. Some are a relatively small percentage of the total CoS expressions using these adjectives, while others are more standard usages. A picture of the space of such adjectives is given in Figure 12, which shows the distribution of total hits against percentage of the total.

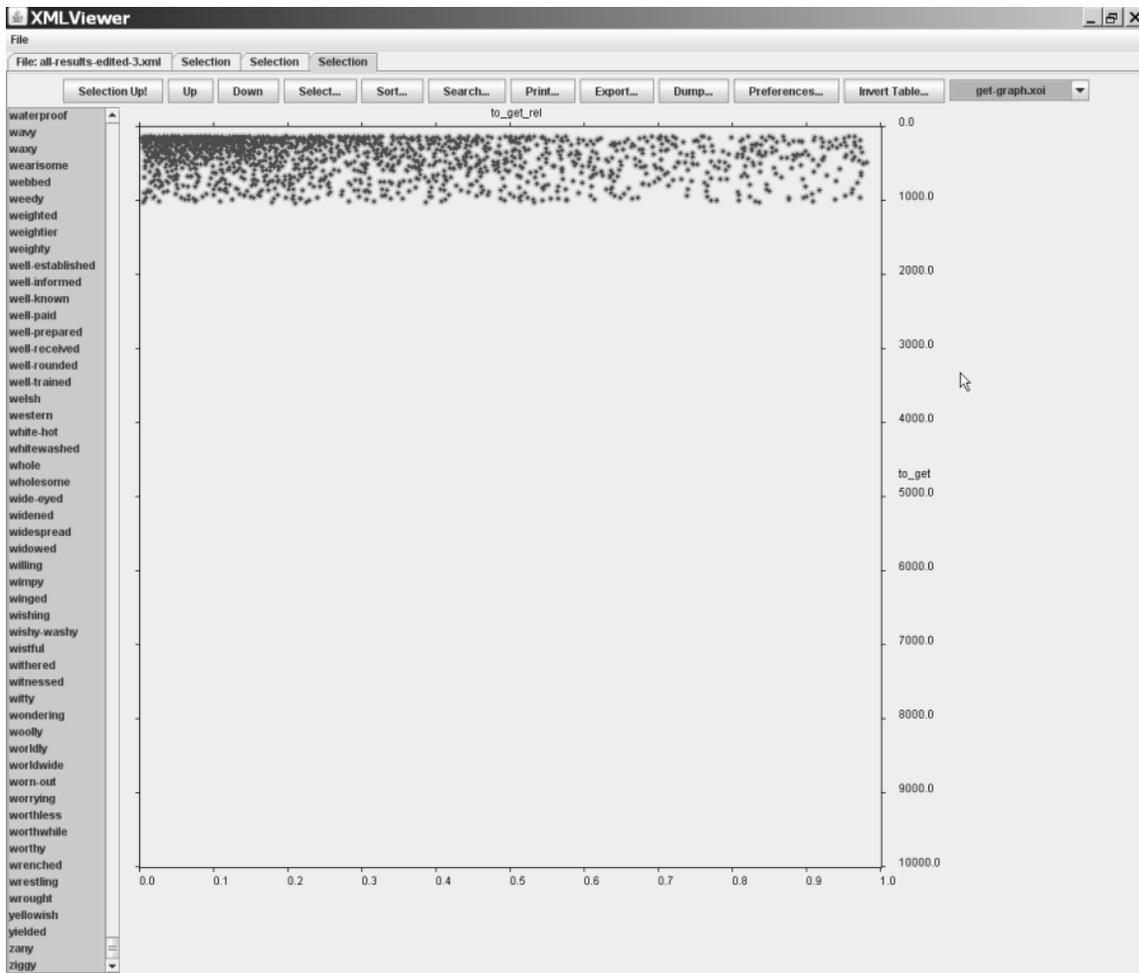


Figure 12. Occasional occurrences of *get*+Adj. X-axis is percentage of total V+Adj hits, and Y-axis is number of occurrences of *get*+Adj.

The data with *get* is noisy, since there are many *get* passives, which distort the distribution. But an examination of the actual hits shows that there are many valid cases. A sample is given in Figure 13. The number of hits for a particular adjective with *get* is given under **hits**, the total number of hits for all CoS verbs with the given adjective is given under **all**, and the frequency of the hits for *get*+Adj versus the total is given under **frequency**.

<i>get</i>	hits	all	frequency	example
<i>abnormal</i>	114	14561	.78%	For instance, if you use always the same motions, your body gets abnormal or your physical strength may be down due to a partial stimulus ...
<i>apparent</i>	147	1148869	.13%	This is less relevant for wide angles as the lenses move out less, but gets apparent with the 90/2.8.
<i>articulate</i>	106	2180	4.8%	nervous, but not enough to get articulate about it...
<i>gutsy</i>	735	761	96.6%	Just last weekend got gutsy and tried the Paula Deen trick
<i>idle</i>	316	19560	1.6%	What happens if the failed BizTalk server never gets idle again, is the message lost?
<i>novel</i>	111	1298	8.6%	Academy Award winner Tom Hanks gets novel in this cryptic tale of politics and corruption.

Figure 13. Occasional *get*+Adj

We find occasional expressions for the other CoS verbs, as well. Some representative cases are given in Figure 14.

<i>turn</i>	hits	all	frequency	example
<i>luddite</i>	117	151	77.5%	It brings up questions such as, Is there something about reading and thinking that would cause or predispose a person to turn Luddite ?
<i>coppery</i>	149	182	81.9%	because your hair is auburn the blonde will tend to turn coppery
<i>crucial</i>	156	52752	.3%	Understand how motives change when conversations turn crucial .
<i>caustic</i>	271	632	42.9%	Siebers' vampy humor turns caustic and to good effect.
<i>crunchy</i>	69	1467	4.7%	Up course the floor turns crunchy and everything is in full bloom.
<i>fall</i>				
<i>lifeless</i>	2554	6206	40.8%	Why let your next secret society fall lifeless when the real world has already done the work for you?
<i>vacant</i>	9400	80340	11.7%	The position of the ED and CEO, IDCOL will soon fall vacant due to its present ED and CEO having decided to leave the Company after delivering outstanding services for nine years.

<i>sick</i>	58832	774110	7.6%	Workers have fallen sick in buildings ranging from libraries and hospitals to offices, and some of them say poor indoor air is to blame.
<i>idle</i>	539	13463	4%	In the Gyimes region of the Szekely land the outdoor bread ovens are falling idle and satellite dishes adorn the roofs and gardens of the better off.
<i>faint</i>	364	18216	2%	“I fell faint in the middle of singing Christmas carols and then I felt really bad I thought I was confessing to the Godfather that I've done something terribly wrong and I just said ‘Bob, I think I'm pregnant, ’” Angelina revealed.
<i>go</i>				
<i>melodramatic</i>	18	1377	2.5%	
<i>dotty</i>	1026	1127	91%	Then Andy Warhol went dotty over dots in the 1960s, making portraits with them.
<i>loony</i>	987	1197	82.5%	Morag herself asks Alsa whether she is going loony , and Alsa says if one admits they think they are going crazy, chances are they probably aren't.

<i>flinty</i>	10	84	11.9%	Finally Brian looks up at his friend and Michael's eyes go flinty with disapproval.
<i>odd</i>	379	4113	9.3%	The all-niters are awful as your body clock starts to go odd round 4am.
<i>come</i>				
<i>unstuck</i>	11192	21817	51.3%	Yahoogole deal could yet come unstuck .
<i>loose</i>	45608	111785	40.8%	GOP has come loose of its moorings.
<i>open</i>	2353	11705	20.1%	My glove compartment won't come open .
<i>available</i>	13277	60349	22%	During 2004 a larger piece of property came available behind Hope House and Horizons Foundation purchased this farming location.
<i>grow</i>				
<i>proudest</i>	5	5	100%	As his presidency neared its end, Roosevelt seemed to grow proudest of the things he had done to make the United States into a major military power.
<i>sleek</i>	2356	649	36.3%	Those rugged names to our like mouths grow sleek . -- Milton
<i>rounder</i>	209	961	21.7%	As people grow rounder and rounder, so

				do the vehicles that transport them, and the energy required to move them about.
--	--	--	--	---

Figure 14. Other occasional and robust V+Adj pairs

The point illustrated by these cases is an important one. The various constructions can be extended to relatively infrequent cases. As we see, the determining criterion is whether the adjective can be viewed as denoting a property that is consistent with the interpretation imposed by the construction.

5.3. Rarities

Let us now go far into the sparsest regions of the space, and try to find instances that are valid but very rare. Our criterion for ‘very rare’ will be that the number of hits is less than 5 for a given verb. There are 1927 adjectives in our data that fall into the category of very rare. A few examples are given in Figure 15.

<i>turn</i>	hits	all	frequency	example
<i>foetal</i>	2	2	100%	My wife turns foetal whenever I start on energy/humans, she likens it to living with Armageddon.
<i>unlovely</i>	1	29	3.4%	The imagery is of unlovely things, or of lovely things turning unlovely .
<i>moronic</i>	4	94	4.3%	lending companies turned moronic through

				greed.
<i>fizzy</i>	4	231	1.7%	The 2003 Rhône reds may turn fizzy .

Figure 15. Very rare instances of *turn*+Adj (less than 5)

These rarities are valid instances of $V_{\text{Cos}}+\text{Adj}$ that are so infrequent that it is difficult to argue that they are possible because of prior experience. The divide between very rare expressions and unattested expressions does not appear to be systematic, but accidental. Many of the very rare expressions bear at best a tenuous semantic connection to frequently occurring cases. Yet they do occur. The creativity that they show constitutes evidence for the rule $VP \rightarrow V AP$ above and beyond a set of semantically specified constructions.

These examples of course do not tell us what the space looks like, and there is no practical way to display the full database with respect to the incidence of very rare expressions and the various semantic dimensions. But we can get a preliminary picture of how the very rare expressions with *turn* distribute by selecting a subset of the 1927 adjectives. The criterion that we use is that the same adjectives are relatively rare in general (less than 100 total hits).

There are 315 such adjectives in our data. In order to get a representative sample, we list here only those for words beginning with the letters ‘a’ and ‘b’ for which there are verified valid expressions. There is no evidence that these adjectives occupy any particular region of semantic space, and in fact, the only organizing principle that emerges is that they begin with the same letter.

<i>abstemious</i>	With French drivers turning abstemious , winemakers are hoping that the country's cars can drink up the excess.
<i>adrenal</i>	I had one ferret who turned adrenal at age 10.
<i>African-American</i>	I haven't seen a casting list for the movie yet, but I'm willing to bet the Munster family won't turn African-American .
<i>agonizing</i>	My mind finally gave way after the eventful turned agonizing .
<i>anthropological</i>	When the political malaise turns anthropological , there are no easy or quick fixes.
<i>anti-British</i>	The Malay nationalistic movement was at its high in the 1950s and most editorials soon turned anti-British including Utusan Melayu.
<i>anti-catholic</i>	ANTI-VOUCHER ACTIVISTS TURN ANTI-CATHOLIC .
<i>anti-democratic</i>	At that point the true believer has to decide whether to lie down peacefully and see his beliefs swamped, or whether to turn anti-democratic , to reject the most basic clauses of ...
<i>anti-establishment</i>	He cleverly reveals the xenophobic attitudes of the establishment towards the changing face of British culture but saves the play from turning anti-establishment , by balancing it ...
<i>anti-Japanese</i>	Pick a topic and it will turn anti-Japanese .
<i>anti-Jewish</i>	Particularly once the USSR turned anti-Jewish , it became a primary target of not just ADL but many Jewish organizations.
<i>anti-nuclear</i>	I was still more surprised when it began to turn anti-nuclear .
<i>anti-smoking</i>	I can understand why restaurants may turn anti-smoking , they

	serve children, but bars?
<i>anti-terrorist</i>	After Casablanca, the media of the country turned anti-terrorist .
<i>anti-Western</i>	If she turns anti-Western , you can rest assured that oil prices are going up.
<i>anticipatory</i>	His smile turned anticipatory and he put a foot on the chair, propping an elbow on his raised knee.
<i>Antipodean</i>	Strangely my life is turning Antipodean , Caroline has just started a new job working for a Melbourne based company and has just spent the last month out there.
<i>aphoristic</i>	He spins out daydreams with such compression that they turn aphoristic .
<i>appraising</i>	His eyes turn appraising as he looks at Cherry.
<i>approving</i>	Watching her smile turn approving had somehow failed to reassure, but when he'd seen what she'd done with breakfast, all his reservations went right out the window.
<i>arboreal</i>	Aerial shots of staircases break into a kaleidoscopic pattern, cantilevers erupt into festive sparklers, windows turn arboreal and sprout leaves instead of glass; columns turn into ...
<i>arterial</i>	What appears to be only a flesh wound may turn arterial , and we are forced to watch.
<i>atavistic</i>	In the 21st century, inundated by a world of ideas, our boundaries of expectation incessantly broadening, a culturally ingrained man suddenly turns atavistic and runs away in ...

<i>awe-inspiring</i>	A view that was incredible from the seat of the motorcycle turns awe-inspiring as I stare straight down 20 stories to the water.
<i>Balkan</i>	Recently Rachel Brice also turned Balkan .
<i>balletic</i>	Much is made of cooking the anchovies at nearly the same moment that the spaghetti is done, a sort of acrobatic feat that can turn balletic with practice.
<i>Bangladeshi</i>	Cockney slang turns Bangladeshi .
<i>bathetic</i>	Things quickly turn bathetic , however, as an over-determined “family drama” plays out in the reconstruction period.
<i>bitter-sweet</i>	Because of this, the flight had turned bitter-sweet for him.
<i>botanical</i>	We talked to some Illinois birders, and they all said to look for foxtail; so unanimous was this advice that our quest turned botanical , and our day-list ground to a halt.
<i>bovine</i>	Everyone knows that the minute we start breastfeeding, we turn bovine .
<i>bronchial</i>	When I got the flu this year and it immediately turned bronchial , I knew I ...

Figure 16. Very rare adjectives with *turn*.

In Figure 17 we give an additional sample of attested V+Adj pairs for which the number of hits is close to 0, and for comparison purposes a number of unattested cases.

Verb	Attested very rare expressions	Unattested
------	--------------------------------	------------

<i>get</i>	lukewarm ¹⁵ hopeless ¹⁶ obese ¹⁷ vociferous ¹⁸ sullen ¹⁹ unpredictable ²⁰ eloquent ²¹ irresponsible ²² erratic ²³ sacrilegious ²⁴	meaningful sympathetic unobtrusive hollow relentless inconsiderate self- reflexive airless proximate normal
<i>turn</i>	abortive ²⁵ acrobatic ²⁶ dissolute ²⁷	adjudicative acquiescent actuarial

¹⁵ “Many of its enthusiastic subscribers **got lukewarm** or colder and failed to pay up their subscriptions.”

¹⁶ “I never thought it **got hopeless** until it got to be 28-3,’ said Dwight Clark, the 49ers’ wide receiver.”

¹⁷ “In the past, people believed that you **got obese** by eating too much and being lazy.”

¹⁸ “Republicans sure got vociferous!”

¹⁹ “Sometimes when he been drinking, Hard Rock **got sullen** and mean.”

²⁰ “He was transformed but never **got predictable**.”

²¹ “He didn’t get sputtery and inarticulate; he **got eloquent**.”

²² “Banks **got irresponsible** and they created loans they shouldn’t have.”

²³ “The whole romance thing got kinda confusing and the story line **got erratic** at times.”

²⁴ “Now you done it Tex, gone and **got sacrilegious**.”

²⁵ “Rahul is sent in to persuade her but his efforts to persuade her **turn abortive**.”

²⁶ “Motorcyclists **turned acrobatic** on Friday, lifting their feet from the brake and gear to protect their footwear and trousers from water that had mixed with the dirt that lay accumulated on the concrete...”

²⁷ “A few by George MacDonald Fraser, “Black Ajax” about a slave in the south who gains his freedom as a boxer, rises to become the heavyweight champion, and **turns dissolute**.”

²⁸ “If you start overindulging him like this, he will want more and more and he’ll **turn insupportable**.”

²⁹ “The sooner the West **turns multiracial** the better.”

³⁰ “Countries that have consciously **turned anti-western** fell behind others (the USSR, Maoist China, most of the Muslim world) while those that internalized western ways have profited (Japan, India, modern China).|

	insupportable ²⁸ multiracial ²⁹ anti-western ³⁰ exultant ³¹ tree-like ³² obdurate ³³ circular ³⁴	abdominal briefest healthiest herbaceous incurious nerveless
<i>fall</i>	black ³⁵ cold ³⁶ dim ³⁷ dry ³⁸ dark ³⁹ loose ⁴⁰	active adept airless amber banal kind leafy live supple sweet tame

³¹ “The Allies continued on to Berlin, encountering fierce resistance along the way. After the Battle of the Bulge, the Allied reporters' coverage **turned exultant**.”

³² “Fangorn is actually not far from Isengard, and most of the trees chopped down by Saruman were Huorns - Ents that have **turned 'tree-like'**.”

³³ “Although, during this first war, Decebalus had shown a disposition to negotiate, after defeat he **turned obdurate** and prepared to continue the struggle.”

³⁴ “you find that your square has **turned circular** and that every step you take you somehow are at the beginning.”

³⁵ “O' the night **fell black** and the rifles' crack Made "Perfidious Abion" reel”

³⁶ “Tell us which teen star landed a toasty adult career and which ones **fell cold**.”

³⁷ “I know your face, he whispers, Eowyn, My eyes are **falling dim**.”

³⁸ “The Haarlemmermeer was first, **falling dry** in 1852 , and the largest part of the IJ followed suit between 1865 and 1876 , with only a small lake remaining at Amsterdam that was closed off from the ...”

³⁹ “Also, in a dimly lit room with an off-center source of light, one side of the bezel reflected the light off its silver-plastic surface while the other **fell dark**, creating the illusion of a non-uniform frame around the screen.”

⁴⁰ “The other straps **fell loose**; Doug took one long step back.”

<i>go</i>	coy ⁴¹ dim ⁴² hollow ⁴³ stupid ⁴⁴ sympathetic ⁴⁵	meaningful unobtrusive relentless inconsiderate self-reflexive airless proximate normal
<i>come</i>	clear ⁴⁶ dark ⁴⁷ ill ⁴⁸	meaningful unobtrusive relentless inconsiderate self-reflexive airless proximate normal
<i>grow</i>	hasty ⁴⁹ ill ⁵⁰ obscene ⁵¹ popular ⁵² litigious ⁵³	buddhist fictitious adaptable

⁴¹ “The United States did not expend its blood and treasure to **go coy** at this critical time.”

⁴² “If one bulb goes bad, both go out or **go dim**.”

⁴³ “When I dropped down the face, the whole wave **went hollow** and I started making an arcing turn back up-that's when I was like, 'This is a huge wave.’”

⁴⁴ “Abril has a licensed copy of Photoshop because MY Photoshop **went stupid**...”

⁴⁵ “Terren’s face **went Sympathetic**, “Oh my god. You still aren’t sweet on that Jedi, are you?””]

⁴⁶ “When the time was 'up', he read his thoughts aloud to me, and it **came clear** that this exercise really reached him, not only in an 'English lesson' sense, but in a lightly therapeutic sense.”

⁴⁷ “At the very first, he was like the other birds; he had the same kind of eyes as the other birds, and he flew around and sang in the daytime, and when it **came dark** he went to roost ...”

⁴⁸ “He had been a hard working man before he **came ill** and all of a sudden he was depending on other people which I know he hated.”

⁴⁹ “Valencia **grew hasty** in their approach play and increasingly ragged.”

⁵⁰ “Phillip Daggett says he **grew ill** after eating a soft taco he ordered from a Taco Bell on Plymouth Ave. in Fall River over the weekend.”

⁵¹ “Words that were once chaste, by frequent use **grew obscene** and uncleanly.”

⁵² “What protocol suite **grew popular** in part because software developers have always been able to freely modify it?”

⁵³ “The tile tradition continued after the 1999 shootings, but **grew litigious** when the school rejected several

impartial ⁵⁴ dangerous ⁵⁵ purposeful ⁵⁶ mad ⁵⁷	unmanageable primitive abdominal
unreal ⁵⁸ lewd ⁵⁹	irrepressible

Figure 17. V+Adj pairs for which occurrence is close to 0 hits.

5.4. *Coercions and implicatures*

In our introductory remarks we suggested that when an adjective does not naturally express a property selected by a verb, it can be licensed through coercion. Because the selectional properties of these adjectives are evaluative rather than extensional, the coercion may be very subtle. Consider the following attested example.

(40) When sauerkraut goes bad, does it turn sweet and smell good?

[<http://answers.yahoo.com/question/index?qid=20080102234821AAUA7j2>]

We have suggested that *turn* presupposes that the property acquired is negative in some sense. While ‘sweet’ is not generally thought of as negative, it is plausible that in the context of sauerkraut, sweetness is a negative, as suggested by the context ‘when

tiles that included religious themes, including two made by Brian Rohrbough, whose son Danny ...”

⁵⁴ “Of course there is the garden, but I’m starting to **grow impartial** to some of the weeds we are cultivating”

⁵⁵ “They only seem to **grow dangerous** once they hit poultry—and seem only to grow really dangerous in modern-day industrial poultry farms.”

⁵⁶ “Women, though, **grow purposeful** as the urge-to-shop blossoms.”

⁵⁷ “Some men **grow mad** by studying much to know. But who grows mad by studying good to grow?”

⁵⁸ “This war was **growing unreal**.”

⁵⁹ “Loki’s green eyes glittered at her, and his three-cornered smile **grew lewd**.”

sauerkraut goes bad.’

However, not all uses of *turn sweet* are negative, and not all instances of the other V+Adj expressions necessarily satisfy the selectional properties that we have outlined.

Here are some cases of *turn sweet*.

- (41) a. ... and sour dish with fresh pineapple, mushrooms, onions, tomato, cucumber, ginger and baby corns to make ‘a sour evening **turn sweet**’
- b. Please do not let your plantains turn yellow-black because they will **turn sweet**.
- c. because the cloves will **turn sweet** if browned.
- d. At temperatures around 35 degrees the potatoes may **turn sweet**. This can be corrected by holding them at 70 degrees for 1 to 2 weeks before using them.
- e. Available in three delicious flavors, strawberry, green apple, and watermelon. These gummies start sour and then **turn sweet** in your mouth.
- f. Sweet foods are digested just as they are and remain sweet after having been consumed. Salty foods, on the other hand, **turn sweet** after having been consumed.
- g. Not surprising that many preschoolers behave like little tyrants at home but **turn sweet**, cooperative in school.

If foods that are intended to be sour or salty become sweet, that is a negative event and

turn sweet is appropriate. But *turn sweet* can also be used to describe a state of affairs (41a) or a person (41g), in which case turning sweet does not have the negative implication. We suspect that this is because the negative state is already associated with the prior state, e.g. ‘sour evening’ or ‘little tyrants’. Thus, it appears that evaluative selectional restrictions, such as the negative associated with *turn*, function as implicatures, and they can be suspended under the appropriate circumstances. When this happens, the meaning is neutralized, and the CoS verb simply means ‘become’.

6. An architecture for frequency

Our review of the foregoing data suggests that while speakers have knowledge of frequency, this knowledge is not necessarily part of their grammatical knowledge. The problem we are faced with is that there are at least four distinct components of knowledge that all have an affect on the frequency with which certain phrases appear in a corpus.

- grammar
- processing complexity
- knowledge of the world
- familiarity, including collocations

The grammar itself (that is, the rules and constructions) contributes to frequency, in that the frequency of ungrammatical forms will be close to zero. Processing complexity contributes to frequency in that more complex constructs will be less frequent, other things being equal. Knowledge of the world contributes to frequency, in

that the less common will be less frequent in the corpus. And style contributes to frequency, in that certain ways of saying something may become preferred, or even exclusive.

Given a theory of what determines frequency, it is possible to make predictions of frequency. So, for example, in a Google search we find *eat pizza* on 25,100 pages, *eat octopus* on 1,210 pages, and *eat anemone* on 9. This is predictable, at least in gross terms – it has to do with our knowledge of the world, what we prefer to eat, and what we talk about. This is not knowledge of language *per se*, although it is reflected in our use of language, and, crucially, may well be reflected in native judgments of acceptability and reaction times. There is good evidence that semantic complexity and plausibility, as well as lexical frequency, play a role in acceptability judgments (McKoon and Macfarland 2000; Gruber and Gibson 2004).

The frequency distribution reflects not only grammatical knowledge (an ungrammatical phrase is unlikely to occur), but also the existence of particular constructions that have particular presuppositions associated with them (each verb has its own construction, in this case) and style (as in strong collocations that exclude other grammatical and meaningful possibilities), and how we experience the world (we talk more about eating pizza than eating anemones). But it is not justified to infer back from a particular frequency distribution to the strong claim that this is what is in the grammar, and part of our knowledge of language. In the absence of an account of each of the components that determine frequency, it is too big a step to the “grammar [...] as a cognitive map of linguistic experiences, with acceptability judgments that are based on familiarity ...” (B&E, 353).

What do this data tell us, then, about the device that embodies knowledge of language in the human mind? It appears to have the following properties,

- It can record individual exemplars of sound-meaning correspondences.
- It can generalize from sets of exemplars that are related in form and corresponding meaning to sets of correspondences, some of which have not been encountered in experience.
- Outliers (or exceptions) to these generalizations can survive in the face of this generalization if there is sufficient support for them in experience; hence we have irregular verb forms even when we have regular morphological inflection.
- In the limiting case, it can generalize from correspondences in terms of general categories of words and phrases and meanings in terms of general semantic categories to exceptionless or virtually exceptionless 'rules'.

Culicover and Nowak 2003 take a stab at describing the architecture of this device as a dynamical system. Linguistic expressions are represented in this system as temporally directed trajectories through a set of corresponding spaces (phonological, syntactic and semantic), where each point in each space is a linguistic element of some type (e.g. phoneme, word, etc.). Elements that share properties are close to one another in the space; similarity induces clustering which leads to the formation of categories (see Wedel 2007 for a nice demonstration of this).

Crucial to the fine-grained topology of these spaces is frequency of experience. A lot of input to a trajectory or group of parallel trajectories leads to generalization of the

trajectories, and mimics the formation of lexical categories at the level of phrases. In this way, we get the formation of ‘rules’ that may be semi-productive, in the sense that the original exemplars on which they are based are a subset of a particular lexical category, and the resulting generalization across the subset to a more general formulation is still not the entire lexical category, but a subcategory. In the case of the CoS verbs, it appears that the generalizations are in terms of properties of the states denoted by the adjectives. Depending on the semantics of the class, the construction defined by the semi-rule may be in terms of a subcategory (e.g. verbs that select double objects) or a coercion (e.g. the verb *grow* requires that its complement be interpretable as denoting a higher point on some scale).

As we have suggested, knowledge of the constructions goes beyond the frequency of experience. But there is no reason to believe that the frequency of experience is without effect. Thus we expect to find, and do find, that the configuration of the space in terms of the depth as well as the breadth of the individual trajectories and clusters of trajectories will be reflected in frequency of production, speed and ease of comprehension, judgments of ‘acceptability’, ‘grammaticality’, ‘familiarity’ and so on. There is no reason, as far as we can see, why a system such as this cannot encode both the statistics of experience as well as the potentially unbounded set of possible expressions.

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