From "Naturalizing Phenomenology" to Formalizing Cognitive Linguistics (II): Grounding and Center/Peripheral Relations

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2021/05/24

Abstract

This essay continues Part I, placing somewhat greater emphasis on themes related to methodology — by extension to the Philosophy of Science considered as an approach to thinking about the goals of linguistics in general, along the lines of the sometimes-encountered notion of "Philosophy of Linguistics". In addition this essay focuses especially on Ronald Langacker's *Introduction to Cognitive Grammar* as primary source material.

> On connaît la célèbre affirmation de Claude Lévi-Strauss: "les sciences humaines seront structurales ou ne seront pas". Nous aimerions lui en adjoindre une autre: "les sciences humaines seront des sciences naturelles ou ne seront pas". Evidemment, sauf à en revenir à un réductionnisme dogmatique, une telle affirmation n'est soutenable que si l'on peut suffisamment généraliser le concept classique de "naturalité", le généraliser jusqu'à pouvoir y faire droit, comme à des phénomènes naturels, aux phénomènes d'organisation structurale.
> — Jean Petitot, [9, p. 1]

> The nature of any entity, I propose, divides into three aspects or facets, which we may call its form, appearance, and substrate. In an act of consciousness, accordingly, we must distinguish three fundamentally different aspects: its form or intentional structure, its appearance or subjective "feel", and its substrate or origin. In terms of this three-facet distinction, we can define the place of consciousness in the world.
> — David Woodruff Smith, [10, p. 11]

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This is the second part in a three-part series of essays discussing Cognitive Grammar — and, to a limited extent (the limits backed by philosophical claims) formal natural-language models. As with Part One, example sentences used to demonstrate or warrant linguistic suggestions are compiled into a data set accompanying these papers. More information about the dataset and code for generating and accessing this data are available from the repository where this paper is hosted.

The current document will focus particularly on Langacker's ideas about grounding, which were touched on at the end of Part I. My arguments in Part I were centered on the idea that sentences evince an accretion of propositional content — with the caveat that linguistic structure and figuration often invokes propositional structure only indirectly, so, I suggest, attempts to read language through "logic" are problematic — and that we can analyze inter-word relations and lexical, semantic or syntactic "type systems" as outlining stages in this accretion. A central facet of this theory is that the "accretion of detail" building toward a sentence's propositional intent — note that, as with Speech Act theory, the relation between an utterance and its predicate designatum may be more complex than simply asserting beliefs — is inherently organized, as a process, around the speaker's epistemic and perceptual relation to the situation contextualizing the sentence. A "sentence" here is proxy for any relatively self-contained language segment, which would be received as "sentence-like" as far as bearing relation to a specific propositional content; and by "speaker" I mean generically whoever formulates a sentence, not necessarily by speaking (cf., writing, sign-language, etc.).

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It seems fairly obvious and uncontroversial that propositional attitudes expressed through language are centered on the speaker — we can of course assert, say, that some third person believes something, but this occurs against the backdrop of our (typically unstated) belief *that* they believe it. Moreover, every sentence carries with it a point of view; since language is an interpersonal activity, it implicates all of the faculties of intersubjective reality and our innate "theory of other minds". We can readily make sense of others' deictic references, for example, by evaluating designations such as "this" or "now" in terms of the speaker's current practical and perceptual situation. While these ideas are familiar in both linguistics and philosophy, Langacker's analyses of speaker-relative *grounding* or *anchoring* achieve exceptional detail both in terms of revealing the diversity of grounding effects — classifying different linguistic structures in how they situate speakers vis-à-vis situational foci in different ways — and in examining how grounding effects structurally thread through the entirely of language.

Although most sentences have one elevated point of focus, or (a term I used in Part I) "nexus", many sentences have supplementary details and clauses which add refinements. However, these less-central elements are not undifferentiated "peripheral" content, but rather evince different levels of centrality and different structural relations to the nexus. Langacker's analyses transform generic notions of a center/peripheral axis in sentence-construction into a detailed theory, outlining in discursive and pragmatic terms how the grounded center draws in different peripheral and semi-peripheral content in different ways. I proceed here under the assumption that this Cognitive and *discursive* model applies to syntactic and semantic structure as well, and can help motivate more formalized paradigms for representing linguistic schemas. Metaphorically, we can picture a sentence-nexus as pulling content in to the center, and this dynamic provides an orientation which motivates patterns of regularity and entrenchment that give language a formal dimension. System such as Dependency Grammar (analyzing syntax in terms of rules governing word-pairs, as the building blocks of syntactic conventionalization) or type-theoretic semantics can be seen as deriving their technical rigor — despite the often ambiguous and subtle nature of human language — from the processual and epistemic order induced by sentence-grounding and center/periphery connections.

Formal presentations of natural-language grammar are often classified as either "dependency" grammars (concentrating on inter-word relationships) or "constituency" grammars (focusing on phrase structure and phrase hierarchies). Unlike more rigidly formal models, Langacker attends less to syntactic or semantic rules, calling attention instead those features in an overall linguistic artifact which reveal specific facets of language as a conceptualized system: cognitive construals of referents, extra-linguistic situations, and word-senses; relations of current sentences to previous discourse; speakers' epistemic attitudes and relations to the objects topicalized in their speech-acts. In general, the analytic focus gives an impression of prioritizing intermediate linguistic scales, larger than individual words or word-pairs but smaller than sentences or complex phrases.

Langacker does, however, recognize many established linguistic terms and constructs insofar as they establish grammatic or lexical categories, phrase-types, or salient inter-word relations (nominals, clauses, anaphora, periphrasis, complements, serial verbs, grammatical cases). Cognitive Grammar incorporates many of the structural features identified by syntactic theory, or also "generative" semantics; it differs from established paradigms however by seeking explanatory grounds for these identified patterns in cognitive construals of situations and dialog, rather than in regulated grammatic behavior or logically structured semantic models.

Granted, the rule-bound and logical core of syntax and semantics is, at one level, undeniable — certainly we do hear certain potential rearrangements of an expression as grammatically incorrect, while other seemingly similar transformations are accepted. Likewise, although word senses tend to proliferate, there is usually some logical structure binding senses together in a lexical network. For instance, one recurring example in Langacker's writings is *ring*: a network of diverse but interconnected meanings join the senses of *diamond*, *wedding*, or *smoke* ring with *criminal* or *boxing* rings.

So, because grammar operates according to restricted transform rules — we can build complex expressions from simpler ones only via certain sorts of insertions and rearrangements — and because semantic meanings, while often subtly organized (more so than crisp mappings like *cat* to *felid*), often have a stable predicate-like substra-

tum — it is tempting to picture language as logically structured. It is tempting, i.e., to envision that meanings emerge from sentences via a series of stylized deductions which people instinctively follow, like replaying a notated chess match or repeating the same morning commute. Linguistic novelty is inevitable but constrained, requiring just a localized mental readjustment against a familiar global pattern, like needing to take two subway lines instead of one to arrive at a desired transfer point (as a metaphor, say, for replacing adjectival phrases with a finite clause: *I hate the crowded morning subways* with *I hate the subways that are so crowded in the morning*).

Langacker invites us, however, to see language as less predictable than that; the structured and regulated facets of language coexist with a dynamics wherein speakers try to match language against their conceptions and construals of situations, which are the themes and the enveloping social ambients contextualizing language artifacts as such. The basic Cognitive Linguistic philosophy that language is *subtle* hews closely to a parallel — perhaps Cognitive *Phenomenological* — dictum that *reality* is subtle and complex, especially for social, emotional, goal-oriented humans. It is difficult to produce quasi-mathematical logical models of human affairs, with our rituals and abstractions that have circuitous links with concrete states of affairs: registering to vote, a celebratory meal, reading about the history of architecture. The human world is not a trivial robot's world of movable blocks and generic rooms. If we cannot give a constructively logical account of the social environs which we talk *about*, we cannot hope to achieve a plausible analysis of language which starts from an assumption of its inherent logical order.

Perhaps a more propitious paradigm is to see language as a membrane where a quasi-logical systematicity runs up against a socially (and not logically) organized world. We are simultaneously aware of language's structural norms and of the nuances of pragmatic social milieus that are impossible to encapsulate in a predicate logic. We therefore creatively encode social interactions — expressions of belief but also practical enactions and synchronizing collective construals — within the space of linguistic possibility, sometimes bending rules to communicative effect. To understand linguistic performance we cannot, then, only look to the states of affairs apparently introduced via linguistic declarations, like *John spilled wine on the carpet*. The actual discourse implies more than a propositional gloss might identify (e.g. that there is now some wine absorbed by the carpet) — in particular, we hear that the spill was accidental; that the wine was originally in some container that would normally prevent spillage; and that the carpet is resting on the floor (not, say, hanging decoratively high up on a wall).

In short, to properly analyze linguistic meaning we have to consider how elements of language combine to signify speakers' epistemic *attitudes*: choosing *spill* rather than *pour* connotes that the speaker believes the act was unintentional (compare *John poured wine on the duck*). Epistemic attitudes determine how we understand and interpret situations, both in terms of their underlying causal explanation (as in contrasting deliberate with accidental actions) and in terms of mental organization (such as patterns of visual focus when perceptually spanning an environment where the situation is playing out). So *I walked toward two dogs barking in front of the house* suggests a not-identical architectonic of visual foci than *I walked toward the front of the house where two dogs were barking*. Similarly, Langacker contrasts the "direction of mental scanning" in (his example 23 [5, page 82]):

- (1) The hill gently rises from the bank of the river.
- (2) The hill gently falls to the bank of the river.

In brief, the philosophical starting point for linguistic analysis should be that sentences communicate *epistemic attitudes* (beliefs but also precis of how speakers causally interpret, perceptually scan, or seek to influence situations), and not (except indirectly) states of affairs. That is, language signifies contents of an intellectual, not extramental, nature.

To the degree that structural norms operate in language, then, they are pressured to be representationally adequate for cerebral contents, not impersonal states of affairs. Setting aside occasional falsification, we can assume that people usually desire to create faithful linguistic encodings of their situational construals, limited primarily by a sense of what level of detail is dialogically appropriate. Speakers will select whatever lexical and syntactic packaging is appropriate to best describe their mental attitudes, with adequate (but not excess) precision.

This is the only essential structuring force we should recognize in language: speakers are under no obligation

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to use standardized syntactic constructions, or even conventionalized word senses. Indeed, many linguistic "rules" shoud be seen as approximate. The question of whether or not a certain construction is or is not grammatically acceptable is often not black-or-white. Langacker's analyses frequently point to semantically and syntactically similar patterns which nonetheless have different levels of normalcy, as in (*op. cit.*,pages 430-432):

- (3) Those problems were fully expected by the organizers.
- (4) To encounter those problems was fully expected by the organizers.
- (5) That she will graduate in June is expected by her mother.
- (6) That they would encounter problems was expected by everybody.
- (7) The painters expect that they will finish on time.
- (8) That they will finish on time is expected by the painters.

He gives each of these different levels of acceptability. The most uncomfortable-sounding in my mind are (5) and (8); Langacker argues that (6) sounds better than (5) but that the two sentences have similar rationales both in grammatic form (e.g., opening with a subordinate finite clause) and in semantic content (that clause profiling a grounded process which becomes treated as an object of thought by a sentient subject in the main clause). Nonetheless, (5), (6), and (8) are not equally conventional. The reasons for this may be subtle (see *Introduction*, page 432; subsequent references will be to this book unless otherwise noted), and I will discuss this example in more detail below. The present point, though, is that acceptability criteria can depend on holistic conceptual and situational features of a sentence, rather than on mechanical concordance with specific grammatic laws or templates. This can be difficult to reconcile with the idea that grammar determines how meanings fuse into wholes — if holistic meaning is prerequisite for adjudicating syntactic form, then how do addressees infer the constructional sequence which is proper for perceiving the holistic meaning which a speaker intended?

In the presence of these issues we should assume that grammar is more anarchic than linguists traditionally realize. There may be grammatic rearrangements which are reasonable even if unconventional; there may also be conventional norms which persist even if violations of those might still yield understandable speech-acts. In these sorts of situations, the norms of a language will tend to be loosened, and the "templates" of entrenched constructions tend to multiply. New patterns, or new levels of acceptability collectively granted to constructions or usages that were once dubious, could emerge under the same dynamics as new lexemes and word-senses: if there is a semantic niche for some pattern, to either communicate some idea more precisely or with a new degree of precision in a given register (on a scale of casual to formal language). For instance, a novel pattern might become popular if it yields an idiom in everyday speech which equals the precision of an entrenched but overly formal-sounding alternative. One of the forces giving impetus to novel constructions is, I think obviously, a speech community's desire to have a casual, quotidian language register equally expressive as more formal, professional language. When an idiom feels to old-fashioned or non-casual, English speakers seem compelled to settle on an alternative: *No problem* instead of *You're welcome*; *dude* or *boss* instead of *sir*; *gotta* instead of *must*.

The pressure against excess novelty comes from our concern that linguistic productions will be opaque to our addressees, and therefore fail to properly interpersonalize our private epistemic framings. But a *lack* of novelty can be undesirable for similar reasons: rote expressions might cause listeners to miss the nuances of one's attitudes. People will often choose words carefully, and expect their hearers or readers to understand that they are consciously selecting some words, in lieu of others, to signify that the rejected words are less appropriate for the speaker's mindset (the "competitive" example is Langacker's, page 473; the first is a now-famous quote about Donald Trump):

- (9) If we had had confidence the president clearly did not commit a crime, we would have said so.
- (10) I think he's rather ... uh ... competitive

Such paradigms do not preclude the use of technical vocabulary, or formal representations, to explicate the structures which speakers avail themselves of; our only requirement is that we keep in the background a cognitively-oriented picture of the dynamic processes through which linguistic norms get perpetuated and, on occasion, changed. In general, a choice of wording or phraseology which is *licensed* by the relevant syntactic or semantic rules will only *actually* be selected, in lieu of alternatives, by (in the speaker's estimation) best cap-

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turing her epistemic attitudes to a desired granularity. Adjectival phrases, for instance, can be "factored out" to infinite or finite clauses, supporting different scope of supplemental detail:

- (11) I like Ontario wines.
- (12) I like red wines from Southern Ontario.
- (13) I like dry red wines that come from Southern Ontario wineries using traditional European grape varieties.

Faced with a goal of conveying some mental content, linguistic structures act as "gears" that can be manipulated to fine-tune how the speakers' mental picture, explanation, sentiment, and intentions are communicated, along with level of detail:

- (14) John is embarassed because he spilled some wine on the carpet.
- (15) John shouldn't be embarassed about spilling wine on the carpet, because they served us wine in awkward plastic cups.
- (16) I'm going to tell John not to be embarassed about spilling wine on the carpet, because they served us wine in these dumb plastic cups.

The formal patterns identified by dependency or constituency grammars can therefore be seen as fleshing out the structural maxims that *allow* constructions to be affordances which speakers avail themselves of, metaphorical dials that are "turned" so as to vary different aspects of construal: level of detail, perceptual organization (e.g., which visual sites are focal and which peripheral), force dynamics, other people's intentions and rationales (via a "theory of other minds"), causative interpretations more generally, and so forth.

Since linguistic order is part of what makes these "gears" work, it is consistent with Cognitive Grammar to seek rigorous theories for the structural patterns that articulate the space of variation within which cognitive construals *can* be finely portrayed. Langacker often defers to established classifications and characterization of the structure and behavior of lexemes, phrases, and clauses. In the same vein, it may be useful to consider formal parse-reconstructions of sentences, or annotations of word-pairs, to notate the structural patterns which dependency or constituency grammars identify in linguistic performance — insofar as this formalization is understood not as a mechanical recipe for expressions' meaning but rather as an itemization of structural features through which expressions are mapped against cognitive attitudes.

This then leads to the question of what *sorts* of formal representations are most appropriate for Cognitive Grammar. There are points in Langacker's analyses which seem to cut against both Dependency and Constituency traditions. For example, consider his analysis of how adjectives which each modify one noun cluster together:

> Even confining our attention to modifiers traditionally classed as adjectives, we observe considerable semantic diversity and numerous departures from the prototype of describing inherent properties. For example, some adjectives specify position in a sequence or location in time: *my first teacher*, *our next president*, *a prior commitment*, *future events*, *a former girlfriend*. Others assess the validity of the nominal type specification: *genuine leather*, *fake Rolex*, *putative expert*, *real gold*, *counterfeit tickets*, *true patriot*. These shade into adjectives indicating the referent's status with respect to a category: *typical doctor*, *perfect circle*, *complete idiot*, *canonical example*, *ordinary member*, *representative instance*. Rather than intrinsic properties, many adjectives describe how a thing is experienced by others: *comfortable chair*, *scary movie*, *offensive statement*, *pleasant evening*, *welcome break*, *unsatisfactory answer*. These in turn shade into evaluative assessments whose basis may be entirely subjective: *marvelous report*, *charming couple*, *wonderful vacation*, *darling restaurant*, *horrible person*. Instead of a property, certain adjectives specify which domain a thing pertains to: *electrical engineer*, *mental hospital*, *corporate executive*, *medical textbook*, *culinary institute*. Still other adjectives relate to quantity: *abundant resources*, *rare coins*, *countless opportunities*, *infinite patience*, *meager allowance*. In fact, absolute quantifiers (*many*, *few*, *much*, *little*, *several*, *nine*, etc.) qualify as adjectives from both a semantic and a grammatical standpoint. (page 320)

Langacker then argues, as delineated by this sort of classification, that aggregates of adjectives are pieced together in a generally fixed order:

> There is arguably an overall tendency for proximity to the head to correlate with intrinsicness

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> of the property specified. Quantifiers are always farthest from the head: *nine black cats*, **black nine cats*, *several important visitors*, **important several visitors*. Closest to the head are adjectives that directly pertain to type. Domain adjectives have to be adjacent to the head: *excellent culinary institute*, **culinary excellent institute*, *young electrical engineer*, **electrical young engineer*. Indeed, since they also resist predicative use (e.g. **The engineer is electrical*), they might best be analyzed as part of the head. Also close to the head are modifiers that assess a type specification's validity: *large fake diamond*, **fake large diamond*, *cheap imitation leather*, **imitation cheap leather*. A number of specific patterns are well established. For example, adjectives of nationality follow those assessing validity but precede domain adjectives: *true American patriot*, *fake Moroccan leather*, *British mental hospital*, *German corporate executive*, *genuine French culinary institute*. Modifiers describing size, color, and material normally occur in that order: *large black woolen coat*, *small red cardboard box*, *big blue wooden sign* (but not **blue big wooden sign*, **wooden big blue sign*, or **blue wooden big sign*). The various patterns and tendencies noted are neither exceptionless nor even close to being exhaustive of English nominal structure. But while the facts of noun modification are quite complex, they also show a great deal of systematicity. (page 320)

This systematicity is, arguably, imperfectly modeled within Dependency Grammar, insofar as the foundation of that style of analysis lies within individual word-pairs. It is true that a noun can pair off with numerous adjectives — see *genuine French culinary institute* or *those two lazy cats* (page 311) — but full analysis (granting Langacker's contentions here) calls for identifying rankings *between* those pairs. The "ordering" of pairs is perhaps better conveyed by a phrase-oriented (constituency) model, where we can see the adjectival constructions as nested inside one another. So for instance *my three broken chairs* has the possessive as an "outermost structural layer" (page 275), with *broken* a designation of quality and *three*, in between, a designation of quantity. Each modifier supplies a different sort of detail, yielding a progressively more complete phrase. However, analyzing the construction in phrase-hierarchical terms still does not entirely model the issue of this "accretion of detail" needing a specific *sequence*: why are the phrases nested in that order conventionally (quality, then quantity, then possessive/grounding) when other nestings — which would ultimately aggregate to the same combination of specifiers — are dubious or wrong (*broken my three chairs*, *three my broken chairs*, *my broken three chairs* — although this last is at least plausible)?

Another area where both Dependency and Constituency grammars feel strained as representational vehicles concerns ambiguities in how we hear sentence elements as grouped together. Langacker frequently discusses constituency as a noticeable but partial pattern, so that sentences do not necessarily have a fixed construction hierarchy:

> There is no consensus about the internal constituency of nominals, due in part to the matter being quite complex. But let me suggest a more basic reason: that there **is** no definite constituency. As viewed in CG [Cognitive Grammar], constituency is neither essential nor fundamental to grammar. While certain hierarchical arrangements are fixed and well established, constituency groupings are often flexible and variable, if not just indeterminate. We have no reason to think that the structures constituting a symbolic assembly all have to be arranged in strictly hierarchical fashion, nor does any single hierarchy capture all aspects of grammatical organization. From the CG standpoint, questions of constituency have to be addressed as part of a broader consideration of symbolic assemblies. A symbolic assembly consists of semantic structures, phonological structures, and symbolic links between the two. (pages 323-4)

> CG ... eschews the standard assumption of a single, fixed constituency. Rather than being fundamental, constituents emerge within symbolic assemblies as a special case (albeit a typical one) of the configurations their elements can assume. It is only to be expected that the same symbolic components might sometimes be grouped in alternate ways, without significantly affecting the ultimate composite structure. It may also happen that grammatical constituents do not emerge at all. Given three component elements, like *small*, *table*, and *near the door*, nothing prevents them

from combining at a single level of organization, with no internal grouping: *((small) (table) (near the door))*. And should grouping occur at one pole, there is no necessity that it be concordant with grouping at the other. ... In the absence of clear-cut evidence, the proper analysis may simply be indeterminate — certainly for the analyst, and very possibly even for speakers. (page 325)

Langacker argues that constituency patterns depend on how tightly coupled two or more words would be to form multi-word units. Thus *put through* (as in a phone call) serves as a compound verb, whereas *ran through* is more likely a motion verb along with a path description (his example 49, page 404):

- (17) He ran through the mall.
- (18) He put through the call.
- (19) Through the mall he ran.
- (20) The call was put through.
- (21) He put the call through.

Langacker argues that *Through the call he put*, *The mall was run through*, and *He ran the mall through* are erroneous. This suggests that *through* binds "tightly" to *put* but only loosely to *run*.[1] But numerous factors influence whether and to what degree we hear words as "coupled". Even if phrases *logically* gather up into a hierarchy, in terms of the situation they describe, Langacker suggests that we may perceive them in a more linear fashion and only retrospectively build up the logical picture. He cites the example *Alice said that Bill believes that Cindy claims that Doris swallowed a spider*:

> The constituency [here] is seldom seriously questioned. But perhaps it ought to be. One factor long recognized as problematic is that the nesting ascribed to such expressions is at odds with their phonological realization. Intonation suggests [a] nonnested structure ... each clause is a separate intonational unit bounded by a slight pause from the one that follows. Furthermore, a primary reason for adopting a layered structure is the tacit assumption that basic grammatical relationships have to be reflected in constituency. In CG this assumption is seen as being gratuitous. Grammatical relationships have a conceptual basis and can be captured by correspondences irrespective of the order of grammatical combination. A viable description is therefore possible adopting an unlayered structure .... (page 417)

Although these points are made in the context of *constituency*, they obviously influence our sense of words' pairwise interconnections also. For example, in *small table near the door* do we perceive *near the door* as modifying *table* or *small table*? That is, do we mentally adjoin *near the door* to *small* as a package of specifiers explicating how we perceive the *table*? Or do we adjoin *near the door* with *table* because that is the noun which the phrase modifies?

Along similar lines, Langacker uses several examples to contrast subordinate clauses and non-clausal phrases, such as (examples 12-13, pages 415-6):

- (22) They began arguing before they even sat down.
- (23) They began arguing before dinner.

Langacker's theme here is distinguishing *subordination* from *coordination* between clauses: "in contrast to the spirit of coordination, the relation between the clauses is inherently asymmetrical ... Underscoring their asymmetry is the possibility of replacing the clause in question with a nonclausal structure" (page 415). He goes on:

> With this approach, we are able to maintain a clear and precisely defined distinction between coordination and subordination. But is the distinction really sharp? We have already seen that coordinate structures exhibit various kinds and degrees of asymmetry. Should we not also expect the converse, that certain subordinate structures might tend toward symmetry? Instead of a strict dichotomy, we might well anticipate a fuzzy boundary with transitional cases.

I read this as questioning whether we hear *before they even sat down*, say, as a subordinate detail *supplementing* the main idea of the sentence (their arguing), or as a coordinate specification which for the speaker has almost equal weight, her mental focus simultaneously on their arguing and on the remark-worthy length of time that

[1] Interestingly, we can give the example of *run through* as a compound verb, in the sense of "mentally review", which behaves like *put through* instead of like the "physical" run-through: *through the options he ran in his mind* is dubious at best).

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such has been going on (as if to say *They're arguing, and they've been doing so since before dinner*).

But I think this question in turn depends on how tightly we hear *before dinner* or *before they even sat down* coupled to the antecedent phrase and to its parts. In (23), *before dinner* can be treated as a further detail on *started*: it establishes a temporal time frame augmenting how *start* profiles the beginning-point of some process. Or we can read *before dinner* as a supplement to *started arguing*: we have the verb-phrase *start arguing* indicating that the speaker is presenting information about that specific phenomenon (the time at which their arguing began), and *before dinner* is used to convey a time scale (if they *started* arguing a relatively long time ago, they have *been* arguing for a long time). Moreover, we can potentially read *before they even sat down* as a refinement of the whole finite clause *They started arguing*: the sentence profiles the fact that they are arguing, and then clarifies that this situation has been going on since before they sat down. The latter reading — that *before they sat down* is a separately conceivable idea (since *they sat down* and *They started arguing* are both finite clauses) that adds a temporal framing to the overall idea of their arguing — seems to invite the model wherein the latter clause is co-ordinating and not subordinate.

But note that these varying summaries of the effective linguistic structure here depend on where we "attach" the second clause (*before they sat down* or *before dinner*) to a word or phrase in the antecedent part: does the second clause modify *started*, or *started arguing*, or the whole clause *they started arguing*? Is there some fixed sense that we can distinguish which model of the word-to-word, word-to-phrase, or phrase-to-phrase linkage is "correct"? Indeed, our conception seems more holistic: surely we understand that *before dinner* is a temporalizing detail relevant to, and epistemically qualifying, "started" *and* "started arguing", *and* "they started arguing". So perhaps trying to select one parse or another is conceptually misguided: our conceptualization of the sentence does not *work* in such a way that such distinction is meaningful. However, we say this only from a retroactive awareness of the sentence's meaning. This does not preclude a more specific structuration at some subconscious level that we would not necessarily find well-motivated based on our conscious sense of the sentence's meaning, precisely because we cannot undo our knowledge of what the sentence means in its totality, and retrace with conscious awareness how we *arrive* at that meaning.

In effect, it is possible that subtle variations in how we see a sentence as structurally unified — what network of conceptual and "reception" couplings (in the sense of our initial reception of a language-artifact) connects one part of a sentence to other parts, so that we can trace how a word, phrase, or clause *directly* modifies some other word or phrase, as compared to indirect modification through some intermediary. Sentences are obviously a *network* where we find some elements "connected" to some other elements as modifiers to modifieds, where "modifying" involves some conceptual re-interpretation or supplementation of detail. Since sentences have a holistic meaning, every part of a sentence has some determinate influence on every other part; but some modifications happen explicitly through syntactic and semantic norms. Therefore we can see sentences as a network where elements are "nearer" or "further" from one another, where the nearest elements are those that expressly modify one another.

This implies that graph-like, structural representations of sentences are useful glosses on their network structure. However, we still have issues of which modifications are seen as more or less immediate, and so which elements are more or less tightly coupled. Is the more immediate, conceptually salient, mentally noted modification-pattern the effect of *before they even sat down* on *started* (providing a temporal anchor to *start*'s notion of initiation), *started arguing* (as a temporalizing container on the profiled composite process, the act of starting to argue), or *They started arguing* (as a complete idea to which the second clause adds temporal detail)? Even if we deem that each of these patterns of conceptual alteration are equally salient — or at least that there is no credible theory "ranking" one parse over the other — we can still say that these three options are three distinct views of the sentence's "network" which all have some relevance to how the sentence works. The temporalizing clause has some conceptual relevance for modifying and elaborating on the prior material at different levels (*started*, *started arguing*, *They started arguing*). Each of these modifications can be observed by sketching the sentence's "network". If it is true that each level of conceptual influence is conceptually relevant, then perhaps we need to sketch the network in three different

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ways. Perhaps a thorough analysis would embrace the structural partiality of any one network model but use multiple such models as a "holistic" picture of the sentence's conceptual gestalt.

Along these lines, we have some license to pursue formal Dependency and/or Constituency reconstructions of sentences, even if the choice of one precise structural model may be somewhat arbitrary. A sentence may tolerate several different parses and reconstructions, which all reveal some layer or detail of its conceptual patterning (this is separate and apart from ambiguity; I refer here only to the conceptual holism which makes it difficult to argue that the smaller parts of a sentence are linked or pieced together in some single manner). Each notated Dependency Graph or Constituency Tree may be a valid but incomplete summary of *some aspect of* a sentences' inner working. A full picture may emerge from the superposition of multiple such formal reconstructions.

Where does this leave us with regard to formal methodology? Parse graphs, trees, or any other sentence-reconstruction is a useful *tool* for *investigating* sentences, but we should not confuse any one formal representation with the "meaning" of a sentence, or deem the process of arriving at a formal re-construction to be akin to *understanding* the sentence. Such an assessment bears on the issue of "computational" linguistics, and the philosophical question of whether computers can "understand" language — and whether their automatically creating a structured model, like a parse-graph, serves as proof of something like linguistic competence, or perhaps a preliminary step *toward* linguistic competence.

When linguistic methodology is described as *computational*, this usually implies that the research is not only developing or employing some formal representation of linguistic elements, but is moreover using computational mechanisms to instantiate and/or analyze the relevant formal structures, concretely filled in with particular linguistic content. In the case of constituency trees or dependency graphs, for example, there may be a software package which implements the trees or graphs as digital data structures, manifested by assigning words (or other lexemes) to the requisite nodes (or "leaves"). In that digital form, the data structures may then be available for further manipulation, such as being visually presented in some diagrammatic manner or being paired with other data structures, like tables itemizing the lexical interpretation and/or grammatic categorization of the component lexemes.

The term *computational linguistics* probably also implies that these digital representations are — or will potentially be — *automatically* generated by a Natural Language Processing system. For most researchers, that is, the use of computers as linguistic tools is bound up with a goal to automate various dimensions of linguistic processing, which in turn could provide for Artificial Intelligent agents that mimic human linguistic competence. Machine translation, for instance, could be effectuated by parsing sentences to dependency graphs, transforming the resulting graphs by translating words between languages, and synthesizing sentences in the target language via the output graphs. The machine-translation "problem" is thereby reduced to three smaller problems whose "solutions" can be chained together — starting with the problem of mapping linguistic content to formal re-constructions.

For linguists, of course, automating the annotation of linguistic components is more convenient than doing the same work manually. In the context of Natural Language Processing, automation is more than just a convenience: here, theoretical paradigms and concrete models are assessed specifically on how well they engender computational artifacts which manipulate linguistic givens in human-like ways without human intervention. A module which transforms unadorned sentences into formal dependency graphs, say, would be deemed successful if most such parses are identical to those produced by human annotators. To be sure, the more that reconstruction of linguistic content between different surface-level or formal representations can be automated, the more that Artificially Intelligent language engines can be constructed merely by interconnecting these automated capabilities. However, we should not assume that formal representations are *only* valuable in the context of these automated systems.

Instead, it is possible to employ formal or, indeed, computational structures as vehicles for linguistic explanation or exploration, whether or not the structures can be automatically obtained from surface-level language (or from other formalisms). As a case in point, I will here propose a formal model for Cognitive Grammar which, in broad outline, takes its structure from

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recent investigations merging Conceptual Space Theory, in the sense of Peter Gärdenfors, with a notion of "hypergraph" grammar. This combination — proposed in a schematic manner particularly in [2], which apparently reflects the experiences of several seminars conducted by a group of linguists and mathematicians — outlines an overall linguistic model where hypergraph structures are featured in grammatic description and Conceptual Spaces are recognized as a foundation for semantics. The proposal, which I will examine in more detail below, is sufficiently schematic that it may be best treated as a metatheoretical template — open to elaboration both in terms of how hypergraph grammars are specified and in terms of how Conceptual Space theory is understood to anchor semantics (here I will consider both dimensions in the context of Langacker's Cognitive Grammar, e.g. comparing Langacker's notion of *domains* to that of Gärdenfors).

Assuming, in any case, that we have a specific "Conceptual Hypergraph" model (unifying an elaborated Hypergraph Grammar theory with a Conceptual Space semantics), this model can be considered a *computational* model insofar as the resulting hypergraph-based data structures are amenable to computational treatments: for example, being implemented as data structures in a programming language, and subject to manipulation via these computational representations. Indeed, I will argue that a variation of the Conceptual Hypergraph model can be adopted as a basis for *formal* languages, such as computer programming languages. Accompanying this essay is demonstrative implementation of a programming language which illustrates this explicitly, using a "Hypergraph Virtual Machine" and hypergraph-based Intermediate Representation to concretize the compiler and runtime algorithms needed to translate source code (conformant to a hypergraph grammar) into machine-readable instructions. In this sense, I claim that a Conceptual Hypergraph model of language in general is interesting in computational contexts in part because it has applications to both natural and artificial languages.

Nevertheless, I do not claim here that the Conceptual Hypergraph model is well-suited to computational *automation*. Although I will describe a formal representation for linguistic data within this model, I am not concerned with whether computers could be programmed to derive these representations automatically, in contrast to the process of humans manually assembling the hypergraph structures as explanatory models for given sentences. While I think Conceptual Hypergraph models are subject to many interesting computational treatments (including via compiler/runtime pipelines), I do not endorse any philosophical speculation that natural language is sufficiently formalizable to be emulated by machines (even given practically infinite computing power and "training data").

Let me, in particular, make a contrast between *explanatory* formal models (whose metaphysical presuppositions can be relatively modest) and, as opposed to these relatively modest technical projects, formalisms aspiring to *simulate* human linguistic performance. In the former sense, models are used by humans to better understand language as a structural and/or cognitive phenomenon. The compositional requirements and transformative options available to formal models can then serve as proxies or intuitions for the rules and transformations internal to language. In this explanatory role, formal models do not need to be precise reconstructions of linguistic behavior, because we do not need them to serve as our sole source of linguistic explanation: formal models are simply one vehicle among others for investigating linguistic phenomena and communicating linguistic theories. By contrast, when we reify formal models to the point of *subsuming* all linguistic phenomena — in the sense that models should engender AI engines that replicate human linguistic competence — we impose an unreasonably high burden. Formal (and computational) models can be theoretically useful even if they are not totalizing enough to reduce all language to computationally tractable algorithms.

In this spirit I will argue, then, that a Conceptual Hypergraph model can be used to bridge Cognitive Grammar to formal linguistic methodologies — not in the sense that Hypergraph Grammar and Conceptual Space theory jointly embody a complete formal specification for language, nor that the model allows us to equip AI with something like "cognition", but rather that a certain class of Hypergraph Grammar and Conceptual Space constructions can be simultaneously illustrative specifications of Cognitive Grammar constructions and also elements of a system with formal properties, subject to formal presentations and analysis.

I believe that language is neither completely formal nor completely informal; as a result, formal models are

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neither entirely irrelevant nor holistically adequate for linguistic explanation. It is true that language is a human (communal) activity, and surely acquires some of its structure from this interpersonal dimension, just as social norms or cultural value systems reflect certain regularities that can be structurally analyzed. However, structural explanation has a deeper warrant in the context of linguistics than in, say, sociology or anthropology. There are constructive patterns that are directly manifest in well-formed sentences, and which are in that guise amenable to structural analysis; this differs from Structuralism in mythology, for instance, where interpretive sophistication is needed to reveal patterns that imply compositional "laws" somehow operative in myth-making. Even languages with no formal rule-books, no instructional pedagogy, or no written form, evince precise grammatic and morphological systems — equally or more complex than cosmopolitan languages regulated by such institutions as the Academie Française.

In short, it is possible to find within language precisely specifiable patterns that are not imposed by any external authority, nor vague enough to be byproducts of a certain manifest structurality that we might find in many regions of human communal activity. This implies that there is something within meaning or meaningfulness — or our cognition thereof — which trends toward structural regularity. It would certainly be part of the linguistic purview to explain how this trend arises (organically from the mental and intersubjective processes which yield language) and to document structural regularities at work in specific languages. On the other hand, however, such an analysis has no bearing on whether the analysis of structural patterns supplies a comprehensive method for analyzing language as a whole, or how extensively signification relies on structurally enumerable patterns rather than gestures, contextual cues, communicative conventions among narrowly defined dialect communities, and so forth. To analyze the speech of several friends discussing a baseball game, it may be that only a relatively small percentage of the communicative principles manifest in their activity can be explained by structural semantic or syntactic models; such models should then be deemed necessary but not sufficient for comprehensive treatments of language.

Structural patterns can emerge from how we cognize and then share impressions of empirical situations; or in the internal logic of states of affairs that are worthy of or conducive to linguistic expression; or some combination. As I have intimated, it is reasonable (indeed *de rigueur*) to assume that most (or all) linguistic statements have some basis in fact — that they are associated with some *propositional content* which the speaker either asserts or somehow comments on. The point is not that every sentence has a meaning which can be directly reproduced propositionally, but that most or all sentences' meanings take their departure from a propositional content that the speaker profiles in some orientation — as asserted, desired, interpreted, explained, doubted, and so forth. Often the communicative burden lies not in merely designating the concomitant proposition but in expressing a meta-level attitude to that content, so that the speech-act signifies and then elaborates upon it:

- (24) You know that Warren leads Biden in the polls, don't you?
- (25) I hope that Warren can appeal to moderates.
- (26) I'm sure that Warren will pivot to the center and will poll well with moderates.

The proposition that *Warren will poll well with moderates* certainly denotes a testable premise — it will prove true or false as the polls are in fact taken over time — but the point of (26) is not only to assert that claim, but to add interpretive and causative detail: (26) implies that Warren will poll well *because* she "pivots to the center". So we cannot "reduce" the meaning of (26) to the propositional content glossed as *Warren will poll well with moderates*; but denoting that content certainly seems to be a prerequisite to defining (26)'s actual meaning.

Of course, (25) and (26) can be seen as packaging one sort of propositional content inside a second, where the "outer" content reflects states of affairs pertaining to propositional attitudes. Notice that (25) and (26) are falsifiable. Perhaps (25) is spoken by a critic of Warren, who is rooting *against* her; but (25) is an indirect or diplomatic way of calling attention to her problems appealing to moderates (to hope for something implies some doubt whether that will in fact transpire). Conversely, (26) might be said by a Warren supporter trying to alleviate the concerns of (25). We can consciously falsify reports of our propositional attitudes, for various rhetorical or manneristic reasons. But this implies that propositional attitudes are themselves falsifiable contents, so it can be true or false that someone hopes for or believes something. As a result, we can argue that

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the actual propositional content invoked by some sentences can be factored into an "extramental" objective part and a speaker-relative attitudinal report.

Speech-acts, of course, also signal speakers' desires to *make* something the case, including via commands and requests. In the above examples, (24) is apparently performative in a similar way, since (24) implies that the speaker "wants" the addressee to accept the designated claim as true. The insinuation is that *Warren outpolls Biden* (as an asserted fact) *and moreover* that this fact should by collectively agreed upon, among the inventory of shared posits that undergird any conversation. So (24), via some indirection, expresses a kind of second-order "attitudinal" content analogous to (25) and (26) (the speaker's belief that *Warren outpolls Biden* is sufficiently extablished as fact to be collectively "enregistered"), while (24) also implicates a request (that the other conversants consent to this epistemic registering).

In effect, language would be impossible if we could not express both propositional contents and attitudes to those contents (wherein propositional attitudes are in turn a form of propositional content). In this sense language will reveal some structural patterns merely insofar as language's signifying resources include, as a proper part, exposition of factual beliefs and assertions. And so *in this sense* language needs to mimic logic because it often has to signify things with a logical structure.

Here, though, I am not implying that patterns in propositional structure are directly translated to patterns in language — by way of illustration, the usages in (26) are, on reflection, highly metaphorical and stylized. The conventionalized trope of a politician "pivoting to the center" employs a spatial construal to reference an empirical state of affairs which, logically reconstructed, would be very complex and contextual. While we can provide a workable predicate gloss — someone "pivots to the center" if their political comments or speeches reveal a particular pattern vis-à-vis the projection of distinct political topics onto a common centrist/extremist scale, such that someone's posturing over time figures summarily as "movement" in this abstract space — the semantics of the idiom *pivot to the center* is not a facile logical construction like (so the conventional wisdom has it, though I expressed my reservations even here in Part I) *bachelor* and *unmarried man*, or *ring* and *jewelry worn on one's finger*.

Merely noting the predicate structure of signified propositional contents, that is, may be at best tangential to actual linguistic explanation, because it cannot account for how metaphorical cases like "pivot to the center" are cognized and conventionalized. However, the requirement that language must signify states of affairs — via metaphor or conceptual schema or something more transparently compositional — is a reasonable starting point for exploring where language's structural sophistication comes from, because it certainly seems that propositional contents have structural patterns, so that these must eventually fall out of linguistic processing. Of course, we may also argue that linguistic structure derives from how we conceptualize states of affairs — and encode these conceptualizations in language — as much as from the structural logic of states of affairs themselves.

As explanatory intermediaries, both cognitive and propositional structure can coexist as originations for formalisms manifest in language. We need not regard analysis of cognitive frames exerting a morphosyntactic influence on the shape of aggregate linguistic units as denying a parallel influence from the situational context with which discourse must, to some measure, propositionally align; or vice-versa. And yet there do seem to be paradigm-grounded pressures to situate language morphology (in the informal sense of higher-level linguistic "shape") *either* in expressed propositions *or* in cognitive construals. To some degree this may reflect metatheoretic divergence in the basic terms of discussion: is the *meaning* of (27) here to be the proposition that Warren will win, or the speaker's belief that Warren will win?

- (27) Warren will probably win the nomination.
- (28) Biden's support among the base is eroding.

Likewise, should we understand the more metaphorical phraseology in (28) as a conventionalized idiom that has become a kind of entrenched signifier, no longer really operating metaphorically; or rather as projections of metaphorical devices which the speaker uses conceptually to think through the situation, anterior to her opinions being verbalized?

Taking a broad view, language involves a (typically iterative) process where a speaker has some thought, encodes it via language, yielding a spoken or written

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aggregate which an addressee encounters, processes, and then (hopefully) understands. Most of this larger process occurs within the minds of the conversants participating; but it could reasonably argued that the specifically *linguistic* (and not psychological or sociocultural) concern here is focused on the observable properties of the spoken or written content produced. The mental provenance and reception surrounding that content may be very real, but (or so one might say) cognitive analysis only has bearing on the specific disciplinary focus of *linguistics* insofar as the objective language artifact bears the imprint of certain cognitive processes, which are irreducible in a comprehensive account of why the artifact exists.

To make an analogy, suppose a footballer executes a pass in accord with a specific tactic which his team rehearses and discusses in practice. There are surely many cerebral and physiological factors contributing to the player making that pass, but a football expert would be expected to focus on the pass itself — its tactical rationale and execution technique. In this analogy, actual linguistic content — sentences, say — are like the football in a football match; they are tangibly observable. The ball is played over the course of a match, and its spatial position can be described — as can player-specific factors affecting the ball's location, such as how they execute on-ball maneuvers, and their decision-making insofar as it fits within the overall scheme of football's rules and tactics. But the analytic attention should rest with the ball itself, and only expand to include players' thought processes insofar as these bring explanatory value to observations of the game's objective features.

Analogously, language is, objectively, a realm of spoken and written productions or perhaps a system for creating new ones. Consequently, someone can reasonably suggest that cognitive analyses explaining how a speaker came to enunciate *this particular* sentence may be correct, but also are not in and of themselves descriptions of speakers' meanings. Reprising earlier examples, someone might say that political discourse (being fairly important and repetitive in a modern democracy) has evolved certain entrenched idioms, so we speak of *pivoting to the center* or *eroding support* as a shorthand for characteristic, objectively definable situations in the realm of politics. The entrenched expressions and their objective content — however metaphoric the latter may seem, and abstract/contextual the former — stand in a signifier/signified relation not that different from a more mundane/concrete semiosis like *cat* and one class of animals, or *water* and H_2O. We are, in other words, prepared to accept that "cat" is a word which in some sense *means* the clade Felidae, and "water" means H_2O. We do not take these "meanings" to be cognitive phenomena, even if we ackowledge that cognition is a kind of metaphysical prerequisite — no word would mean anything if not for each language-user having their own mental inventory of correct words for different contexts. Yet what makes these inventory items *words* is their stable co-existence in the minds of many (or all) speakers of a language.

The whole point of agreeing that *cat*, say, is a word in English is to recognize a substratum in *cat* which is at a theoretic level non-cognitive even if it *is* cognitive as a matter of ontological foundation. As a *word*, *cat* has a theoretical status which abstracts from its cognitive manifestation in any one English speaker's mind, such that it can be defined "extramentally" in terms of the pairing between the word and the set of mammals which it conventionally designates. To be properly linguistic, it might seem, our understanding of lexical and syntactic phenomena must perhaps acknowledge the cognitive nature of linguistic conventions as a matter of physical empiricism — words don't "exist" in some ethereal netherworld — but then transcend this cognitive layer by analyzing language enough that the synergy among different speakers' linguistic predilections, rather than any intramental immanence, becomes the theoretical center-stage. Linguistics proper therefore arises insofar as the cognitive dimension — siting linguistic rules and judgments in people's minds simply as a matter of ontological parsimony — becomes in a sense canceled out by multi-person alignments (which are preconditions for truly linguistic phenomena). Linguistic extra-mentality is then akin to how political scientists take demographic and electoral trends as their scientific givens, even though elections only "exist" through the voting decisions of concrete individuals.

I will argue in the next section that Cognitive Linguists perhaps discount the pervasiveness or rationale behind these extra-mental intuitions, and therefore have not fully responded to (or potentially bridged to) formal methodology which, in turn, are inclined to underestimate the cognitive contributions to meaning. My own opinion, already intimated, is that language actually unifies formal and contextual dimensions, so that method-

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ologies which foreground cognitive construal and those which prioritize formal substrata are both responding to real "signals" in linguistic data, and therefore both have merit.[2] However, I also believe that Cognitive and (say) Computational linguists have not-entirely-aligned intuitions of the basic demarcation of the linguistic discipline itself, which renders a certain paradigmatic disconnect almost inevitable.

To see this, consider again the minimal example wherein, say, English speakers use the phoneme *cat* to express an idea which (to some approximation) matches the biologists' *Felidae*. I think everyone would agree that a certain cognitive construal is thereby conventionalized and internalized to the point where, from each individual person's point of view, it becomes a *de facto* truth in the world: everyone knows that everybody else expects us to say *cat* when we intend to talk about Felids, so — however much the association may lie in people's minds — we all accept the useful fiction that *cat* means *Felid* as a matter of objective fact; just as Obama's or Trump's victories were objective facts notwithstanding "victory" meaning many individual persons' decisions to vote for them (and even more people's decision to recognize the election as legitimate, notwithstanding their own vote). Against this background, we can say both that linguistics concerns cognitive inclinations that are synchronized between people to the point of conventional entrenchment; *and* that linguistics concerns regularities conventionalized to the point where cognitive processes can be excluded from the field's disciplinary scope (and when they can't — e.g. in the analysis of rhetorical persuasion or of literary artistry — they tap into aspects of language which linguistics is not itself about). But this leaves us with two different conceptions of the linguistic enterprise, differences which can be seen most clearly not on the methodological level but in the "philosophical" process of identifying the specific analyzands which are in fact the substance of linguistic science.

Moreover, I think this divergence is clearest in the context of propositional content. As I argued earlier, most or all sentences are specifically aligned with (and project attitudes toward) specific propositions; such that the meaning of a sentence is dependent on (even when it does not coincide with) a proposition which the sentence signifies. This means that language is a system which can designate propositions in often unambiguous ways — where the connection between the concrete utterance and the relevant predicate complex has essentially the status of objective (albeit social) fact ("objective" in the emergent sense akin to the objective fact of an electoral victory, say). Moreover, this connection is largely a matter of agreement and consent, without any special interpretation or ad-hoc protocols enacted between speakers. Suppose someone overseas desires a baguette from a bakery and, not speaking the local language, points to her bread of choice; the shopkeeper responds by raising two fingers; she responds by giving him two Euros, and he gives her the baguette. Hence their activities have been coordinated, but according to relatively unstructured gestures conceived on the spot (except insofar as some gestures, like pointing or the use of fingers to represent number, have an almost-linguistic determinacy). Conversely, if the two participants both speak English, we might instead have:

- (29) May I have a baguette?
- (30) Two Euros, please.

We can reasonably assume that the shopper in (29) expresses her desire to *purchase* bread (she doesn't expect the baker to just hand her the bread as charity, or for her to examine). Likewise we can assume that the baker indicates in (30) that the bread costs two Euros, so that in the proper discharge of his duty he will give her the bread once she gives him the Euros. We can clearly identify the relevant propositional contents:

- (31) I would like to purchace a baguette.
- (32) If you give me two Euros, I will give you a baguette and recognize it as yours.

But fully explicating the logical details can seem awkward, even impolite. In reality, we almost always use language to designate propositional content which is not precisely modeled by the language itself, and therefore arises by virtue of conventions and implicatures. Language possesses a system of transformations such that linguistic structures map to propositional contents, even if the former structure is morphologically divergent from the structure of the relevant propositions.

In effect, language designates propositional content, but does so in accord with its own rules and conventions, which are not the same as transparent logical articula-

[2] Perhaps along the lines of Francis Jeffry Pelletier "Two-Tiered Theories" framework in his "Compositionality and Concepts" chapter [8].

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tions of predicate structure. While the *processing* which puts these rules in effect is mental, their being linguistic expressly means that the rules have a commonality which transcends any person's (or even any conversation's) cognitive dispositions. We would probably agree (barring some extraordinary contextual detail) that (29) *necessarily* signifies the shopper's desire to buy a baguette, even if she or the baker (or both) are inclined to impose some idiosyncratic interpretation. We can of course imagine competing scenarios — perhaps the baker intends (with her prior knowledge) to give her the baguette for free, but she has to pretend an intention to buy the bread so as hide their collusion from other shoppers. In this case (29) might indeed be a special signal the colluders adopt, with an idiosyncratic meaning; but surely they are still aware of their departure from correct usage, and this departure is part of the metalinguistic rule of their convention: they agree to use the sentence *which on ordinary terms* describes the speaker's intention to buy bread as, between them, a coded message. Likewise, as some inside joke, two friends might use the word *cat* to reference *dogs*; but here they are self-consciously investing *the word that means "cat"* with some deviant meaning layered on top of its normal one.

So *how* linguistic structure translates to propositional structure is something outside the control of individual people, and so it manifests itself, as a kind of scientific fiction, as objective fact. A linguist (or logician or philosopher) is then on credible grounds in believing that the locus of scientific inquiry into language lies with how linguistic structures communicate propositional content even though the structures generated by syntax and semantics are not facile duplications of the structures of propositions, or predicate-complexes. Language appears to be an encoding of logic via structures without trivial logical rationales. Accordingly, scientists might well be interested in the "hidden logic" whereby the surface structure of language "compiles" to the deep structure of propositions. The central focus of that analysis would then be propositional content as an extramental signification of sentences (as much as *cat* is an extramental signifier for *Felidae*) and the set of rules which govern the reduction of linguistic structure to predicate structure. Language is fully explicated, on this account, when a list of rules is provided such that every alignment between a sentence (with its specific surface structure) and its propositional content (with a specific predicate structure) is accounted for, so we can have a theory for why *that* surface (linguistic) structure maps to *this* deep (predicate) structure.

From such a perspective, cognitive processing is not so much unimportant as tangential; the surface-to-deep, language-to-predicate transformation is no doubt a cognitive phenomenon, but *as linguistic* it only exists as a cerebral faculty of one person if it exists as a shared competence among all speakers of the language/dialect. For *theoretical* elaboration, then, this "predicate reduction" is *not* cognitive, in the sense that its cognitive givenness should not factor in to its theoretical treatment. Instead, language should be seen as a "predicate reduction" system — mapping surface linguistic structure to deep predicate structure, in the course of signifying propositional contents via linguistic media — which can be described in structural and logical terms, withholding appeals to the cognitive nature of the mental operations wherein the isolation of predicate formations occurs.

I believe this framing of the linguistic enterprise is too simplistic, so I will rebut it somewhat in the next section, but I also believe that it should be assessed on its own terms. The paradigm of "truth theoretic" semantics is most directly contrastible with Langacker's own Cognitive-Grammatic project when the differences are expressed as matters of scientific ontology and theoretical posits. A logically-inspired semantics (or philosophy of language) can presume that there exist objective fixations (or, say, "fixpoints") in how language-to-predicate, surface-to-deep structure maps — regularities/regulations which are extramental in the same way that proposition are. Linguistics per se is (so one might argue) the investigation of how, via a catalog of structural transforms, languages encode propositions — *via mechanisms which* do not rely on cognitive faculties (like observations of similarity or interpretation of gestures) apart from those explicitly regulated by syntactic and semantic norms. There may be alot of further analysis we can perform on the conceptual motivation behind "predicate reduction" rules, on what occurs mentally when people formulate and then interpret linguistic artifacts under the aegis of predicative communication, and on the role of cognitive construals in novel or inventive uses of language — but these are analyses of conceptual processing of linguistic structures, not analyses of these structures themselves. We cannot assume that the presence of linguistic structure in the mind, as

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something we think about and acquire competence for, renders those structures intrinsically mental. By analogy, we can think about and become competent in abstract algebra or complex analysis; and symmetry groups or complex numbers can indeed be objects of thought, indeed objects toward which we apply mental exercises to the point that manipulating their structural domains becomes a kind of cerebral faculty and skill; but none of this makes the structures of group theory or complex numbers internally *cognitive*. They are, instead, abstract givens which become mental only insofar as they become cognitive foci whose thinking-about we rehearse to the threshold of a certain cerebral competence.

Arguably, syntax and semantics are in the same boat — they are objective and extramental systems, but because it is important for most people to master at least one language, we expend effort (albeit potentially unconsciously, when we learn languages as children) to internalize these structures thoroughly enough that we can form and understand sentences with little or no conscious effort. That is, a lot of our human engagement with language is as something that stretches outside our mental reach but which we want to internalize as much as possible — we want to *learn* and *master* languages, so we are engaged with linguistic structures as objects of thought and competence, with our cognitive facility in manipulating language. However — or at least this is an intuition we have to respond to — study of our cognitive facility in manipulating language is a different disciplinary obligation than studying language itself.

My analyses in Part I of this series addressed these disciplinary issues by arguing that, however well-motivated our intuitions linking linguistic content to propositional content, such intuitions are of only limited *explanatory* value. As a result, intuitions about logical structures in "deep" language meaning-content don't actually get us far into a theory of *why* surface language maps to underlying predication — so maybe we have to take a more cognitive stance after all. In most sentences linguistic structure does not tidily recapitulate predicate structure in terms of shape or organization; it merely *conveys* predicate structure, often through figurative or interpretive processes that are hard or impossible to model on logical terms. This line of argument, in short, focuses in particular on how sentences aggregate toward completeness — and on how this structural accretion differs from how propositional content emerges from logical connectives.

In the current document I sustain an overarching theoretical focus on a simultaneous semantic link but structural divergence between language and logic. However, I intend to consider the pattern of structural accretion, on the linguistic side, with greater emphasis on the effects of speaker-relative grounding and center/peripheral organization internal to language-acts.

1 Propositional Content and Compositional Structure

So, I accept, with duly noted caveats, that sentences (as canonical examples of internally complete linguistic artifacts) are associated with a propositional content. Such content is logically structured and verifiable or falsifiable, in the sense that there is a conceptually well-grounded understanding of what would be the case were the proposition *true* or *false*. The sentence as a whole can then be seen as a commentary on that propositional content and the (maybe hypothetical) state of affairs wherein it obtains, or fails to obtain.

Yet language is not, at least not superficially, structured akin to predicate logic; so, the "encoding" of propositional content in linguistic forms depends on certain structural and transformational rules, wherein structures on the syntactic and semantic side map to structures on the propositional side. This structural association is "cognitive" in the (so to speak) "metaphysical" sense that it occurs in people's minds. However, I suspect linguists would disagree on whether the language-structure-to-predicate-structure mapping, or "reduction", is cognitive in the more substantial *theory* sense wherein the cognitive dimension should feature as an explanatory source for theoretical constructions. Again, I would propose an analogy to political science: the whole topic of voters' inclinations to support one candidate or party or another is surely cognitive in the "ontic" sense that voter sentiment can only exist in people's minds. Moreover, some generically mental content may be introduced as explanatory parameters — voters are *concerned about* immigration or jobs or climate change; voters are *attracted to* charismatic or empathetic or idealistic candidates, and so forth. However, apart from instantiating such coarse categories of sentiment, the particular mental world of

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any one voter is not within the political scientist's normal explanatory resources or theoretical purview.

For sake of discussion, I will use the term *predicate reduction* to designate the process or phenomenon of deriving "predicate structure" (treating propositions as constructions which build complex predicates from simple ones, and *propositional content* as propositional ideas which may be intimated even if not signified directly in discourse). Moreover, I believe that predicate reduction can happen on several levels, since aside from a "base" propositional content there is for many sentences a secondary implication of propositional attitudes, which are separate states of affairs — my believing or wanting that Warren will win, or speculation of *why* Warren will win, contrasted to the baseline proposition *that* Warren will win.

I also propose a kind of "tertiary" predicate reduction reflecting the various implicatures or indirections where the propositional content expressed by a sentence cloaks or alters what the speaker really means (often in conventionalized ways so that the intended meaning is clearly communicated). So in a store *I would like* is usually understood to mean *I intend to buy*; or in:

- (33) I would like to interview Mr. Jones, is he in his office?
- (34) I'm sorry, Mr. Jones is not available.

(34) does not mean expressly either that Jones *is* or *is not* in his office, but rather that (33)'s speaker may not interview him. The "basic" propositional content of a typical sentence, then, is often packaged in two or three extra layers reflecting speakers' attitudes *toward* that state of affairs and/or implicatures wherein attitudes toward *one* proposition (requests, opinions, etc.) are often conveyed via sentences which, taken literally, actually describe attitudes to a *different* proposition.

For sake of discussion, I'll simplify my own take by focusing on just "base" level propositional content. I suggest that linguists methodologically differ on their assessment of whether the cognitive dimension of "predicate reduction" in this baseline sense should or needs to be foregrounded. To demonstrate, consider the most elementary sort of predicate structure, realized logically by a predicate applied to a bearer, and linguistically by an adjective-noun pair, like *black cat*. Logically, this apparently means that the predicate *black* is appended to whatever predicates are implicit in the logical designation of the subject; here resulting in a conjunction, something which is black *and* a cat. Such conjunctive predication is, of course, a kind of ubiquitous logical gestalt. The logical pattern is conventionally entrenched in English (etc.) via an `J·N` construction (a noun following an adjective — in these papers I adopt the habit of using the letter **J** for "adjective" in "equation-like" notations — while a similar construction in various other languages would have the adjective following the noun). That is, a simple predicate-subject assembly at the logical level is linguistically encoded via an `J·N`.

This encoding, in a theoretical sense, is not "cognitive" because we can describe it as an objective rule of language. The `J·N` construction becomes something "in" peoples' minds — something *thought about*, in the special sense of "thought" which accommodates cognitive competence, not just the passive presence of an idea in our consciousness — but it is an *object of thought* in the extramental manner that "complex numbers" or "the Eiffel Tower" can be objects of thought. Speaking "metaphysically", `J·N` is *in* the mind because this is its ontological mode of existence; but in the disciplinary parameters of linguistics, we can say that `J·N` is only *in the mind* as an object of mental exercises; the basic rule that `J·N` encodes `Predicate·Subject` (and likewise for any recurring construction-to-expression, or -expressive-intent, mapping in the sense of Construction Grammar) is a social fact transcending any one mind.

Via similar examples, linguists could argue that predicate reductions ultimately boil down to particular syntactic and semantic configurations with their specific patterns of encoding predicate structure, and that all of these are extramental "social" rules, whose cognitive dimension is ontologically necessary but not theoretically explanatory and therefore is properly elided from technical linguistic argumentation. To the degree that we can explain all predicate reduction by posing a logical formation and then a syntactic and/or semantic formation which encodes it, we can according relegate *cognitive* linguistics to a disciplinary offshoot, e.g. a *psychology of language* which differs from linguistics roughly as the psychology of mathematics differs from mathematics.

Consider in this context how Langacker (strategically, I suspect) riffs on *The cat is on the mat* examples (which have philosophical as well as linguistic provenance) to illustrate discursive context-sensitivity:

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> If someone says *The cat is on the mat*, you are likely to envisage a typical domestic feline reclining on a flat piece of woven material spread out on the floor. This is what we take as being the expression's meaning. But does the sentence really mean this? It would, after all, be quite appropriate for describing other situations. Perhaps, for example, the mat is rolled up in a cylindrical bundle standing on end, with the cat perched unsteadily on top of it. Or perhaps a decorative mat is framed and mounted on a wall, and the cat is clinging to it with its claws. ... Maybe the cat is a tiger in a cartoon, who has just lost a boxing match ... Or suppose we are using a light-colored mat as a makeshift screen for a slide show. To find where to place the projector and how to aim it, you put in a slide with the image of a cat. When the projector is finally positioned properly, I can let you know by saying *OK, the cat is on the mat*. Since the sentence applies to such diverse situations, what can we identify as its meaning? One option is to distinguish between its specifically linguistic meaning (a matter of semantics) and the fuller meaning it assumes based on extralinguistic resources (a matter of pragmatic interpretation). There is, however, no strict dichotomy between linguistic and extralinguistic knowledge .... And if we try to factor them out, identifying as "linguistic" just those specifications shared by all an expression's varied interpretations, what qualifies will likely be too impoverished to be apprehended independently or recognized as a meaning. (pages 463-4)

Responding to these points, however, someone claiming a sharper *semantics/pragmatics* distinction might argue that Langacker's "atypical" imaginings of *cat on mat* scenarios all vary in their specific sense of *on*. So the *reason* the sentence has such competing interpretations is that its lexical building blocks have finer-grained senses which the sentence does not explicitly commit to: *cat* can mean a cartoon tiger as well as a pet feline; *mat* can be a boxing ring's floor or a decorative wall element; *on* can mean *perched atop* or *suspended from* as well as *laying on*.

It is uncontroversial that natural-language words have multiple senses. To semantically analyze a sentence, then — or so one might argue — we need to its lexical units not just as spoken or written words but as lexemes classified according to their most specific levels of conventionalized meaning. Imagine that cat_1 is the specific sense of *cat* meaning "small, domesticated felid"; that on_1 is the sense of *on* meaning *laying/spread out on top of*; and mat_1 the sense of *mat* meaning roughly *small rug/floor covering*. Then *The cat is on the mat*, in the most common case, is actually a way to enunciate *The* cat_1 *is* on_1 *the* mat_1. (The other scenarios would solicit different lexical senses for *cat*, *on*, and *mat*, so they are not in fact the same sentence).

Of course, sentences do not mark via any linguistic data — no intonation or auxiliary words or morphological cues — that "cat" here means cat_1, etc. So there *is* a pragmatic and context-specific processing stage, indisputably, which leads the interlocutors to infer cat_1 from hearing *cat*, and likewise on_1 from *on* and mat_1 from *mat*. However, on this analysis, pragmatics and semantics are still separate. The pragmatic component of processing is fully articulated in the deduction that *cat* means cat_1, etc. It is a matter of negotiating the granularity (or lack thereof) of surface language, that lexical instantiation does not get us completely to lexical micro-senses (just as pragmatic processing is needed to map from *she* to a specific person, or *I thought so*'s *so* to a proposition). By contrast, *semantics* concerns how meanings are assembled into propositionally concrete wholes once lexemes (and anaphora) are resolved to their finest designata.

The separating of pragmatics and semantics is defensible even if the two are intertwined as processing requirements: the point is not that we *first* map *cat* to cat_1 (etc.) and *then*, with all words fully resolved, our "semantic faculties" kick in and we put the pieces together. Instead, we can posit that pragmatic and semantic reasoning occur in parallel, or at least in overlapping stages, with feedback between then. Still, isolating the role of pragmatics within the discovery of finest-grained word-senses (plus discourse-related discernments, such as anaphora targets) points to a *logical* contrast between semantics and pragmatics. Langacker, on the other hand, disavows any *strict dichotomy between linguistic and extralinguistic knowledge*. The "extralinguistic" aspect of *cat on the mat* seems to derive from our context-specific inclination to hear *cat* as cat_1, *on* as on_1, and *mat* as mat_1. It is only situational context which warrants such interpretations, and not cat_4, on_{13}, or whatever. Nevertheless, it seems

as if in this case the contribution of that extralinguistic knowledge can be comprehensively summarized by the narrowing of *cat* onto specifically cat_1, and so on, whereas the role of *linguistic* knowledge can be seen as targeted on syntactic rules governing synthesis of those meanings *insofar as* they are extralinguistically filtered to fine-grained senses.

In short, although no purely linguistic or mechanical deduction could derive the proper senses of *cat*, *on*, and *mat* from context, this is not so far evidence that syntax and semantics cannot be isolated, as a pair, apart from pragmatics and from context-sensitive, extralinguistic faculties; or that thus isolated the syntax-semantics pair has a formal predictability, a kind of mechanistic rigor, which perhaps pragmatics and situational cognition lacks. It does not preclude a computational model of sentences *once* fine-grained word-meanings may be resolved. We could speculate that a software program could correctly ascertain the truth or falsehood of *The cat is on the mat*, in the presence of pictures say, *if* the input is not just the sentence *The cat is on the mat* on its own but a more granular rendition, some encoding of *The* cat_1 *is* on_1 *the* mat_1. Here the failure of such a computational system to understand the sentence of a human level — without the extra lexical prompting — would not disprove that language *per se* cannot be automated; only that language in most *human* contexts is inextricably tangled up with non-linguistic reasoning.

This discussion suggests that a metatheoretic commitment to an isolated syntax/semantic pairing — assuming it is in fact theoretically desirable — holds up against certain forms of context-sensitivity such as highlighted by Langacker's analysis of discourse. The paradigm informing such a metatheoretic stance would reflect a "backgrounding" of cognition — not actually a denial of cognition's role in understanding language, but a working hypothesis that the aspects of understanding which demand active cognitive interpretation can be theoretically isolated from a more formalistic syntax/semantics complex, which by virtue of logical rigor solicits cognition only in a passive, automaton-like fashion.

I do not make these comments with the intent to defend such a mechanistic paradigm, only to claim that the problems with any linguistic "backgrounding" of cognition are subtler and deeper than context-sensitivity or pragmatic complications alone can reveal. One preliminary question, which I will skip over temporarily, is why we *want* to exclude cognitive explanation in the first place. Aside from that we can consider more detailed problems of *predictability*, *contextuality*, and *compositionality*, which I will examine in turn.

1.1 The Predictability of Constructive Validity

An intrinsic aspect of language constructions that directly imply predicate structures — such as `J·N` — is that they are equally applicable to novel constructions as established ones. As new nouns and adjectives enter the language, we automatically have `J·N` combinations using these new words as part of the language, too. It is, in effect, *predictable* that a given `J·N` construction is well-formed once the component words are understood as an adjective and noun, respectively.

This too can be seen as an objective feature of language. The observation that `J·N` constructions "reduce" to predicate-subject predication is not only a claim about *existing* pairs in the language, but the stipulation of the *rules* of the language. According to the machinery of predicate reduction for English, placing a noun after an adjective necessarily (in isolation) designates a predicate structure wherein the adjective supplies a predicate meaning and the noun its substrate — even if the particular combination has never been conceived before, or if one or both words are novel. This rule can be treated as an abstract protocol in the encoding of propositional content into syntax and semantics, consistent with the idea of language as an abstract system for designating logically ordered ideas via non-logical structures (not illogical but not expressly based on logic).

However, we can alternatively view the predicate-semantic predictability of novel constructions as a cognitive phenomenon: upon knowing that some pair of words is an `J·N`, we predict that English speakers will *assent* to the `J·N` formation being grammatical. Presented with a novel word, they will *predict* that adjectival constructions wherein it occurs are well-formed. They will *expect* to be able to use novel nouns or adjectives in novel combinations, without addressees failing to grasp their intent of designating a predicate-subject predication. From this perspective, the predictability of constructions being deemed grammatical, and the clarity of usage intent, are

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mediated by cognition as much as they are mechanical abstracta in the language-system. When we say that J·N (for example) is a constructional pattern (in English), we mean that English speakers are disposed to accept J·N constructions as grammatical so long as the components are of the proper syntactic categories, and are primed to anticipate using nouns and adjectives in J·N formations, even if the words are unfamiliar.

There is perhaps a meta-methodological shift in perspective involved here: we can place theoretical emphasis and the force of causation more on the abstract-system side or the cognitive side of such analysis. We can, on the one hand, argue that English speakers are "disposed" to predict the grammaticality of J·N only, or precisely, because the J·N to predicate-subject reduction is a rule of English. It is not as if J·N acceptability in a given novel context is in doubt, and English users have to speculate whether or not the community will decide one way or another — by comparison to how it *is* an open question whether a neologism or novel idiomatic usage *will* "catch on". Linguists might well say that neologistic and idiomatic entrenchment *is* a properly cognitive phenomenon because, prior to entrenchment, these usages are not fixed mandates of the language system, so speakers have to anticipate other speakers' comportment to them — a kind of "theory of other minds" which is of course irreducibly cognitive. But the predictability of legitimating J·N is not cognitive in the same way, because J·N is abstractly essential to the language system. We do not "think about" J·N in the sense of weighing or debating it; instead it is an *object of thought* in the passive sense that J·N is a grammatical rule which we can think about, and use as a maxim, but something whose objective status is outside our control.

In the more "objective" perspective I just spoke to, essential linguistic rules and constructions are *passive* objects of thought in that our proper disposition to them is to take them as objective givens, which we can think about, and incorporate into our arsenal of techniques prerequisite for linguistic competence, but we do not actively shape them. No one person — or even entire linguistic community — can decide that a novel J·N construction is *not* a template for a predicate-subject predication. Language, then, encompasses rules for mapping syntactic and semantic constructions to predicate structures, and such rules are objects of thought only in this passive sense — which is why (on such account) cognition is theoretically tangential to linguistic analysis, just as analysis of the structural integrity of the Eiffel Tower should not reference my personal experiences of the Eiffel Tower qua object of thought.

In the J·N case, the inevitability of constructional validity is *passive* because we assume language users exercise no active agency in assenting to the J·N rule. That is, the "objective" perspective is plausible because it seems as if J·N is so broad and fundamental as to be outside the realm of active engagement on speakers' part. This analysis, then, is only persuasive to the degree that we do indeed relegate the speaker's role to one of a passive observer. While in broad outlines such conception may be defensible, the argument becomes increasingly strained as we consider specific cases of predicate-bearer relationships. The minimal logical notion of *some generic* substrate bearing *some generic* predicate actually encompasses many kinds of cases. We can consider variations of instantiation modes: a *black/tabby/hungry/stray/prize-winning/adopted/very black/very hungry* cat. The *black* predicate differs from *hungry* in our anticipation that the cat is *always* black, but only *sometimes* hungry. Moreover, *black* refers to how the cat appears, whereas *hungry* refers more to how the cat *feels*, and designates a biological phenomenon; a *rock* or *dress* can be black, but not hungry. Unlike "black", *tabby* is a categorization of cats as much as a designation of how they appear. Therefore *very tabby* is quite dubious, while even *very black* is questionable (since there is no obvious scale of more or less blackness), but *very hungry* is quite reasonable. Meanwhile, *stray*, *prize-winning*, and *adopted* are all contextual predicates concerning cats in relation to humans, so they are not "borne" by cats in the material sense of an object bearing a color, or the biological sense of an animal bearing hunger.

Alongside these predicative variations, we should also recognize the proliferation of distinct ontological "registers" through which predicate-subject relations can be conceptualized. We have a *registered democrat*, an *Iowa causus*, a *primary season*, an *illegal goal*, a *championship match*, a *televised game*, a *winning touchdown*, a *controversial call*, a *video review*, a *porcelain cat*, a *police dog*, a *barking dog*. The full spectrum of material, biological, psychological, or sociocultural "objects" that can be predicative subjects; and the range of concrete or abstract properties that they can all instantiate — against this diversity the vague predicate-subject pairing seems

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so underspecified as to be almost theoretically beside the point. In point of fact, while we recognize a minimal J·N pairing as "grammatical" in a vague schematic sense, we do not consider most such formulations as communicatively well-founded:

- (35) * That's a hungry window overlooking the yard.
- (36) * That's a porcelain touchdown under video review.

Superficially the problem with these sentences is semantic, in the sense that other sentences with apparently the same form, but different lexical selection, are fine:

- (37) That's a stained-glass window overlooking the yard.
- (38) That's a porcelain vase under fluorescent lights.

Of course, just because any random J·N combination is grammatically plausible, we cannot expect that any noun will have a meaningful predicative combination with any subject.

Nevertheless, these assessments do not only occur at the individual lexical level. For instance, *hungry* is reasonably paired with any sentient animal, so in fact there *is* a general pattern here: in lieu of J·N we have a productive rule like Hungry·Sentient. Langacker calls this a *partial elaboration*: the pattern Hungry·Sentient is more specific than (and a narrowing of) J·N, but more general than *hungry cat*. So we do not just have the extremely general and underspecified J·N pattern, along with individual lexical instantiations of this pattern, which may or may not make sense for lexical reasons. We have intermediate patterns like Hungry·Sentient, which are somewhere in between. Are these patterns syntactic or semantic? Do we take "sentient noun" as a class of nouns — so a kind of more specific grammatical category — or as a grouping of lexical entries which share some important feature?

In light of this question, consider the issue of predictability: assuming that the noun designates a sentient creature, we anticipate that Hungry·Sentient will always be well-formed not just in the minimal sense of being grammatically unproblematic, but in the more important sense of being conceptually tractable. This seems analogous to the J·N case: the pattern is a global rule of language because it automatically propagates to new contexts. Likewise, it seems that any English speaker would consent that any sentient animal — even one she has has never encountered before, or even a newly-discovered species or a newly-invented fictional creature — is a reasonable vehicle for the Hungry·Sentient pattern. This pattern thereby seems "grammatical" in the productional sense that it licenses new construction-instances, as opposed to these being established as lexical particulars. Note by comparison that some patterns seem more determined by lexical specifics, e.g. *quick car*, *quick question*, *quick bite*, *quick score*. There are different senses in which something can be quick, so one might argue that how the *quick* predicate modifies a given noun is a lexical detail that has to be worked out on a case-by-case basis. But, excepting obviously metaphorical uses, *hungry* always specifically refers to animals capable of experiencing their need for food.

In short, the predictability of Hungry·Sentient being deemed coherent, in the presence of a sentient noun, seems structurally analogous (even if more grounded in concrete signification) than the J·N pattern. However, Hungry·Sentient also appears more difficult to abstract away as a fixed pattern of language which we only passively internalize, in the course of our mastering linguistic rules. For one thing, we readily extend the pattern in more rhetorical or metaphorical ways, on certain occasions:

- (39) This team is hungry for a win.
- (40) The violent protesters are hungry for revenge.
- (41) Most voters are hungry for a change.

These somewhat-metaphorical cases are examples of "blending", where some facets of the core meaning — the sentience of the agent which bears hunger, and the status of hunger as experientializing a biological need — are transferred to novel contexts. The parameter of *sentience* is preserved, although perhaps indirectly insofar as the discourse talks about a group of people, not individuals (*a team*, *most voters*). Moreover, the object of want is not food, but something less concrete. However, we accept these patterns as acceptable extensions of the Hungry·Sentient template because the blends "work"; they are conceptually coherent.

Meanwhile, a further complication is the intermixture of different extensions from a core pattern. We readily extend *cat* to encompass representations or fictitious entities:

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- (42) The porcelain cat is black.
- (43) Garfield is a talking cat in a comic strip.
- (44) In the musical, all the actors are cats.

But we cannot mix this extension with the *hungry* construction, in many cases:

- (45) ?The porcelain cat is hungry.
- (46) ?Garfield ate my breakfast.
- (47) ?All the cats are hungry because the actors don't eat before the show starts.

In short, a pattern like `Hungry·Sentient`, or more generally "`J·Sentient`", say — some predicate of a sentient animal — can be extended out in multiple directions. Hunger can be replaced by a less somatic desire, which it metaphorically connotes; the word for an animal can be re-used in the sense of a depiction or simulation (a sculpture, image, fiction, or impersonation). These lines of extension provide extensions of constructive patterns, but they do not necessarily work together. It may well be that the acceptance of a complex or imaginative extension to a constructive pattern *does* involve active consideration on speakers' part, rather than just passive acceptance of the usage as an objective feature of language. Speakers, in particular, can decide whether an unexpected usage is a comprehensible "conceptual blend" that fits some prior extensional pattern, or whether it is an idiosyncratic usage that may be understandable, but not sufficiently warranted by existing convention to be repeated or casually acknowledged.

As a concrete example, the `Hungry·Sentient` pattern is often extended to the "non-somatic" desires of *groups* of people. This more complex extension is actually more prevalent than more unidimensional blends: I think (49) is more conventional than (48):

- (48) The fans are hungry for a goal.
- (49) That fan is hungry for a goal.

Also we are *less* likely to adopt *hungry* for other more "somatic" sensations, which involve less metaphorical leap:

- (50) I am hungry for some sleep.
- (51) The dogs are hungry for water.

Perhaps these more mundane constructions are less normal-sounding because they conflict with non-metaphorical alternatives (like *thirsty*); to truly warrant a metaphorical usage a pattern may need to coalesce several different variations on the underlying pattern — e.g. shifting *hunger* toward desire for a more abstract substance *and* switching from an individual to a collective. Or perhaps cases like *fans hungry for a goal* became entrenched so that other uses which seem to involve the same *kind* of blend or extension feel more conventional. A construction like (49) may then be registered as understandable, but with a certain mental note that the speaker here is *not* adopting a kind of extension which agrees with other precedents (in contrast to (48)). This impression would render the hearer of (49) less likely to use extensions with the same premise in turn.

In these cases addressees are not passively accepting novel constructions as mechanical inevitabilities, but are, instead, actively weighing the plausibility and conventionality of the construction to establish both the semantic intent of the conceptual blend and how it accords with linguistic precedent. These judgments are matters of degree, and it is entirely possible that the language community's collective decision to incorporate some potential construction into "normal" usage is impossible to predict *a priori*. In short, whether or not a given construction becomes conventionalized — at least insofar as it metaphorically deviates from while building off of some core pattern like `Hungry·Sentient` — cannot be regarded as an objective fact of language which users just passively cognize.

Arguably, now, such observations can be accommodated by simply separating out metaphorical uses as semiotically complex, and therefore potentially interesting but thematically removed from the core concerns of linguistics proper. Even if we grant that active cognitive engagement is needed to interpret and assent to metaphorical discourse, we can coherently argue that there are plenty of *non*-metaphorical uses, and that the core of linguistic analysis lies with such cases, so that metaphor and other rhetorical or discourse-related parameters of linguistic performance can be broached by supplemental analyses — perhaps semiotic or discourse-theoretic rather than linguistic proper — adjunct to the core linguistic analysis. This possibility is plausible insofar as we can demarcate a realm of construction-instantiations which are *not* metaphorical; so let us try

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to specify what the properties of discourse *without* any metaphor, or any conceptual blending, might entail.

Given a fully abstract schema like J·N, we can only *passively* accept that such constructions are grammatical and that they signify predicate-subject predications. But now we also want to stipulate that the pattern is instantiated *non-metaphorically*, which means that the specific manner in which the predicate applies to the subject has to be somehow *objective* or matter-of-fact, not involving any interpretive effort or cognitive assent. So *hungry cat* is properly non-metaphorical because we have a clear biological notion of a cat being hungry, but "hungry voters" *is* metaphorical and therefore has to be, in effect, assigned to a different order of communications. Similarly, *black cat* is non-metaphorical because it fits an objective predicational pattern — a spatial object predicated with a color term, implying that its visible surface is composed of a material bearing that color. Here *black cat* instantiates a pattern we could notate as, say, Color·Object, which is non-metaphorical so long as the object is a normal-sized material thing whose color we can observe (whereas *blue Earth* or *green energy* or *black Tuesday* are metaphorical to varying degrees).

If we simply say that syntactic patterns like J·N belong solely to grammar — that their acceptability in a given case is wholly a matter of lexical particulars — then we are not really progressing toward a theory of a linguistic core which is cognitive only in a passive sense. After all, active interpretation may be needed to assess whether a concrete instantiation of J·N is plausible — which would seem to render this judgment intrinsically (and not just passively) cognitive. I think those whose intuitions point away from an essentially (and *actively*) cognitive role in language-understanding would implicitly look beyond the vague J·N prototype, and instead point out that certain predicate-subject instantiations are objective phenomena, or kinds of phenomena, which we *empirically speaking* passively cognize. In the Color·Object schema, for instance, we need not actively interpret the predication in the canonical (and non-metaphorical) case of the surface color visible on some ordinary-sized physical object. Given any color-term we therefore inherit, into language, a predicate construction siting the color into objects, and when encountering such constructions (like *red apple* or *green bottle*) we merely passively read the linguistic construction as signifying the mundane predication.

So the burden of analysis for a "non-metaphorical" linguistic "core" actually depends not on unspecified generalizations like J·N, but rather on certain narrowings of such constructions which can be given non-metaphorical interpretations. From J·N we can derive more specific constructions such as Color·Object or Hungry·Sentient. We can then say that these narrower constructions have non-metaphorical instantiations (setting aside metaphorical extensions), and that *in the presence* of these non-metaphorical cases the role of cognition is wholly passive. Insofar as it is passive, we can then say that cognition need not be theoretically thematized, and argue that the constructions occupy cognition in a manner that, given cognitive passivity, allows us to relegate cognition to a purely observational role, so that we analyze the constructions as objects *of* cognition rather than structures created *by* cognition; we endow them with a certain extramental objectivity.

Here I will not dispute that language *sometimes* has this degree of propositional transparency such that cognition is "passive" to the point of being scientifically eliminable. However, I will point out that these cases involve very specific configurations both at the empirical and the linguistic level. The glosses Color·Object and Hungry·Sentient can be seen as both templates for linguistic content and prototypes of situations expressed in language. These are cases where we have a straightforward and rather naturalistic construal of how a predicate inheres in a subject — color in a physical object, say — and moreover we have a middle-abstract construction which can be elaborated in non-metaphorical ways. By "middle-abstract" I mean that we are dealing with word-classes broader than lexemes but narrower than grammatical categories (e.g., the class of words designating sentient animals). A fully-generic pattern like J·N then becomes partly-narrowed into constructions like Color·Object or Hungry·Sentient, *then* these intermediate constructions get finally elaborated in a manner that supplies lexical specificity in a pedestrian manner: the *sentient animal* slot gets filled by designation of an actual sentient animal (not a figurine or a sports team), and/or the colored-object slot filled by an actual mid-sized object. Under these specific circumstances, we can talk of cognition having a mostly passive linguistic role.

However, laying out all the preconditions for this passivity points to a rejoinder, for those committed to the centrality of cognition: it is not obvious that this par-

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ticular constellation of linguistic and empirical content, where predication and middle-abstract linguistic constructions align in just the right ways to permit purely non-metaphorical predictability, is somehow the most important or most characteristic example of how language relates to states of affairs. From the fact that cognition is plausibly passive in *some* language artifacts, we cannot generalize to say that linguistic analysis should focus on these cases at the expense of, or even as preliminary to, others.

As a result, if this line of reasoning is sensible, we cannot assume *in the general case* that the *predictability of assent* to novel constructions derives primarily from language rules that we just passively witness; instead, speakers have genuine uncertainty about whether a specific concretization of an underdetermined (because very general) template like `J·N` will "work" in all the requisite registers and usage-conventions to be expressively tractable for addressees. Logico-structurally analyzable construction-to-predication rules do not have *sufficient* causal force in compelling assent that they can be universalized as the sole theoretical posit needed for "semantics proper" (which could therefore be elevated retroactively to the status of a truly formal discipline). If this is true, the strategy of "reducing away" the cognitive dimensions to language-understanding on the basis of their *passivity* (a passivity which would connote *lack* of causal influence and consequently a justified theoretical marginalization) effectively falls apart.

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1.2 Contextuality and Compositionality

Above I suggested that paradigms which try to minimize the thematic role of cognition in linguistic analysis face several problems. My preceding argumentation has focused on the idea of "predictability": how constructions license novel elaborations, which at the cognitive level points to language users' active role in assessing or expecting the legitimacy of newly created expressions. Plus, I just conceded that sometimes we *can* grant a passive role to cognition here too: at least sometimes, constructions find new elaborations which are both sufficiently grounded to existing patterns on the linguistic side, and communicative of sufficiently "objective" states of affairs on the empirical side, that we are compelled to passively accept the construction-instance as unequivocally signifying some predicate structure. However, I cautioned that these cases may be the exception to the norm, rather than vice-versa.

The problem of *contextuality* is manifest in how discourse is open-ended: *the dogs are barking* or *those dogs are thirsty* are only meaningful if all conversants have, from context, a clear notion of which dogs are *the dogs* or *those dogs*. We can be more precise via, say, *the dogs in that yard*, but this still has deictic open-endedness. Any transparent propositional context emerges only via substituting determinate content for any designations which conversants have to infer from the dialogic situation (something like *the dogs in the yard directly in front of the person speaking*, but for all its specificity such language sounds strange *as* human language).

How linguistic entities are mapped to ambient objects and situations is presumably outside of language proper: no-one should claim that passively obeying linguistic rules enables one to transition from *those dogs* to *the dogs in the yard directly in front of the person speaking*. The most plausible hypothesis seems to be that deictic reference, resolution of pronoun antecedents, and similar localized referential context-sensitivity demands a mixture of linguistic and extra-linguistic reason, often demanding active reasoning; an intersubjective faculty for inferring speaker intent. I would guess that most linguists could accept that hypothesis, even if they are otherwise committed to reducing the role of "active" cognition.

In some contexts, deictic or antecedent reference can indeed be separated out from syntactic or semantic reasoning as a distinct phase or dimension of linguistic processing. So a pronoun like *she* might need to be mentally substituted by *Warren*, or more precisely by *Senator Elizabeth Warren, presidential candidate*. We can analyze linguistic processing as a mostly passive observation of syntactic and semantic rules *after* all such "local" substitutions occur. Going further, we can also consider "holistic" substitutions, where one sentence is inferred when another is spoken, like *I would like you to pass me the kimchee* for *Could you pass me the kimchee*? In these latter cases addressees infer the original speaker's propositional content by *global* substitutions of one enunciation for another (unspoken) one; in the former, the propositional content is established by locally substituting context-specific words and references

for their empirical equivalents.

If someone asserts, say, that *Warren is in Minnesota*, this sentence's propositional content would be more expansively described as *Senator Elizabeth Warren* being physically situated (at the time of enunciation) in the *state of Minnesota*, a geographic region. Nothing in this content depends on the senator being named as *Warren*, *Elizabeth Warren*, or anything else. Context may of course dictate how much precision is warranted for communicative transparency: a cable news show discussion the American presidential hopefuls might use just *Warren*, while a Minneapolis newspaper, covering many topics (and therefore without the campaign as a referential filter), might prefer *Elizabeth Warren* in a headline. International papers could go further toward, say, *Elizabeth Warren, presidential candidate*. But none of these variations affect the relevant sentences' propositional content; instead they model different conversants' familiarity with the person and therefore their predisposition to understand *Warren* as *Senator Elizabeth Warren*. All of these referential options have the same referent, even if not every English speaker would parse the reference completely: by analogy, someone who sees Elizabeth Warren on television would be seeing *Senator Elizabeth Warren*, even if they do not know who she is.

If the meaning of *Warren is in Minnesota* is that *Senator Elizabeth Warren is in the state of Minnesota*, then variations on how we cite her name are not consequential for the meaning itself; as a result, we might argue, they are not foregrounded in semantic analysis of that meaning. Someone who says the pithier sentence, and then (on a signal she's misunderstood) the more specific one, is not presenting two different states of affairs, but merely repackaging the initial content in a surface structure better targeted to her listener's state of knowledge (or understanding of the current dialog context). We can pragmatically choose our words for hearers' benefit (or to ensure hearers take no offense, as in implicatures). This is, arguably, possible *because* the same propositional content may be expressed via different specific sentences; therefore, we may mentally scan through different phraseological options to find a choice for the exact sentence we produce which is dialogically most cooperative: maximizing the likelihood of being understood and also (as seen in "polite" speech) treating conversation as a rational exchange, not an occasion for bullying or power displays.

We can certainly claim that the choice of one specific sentence, out of many options that express *the same propositional content*, is cognitively "active". However, this supposition also acknowledges that there is a propositional content that may be shared among superficially different sentences. The issues raised here are in a sense the inverse of those addressed through Langacker's *cat on the mat* example: just as one surface sentence can designate variegated propositions in divergent contexts, variegated sentences can all encode one sole state of affairs. Hence we are agreeing on a kind of equivalence class among sentences, perhaps reflecting equivalence classes among their components: *Warren*, *Elizabeth Warren*, and *Senator Elizabeth Warren* being interchangeable in the proper context. So while we may actively decide how to render the relevant predicate structure in context-appropriate English, we simultaneously work within the acknowledgement that there is a specific propositional content at play whose linguistic encoding follows conventional rules (which we can only passively cognize).

Referring back to the idea of constructional patterns, *Warren is in Minnesota* can be seen as an instantiation of a pattern like `N is in` ⟨`place`⟩, whose implied predicate structure is that some physical object (expressed by the noun) is physically located in the expanse of the place (construed as an extended region). This pattern is an intermediate level of construction that can be filled in to varying degrees of referential detail. So we may actively decide whether *Warren*, *Elizabeth Warren*, or *Senator Elizabeth Warren* is the most context-appropriate way of stating her name; but we passively acknowledge that once the nominal and locative references are established, the `N is in` ⟨`place`⟩ construction systematically signifies an objective state of affairs, involving the object's spatial location.

Context is a "problem" for those who want to de-emphasize linguistic cognition because there seems to be active cognitive labor involved in choosing which specific elaboration — given an intermediate schema like `N is in` ⟨`place`⟩ — is most contextually appropriate. Moreover, speakers implicitly anticipate how other speakers will frame the current context, and use this interpersonal knowledge to guide their choice of context-specific linguistic content — e.g., referential expressions — preferring expressions which are concise but unambiguous. But this cognitive activity only exists in the space created by a gap between schemas such as `N is in` ⟨`place`⟩ and ac-

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tual expressions: the context "problem" can, potentially, be resolved by observing that *active* cognition is only implicated by the range of choices for how intermediate schema may be concretized, given the substitutability of expressions like *Warren* and *Elizabeth Warren*. We can then claim that the surface realization of the schema is a pragmatic matter, and maybe cognitively subtle, but that the weight of syntax and *semantics* lies with the intermediate construction, which can be completed in different ways for equivalent propositional content.

Here again, the weight of this analysis apparently lies with the intermediate schema: patterns like `N is in` ⟨`place`⟩, `Hungry·Sentient`, or `Color·Object` are sufficiently transparent — in terms of how linguistic constituents encode predicate structures and their participants — that we can more or less passively apply them to objective situations. We passively internalize the principle that certain constructions are how we express certain situations — exercising discretion perhaps in the precise referential terms used, but less so in the constructions themselves — and likewise passively parse the instantiation of these patterns as encodings of their propositional content. We passively observe, for instance, that `N is in` ⟨`place`⟩ is a kind of reified exemplar for asserting spatial claims pertaining to objects, and passively exercise the linguistic machinery that comes into effect once the referential constituents like *Warren* and *Minnesota* have been decided.

Such cognitive *passivity*, in turn, supports a paradigm wherein cognition does not warrant focal theoretical attention, because cognition does not have an active, structuring, causal role. It may indeed be that a nontrivial portion of linguistic processing involves cognition more actively or interpretively, but we can still isolate a semantic core — rooted in constructions that unsubtly embody predicate constructions — where cognition operates passively and mechanically, so that analysis can focus on the predicate-signifying structures we have cognition *of*. The gambit of a "non-cognitive" linguistics would be to claim that syntax and semantics proper may be focused on this propositionally transparent core, and that other facets of linguistic performance — the reasoning in substitutions among competing realizations of a propositional content; the formation and interpretation of rhetorically more complex sentences which do not employ logically simplistic construction patterns — can be approached as supplements to the core analysis, yielding two modes of analysis which can be theoretically partitioned.

I believe the essential weakness of this metatheoretical setup is that it rests on, or perhaps extrapolates from, a specific genre of linguistic constructions; furthermore a specific version of the transitions mapping back and forth between propositional content and surface structure. There are (as I have put it) "logically transparent" construction-patterns which encode predicate structures more or less mechanically, and which in turn can generate diverse surface language (via referential substitution, or perhaps "holistic" substitution at the sentence level, e.g. within implicature). Analysis can posit a neat separation of pragmatics from syntax and semantics — and a de-emphasis of active cognition from the latter two — for linguistic productions which shoehorn propositional content-expression through this *sort* of workflow, and the particular style among the "middle-abstract" constructions which enables encodings of this kind. However, while a "propositionally transparent" style does exist in language and does need to be accounted for by a comprehensive theory, we should balk at assuming these cases are protypical or explanatorily privileged.

If we analyze the relations between propositional contents and the linguistic constructions that carry them, we do not only find conventionalized renderings of predicate structure, such as my running examples (`N is in` ⟨`place`⟩, `Hungry·Sentient`, and `Color·Object`). In many cases, predicate structure is conveyed through more elaborate constructions with their own compositional patterns, deviating from a transparent reciprocation of the underlying logical form. I'll examine two hypothetical sentences as examples:

- (52) Biden's support among his base is eroding.
- (53) Violent clashes between protesters and the police have spilled out into the streets.

One interesting feature of (53) is that *the streets* figures in the second clause as if to contrast with the first clause; but normally we expect "protests" to happen *in* the streets in turn (this is a different situation than, say, *passengers leaving the subway station spilled out onto the street*). Evidently, then, *the streets* has two different conceptual interpretations which are both relevant to how we would probably receive (53) (in the typical kind of context where (53) would be spoken or written).

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If we say *violence has spilled out into the streets*, the implication is that the violence designated is random and chaotic. This implies that whoever formulates (53) would be thinking of violent acts like assault or vandalism (not just confrontational acts directed at authorities in the course of political protest). In (53) we thereby have an implicit contrast figured between two different forms of violence; a goal-directed defiance which is specific to aggressive confrontations between protestors and police officers (or other representatives of governmental authority), as compared with a less "ideological" form of violence, where intimidation or property destruction is pursued for its own sake. The speaker appears to be claiming the the more "constrained" or "structured" aggression in the former sense has transitioned to the more chaotic scenario of the latter.

This reading is context-dependent: we can imagine scenarios where, let's say, protests originated in some government building and over several hours expanded outside. In that case (53)'s *into the streets* would be more of a literal profiling of a spatial path. However, I feel that a more likely use case for (53) would involve the trajectory being more metaphorical: the violence has "moved" in a rather abstract space of categorizations or interpretations of the violence; violence as a consequence of defiant protests versus violence as the medium or riotous or destructive behavior.

Having said that, (53)'s *into the streets* formulation does also have less metaphorical aspects, because a further implication (in this "riotous" scenario) is that the episodes of violence are indeed spatially expanding. A protest, even a violent one, tends to be spatially circumscribed; the transition from a protest to a *riot*, or some other more chaotic development, is marked in part by the participating individuals being less constrained by a specific focal location. Someone would be more likely to characterize protests as a *riot* if they witnessed (or learned of indirectly) incidents that seemed spatially random and spread out; one would less likely employ that concept for spatially structured protests concentrated in one geographic location, even if the protesters were acting violently. Implicitly, then, the conceptual shift involved in construing defiant acts as a *protest* or a *riot* is driven in part by our conception of the spatial (or "urban-geographical") environment where the events unfold.

So the comparison between (53)'s two "poles of focus", on my reading, is spatial on two levels, one more literal and one more metaphorical. These two construals are mutually reinforcing. The speaker is presenting an overall construal which has several dimensions, including the idea that (as I outlined it) there is a transition in "kind of violence" appertaining to some protest or sequence of protests. One observational *warrant* for this construal comes the "spatial patterns" of riotous incidents, so that the spatial figuration in *spill out into the streets* in part denotes the pattern of observations which compels the speaker to frame the situation as (53) implies. Meanwhile, (53) also intimates that the more chaotic situation is both a consequence of and a deviation from the state denoted at (53)'s opening. To use the phrase *spill out* implies some breach in a container, some outward-aiming force that disrupts a more structured scenario into a less structured one. Parsing *spill out*, then, we are led to *violent protests* being construed as (albeit violent) somewhat contained — which then invokes the sense of *protests* as implying a geographically focused gathering.

The implication, then, is that the very fact of the confrontation being *protests* — i.e., that the protesters were self-conscious of *protesting* and therefore adhered to a certain ordered script — acted as a container, which constrained the protesters both spatially and behaviorally. The phrase *spilled out* implies that the restraints connoted in the first part of (53) are broken, and that this in turn is manifest both spatially and behaviorally: the violent incidents are more spatially scattered and also, we infer, less regulated by the "conventions" of protesting. The manner in which (53) is constructed implies that the speaker is asserting some psychological shift on the part of the protesters — that they have ceased to deem themselves bound to respect certain limits (out of a desire to avoid being punished, or to garner public sympathy, or a desire not to cause harm) that would ordinarily be in effect insofar as one intends to *protest* and take part in a protest.

I think there may also be an implied assertion of *why* this psychological shift has occurred. It may be that "violently clashing" with the police undermines their authority — e.g., by normalizing acts of insubordination, or disrupting their ability to exercise control as normal — which in turn has emboldened people to commit acts they would normally shy away from. Noting that the phraseology suggests a relatively extended transitional

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process — *have spilled out* in the perfect tense — we can also speculate that the protesters grew less disciplined as the protests dragged on, perhaps out of frustration. Of course, the point is not to guess as to empirical facts but to infer the speaker's rationale for her choice of words — how should we read the use of a perfective rather than simple past rendering in *have spilled out*? And why that choice of spatial figuration rather than a more straightforward path-designation like "moved"?

Since speakers consciously or unconsciously select one phraseology in preference to others, we can always (and instinctively tend to) read their choice as signaling their specific stance toward the signified situation, whether or not this signaling is deliberate. The choice of surface-rendering is not only a choice of *what* to describe, but of *how to frame* a description: constructional choices indicate the speaker's *interpretation* and *assessment* of the situation. In many aspects we can highlight the aspects in which this framing is *epistemic*: for (53) I have noted rhetorical dimensions which connotes warrants for (53)'s perspective (observations of a spatial patterns suggesting that the protests are becoming more disorganized) and causal interpretations (the protesters' psychological shift, the authorities losing legitimacy). We tend (inevitably, I would argue) to read sentences like (53) as not merely describing some situation — not merely presenting their propositional content as descriptive assemblies — but as packaging up an epistemic *account* of the situation. The *epistemics* of linguistic constructions include how the choice of surface-level forms connote speakers' rational attitudes toward situations — interpretations and causal assessments of, explanations and warrants for, and so forth.

One facet of this connotation, in (53), lies with *spilled out* being a metaphor; but we should not get sidetracked into interpreting the operation of this construction being especially imagistic or ad-hoc. Instead, we should read the metaphor as conveniently packaging multiple epistemic dimensions. The spatial aspect of *spilled out* helps signify the "evidential" dimension to (53)'s reasoning, since a spatial pattern of observables constitutes one of (53)'s warrants. The force-dynamic aspect helps profile the apparent construal of a psychological shift (among the protesters), which supports (53)'s apparent causal interpretation (that the sentence describes a non-ordinary level of violence caused by earlier protests along with some breakdown in the conventions which might otherwise prevent protests from becoming too anarchic). In short, *has spilled out* hooks in multifaceted epistemic intimations in just a few words, so it is reasonable that a speaker might gravitate to that phraseology when choosing, however deliberately or subconsciously, the precise verbiage with which to formulate her observations. I would argue that we instinctively tend to select the formulations which carry the most epistemic content — which signify interpretations, causal theories, connotations of evidence, etc., alongside bare descriptions — because these most organically encapsulate how we mentally comport to situations.

On this theory, speakers gravitate to metaphoric patterns not so much because "figurative" usages (being imagistic or somehow pictorial, and therefore in a sense iconifying rather than abstractly describing relationships) are convenient proxies for complex elaborations. Instead, metaphors can unify multiple epistemic dimensions, and so we subconsciously may find a given metaphorical expression the most natural "fit" for our own understanding. If we imagine ourselves subconsciously scanning the space of surface-realizations to linguistically encode a situation, it is plausible that we are disposed to select the formation which matches our internal construal most exactly, and moreover that *most exactly* often means *according to the greatest number of epistemic dimensions*. We may subconsciously choose a given metaphor because it has multi-dimensional epistemic appropriateness vis-à-vis our own construals, making it *feel* most accurate, compared to either (more or less metaphoric) alternatives.

I'll illustrate this thesis with (52) from earlier: the metaphor of *Biden's base eroding* encompasses a range of spatial, temporal, and force-dynamic facets. First, erosion is understood to be a gradual but progressive change. Second, it implies that some object or substance (in literal use, a geographic feature) is diminishing in spatial extent. Third, *erosion* implies a contrast of interior and exterior forces, where external forces somehow overpower contraindicating tendencies for the eroding feature to remain whole. In a political context, a *base* has an internal dynamic which tends to keep it intact, because people's ideological commitments are usually relatively stable. To speak of the base *eroding* is, then, to connote the existence of destructuring factors which compete against the base's expected perpetuation. The force-dynamic implications of *erode* therefore attribute

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to the speaker a sense of both centrifugal and centripetal force efficacious within the "base", which in turn is conceived quasi-spatially.

Moreover, the *base* is not just very abstractly spatial (e.g., as something which has magnitude). Presumably, we would not speak of a politician's *eroding support* if she were, say, to show poorly in polls *in one location*. Someone following Biden's campaign would be more likely to assert (52) in the context of recurring observations wherein someone who has supported — or who is of a demographic or ideological profile that would often support — Biden in the past fails to do so in the present. So (52) carries an implicit provenance where it would be buttressed by multiple concrete examples, which we seem to assume to be spatially diverse both literally and figuratively. We expect (52) to be chosen as a description of the current stare of Biden's campaign by someone who has encountered evidence of Biden losing support in numerous different places — sticking to a literal reading of spatial extent — and also, quite possibly, losing support among different *categories* of voters (a case which also justifies spatial figuration, more metaphorically).

So the spatial dimension of the metaphor in (52) implies a spatial extent of warrants — rather similar to the epistemic pattern I argued for in (53). Finally, the *temporal* facet implies a pattern which the speaker might intend to signify both descriptively and epistemically. The *erosion* image implies that the process described — Biden losing support — has been gradual and continuous. We expect (52) to mean that he did not lose a lot of support all at once (due to some scandal, say). Plus, we may well hear (52) as inferring that the speaker has become increasingly *aware* of the trend. Of course, (52) does not imply that the speaker mistakenly estimated Biden's level of support, so that his level of support has not changed. But (52) *does* imply that Biden has been losing support on roughly the same time span as the speaker's process of becoming aware of this fact (we assume the speaker talking as an expert or observer of politics). That is, (52) connotes both a speaker-relative and an objective assessment of the temporal parameters wherein the state-change implied by *eroding* occurred.

In sum, (52) via its phrasing compiles numerous implications appertaining to the speaker's rational stance vis-à-vis the process described. A less metaphoric construction could well be less epistemically thorough: saying *Biden is not polling as well* would carry none of the elucidations of warrants, of speaker observations, of time-span, of causal interpretation, and so forth, which we project into the sentence via the *erosion* metaphor. The point is not that we are attracted to metaphors because of a desire for pithy, elegant statements; I claim more specifically that we experience metaphoric speech as more *complete* because (via a metaphor's various facets) it covers a wider range of epistemic connotations. From this sense of completeness we are often, I'll then claim, led to select metaphoric constructions even if we do not self-consciously choose to endorse the epistemic parameters which the metaphor serves to discursify.

Hearkening back to my earlier comments about "passive cognition", the dynamic in how we, on my account, *gravitate* toward metaphor seems to clearly cut against the paradigmatic commitments of an "objective" semantics cleanly isolated from pragmatics. To see this, note that metaphoric patterns in (52) and (53), I have claimed, are effective in significant part because they unify a signification of multiple epistemic attitudes to their propositional content, as well as the content itself. So (52) signifies that Biden has less support than he once did — meaning that the percentage of voters supporting him compared to other candidates has decreased — and (53) signifies that there has been an increase in violent or riotous incidents, apparently connected to some protests (e.g., some of the protesters are also perpetrators). These are accounts of the basic propositional content laid out by (52) and (53); but they are not the full *meaning* of the sentences, because in their natural context I think we would surely hear them as adding epistemic, speaker-relative details: why she thinks this is happening, what warrants her observations, what kind of holistic interpretation can be imposed.

If we now say that the *propositional content* signified via (52) and (53) expands beyond just the observed affairs, to include the speaker's assessments and interpretations, then we have to account for *how* this expanded content is communicated. I have suggested that metaphorical patterns "package up" multiple epistemic dimensions. How does this happen? Is such assembly a product of conventionalized predicate-structure-disclosing schema, like `Color·Object`, `N is in` ⟨`place`⟩, or `Hungry·Sentient`? Or do we apply a more active cognitive hermeneutic to uncover the epistemic implicatures residing in metaphoric (or other surface-level)

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figurations?

My answer to this questions is that compositional patterns — *how* surface language encodes propositional content — have often indirect and circuitous relations to the propositional content involved, especially when the language chosen reflects multifaceted epistemic parameters along with base-level descriptions. Merely asserting that a given sentence — even in a relatively complex discursive register, as in (52) and (53), which are expected in relatively formal journalistic or academic speech rather than in casual dialog — has a particular associated propositional content (which is somehow then its "meaning" or a basis for its meaning), does not amount to a bonafide linguistic analysis. The question is *how* we understand what the propositional content *is* given the exact language artifacts we receive. In cases which reduce to "transparent" schema like `Color·Object`, `N is in ⟨place⟩`, and `Hungry·Sentient`, we can plausibly claim that the rules for applying those schema demand a passive sort of cognition. However, I would dispute any intimation that the constructional alignment between metaphors like *eroding base* (in politics) or *spilling out into the streets* (of violent protests) and their epistemic-plus-descriptive content is *passive*, or the merely mechanical application of syntactic and semantic rules.

I see this as a *compositional* "problem" for "non-cognitive" linguistic paradigms because the crucial mismatch is a gap between predicate structure and actual language. We can analyze the surface-level choices as shaped by a dynamic which pulls toward epistemically dense and multi-faceted communications: for a given sentence we can examine how the choices informing its surface structure carry added epistemic detailing. That is, we can draw connections between the semantic and syntactic selections evident in a sentence and the package of epistemic parameters which are embedded in the sentences' selective principles. But this analysis does not appear to bear any direct structural relation to the propositional content signified: instead of a neat alignment between predicate structure and linguistic construction (as in `Color·Object`), we have two seemingly disconnected structural registers. We can identify a certain logical architecture within the propositional content, and another structural coordination in metaphoric or speaker-relative articulations, but the structural principles of the latter are not directly grounded in or shaped around the form of the former.

This is not to claim that propositional content has no influence on discourse, but that the influence is filtered through situational and discursive details; it is not especially linguistic; and certainly is not cognitively passive. That is, we formulate sentences from a situational vantage point informed by why we are choosing to speak in the first place, and by our mental construals of the situations around us — what is happening, and why. We produce sentences bearing the context of these situations. We almost instinctively endow sentences with interpretive stances toward the situations around us, because we are usually actively participating in situations at the same time we are talking about them. By virtue of this active participation, we experience situations not only as observed states of affairs — compilations of empirical givens — but as evolving contexts with internal causal and dispositional dynamics. We cannot help *but* mentally orient ourselves toward external affairs not only via observation of *what* obtains, but also through narrative, interpretive, and in a sense meta-cognitive or "meta-epistemic" stances (keeping track for ourselves *what* we believe but also *why*; on what warrants).

Insofar as we bring these interpretive dispositions to bear on ambient situations, it is inevitable that they will shape our linguistic performances: certain language-structural framings will "feel" most correct because they jive with our prior and ongoing narrative and interpretive construals. We will most likely then produce sentences which feel most accurate, whether or not we consciously "choose our words" (unless we are deliberately trying to *hide* some details of the facts or of our beliefs relevant to them). In short, in many linguistic performances we are (consciously or not) conveying (what I might call) *interpretive attitudes*. Certain propositional attitudes, moreover, can be readily accommodated in a "non-cognitive" linguistic by appeal to holistic "grounding": for any sentence asserting a fact we can prepend a clause such as *I want*, thus designating an attitude rather than a bald assertion. That is, there are entrenched and "propositionally transparent" constructions which encode *some* forms of propositional attitudes, as extensions to conveyed propositional content.

But the *interpretive attitudes* I am emphasizing here are not sentimental or speech-act ornamentations like wants of demands; rather I am focusing on how language

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reflects our narrative encapsulation, causal reading, or interpretive assessment of situations. Inherent in being *aware* of scenarios around us is how we mentally impose an order on them, trace their evolution like a story, schematize our assemblies of belief-warrants via spatial or temporal gestalts. Thus we are already speaking "from a place of" narrative, of causative projection, and of interpretive schema. In many linguistic examples I contend that the narrative, causative, and interpretive configurations through which we epistemically organize our understading of states of affairs structures language more than the predicate structure of the propositional content created by the affairs' empiricity.

If this is true, then articulating the *structure of propositional content* has only limited value in linguistic analysis, because such a project only explains the compositional rationale for linguistic constructions which recapitulates this predicate structure mostly transparently. In other cases, linguistic structure reflects the *structure of narrative*, or the *structure of causal interpretations*, or of the summarial distillations we use to interpret underlying patterns that are useful cognitive proxies for superficial observations.

I therefore claim that in many linguistic examples cognition is *active* because only via active cognitive effort can we produce and then understand sentences shaped around narrative, causative, and/or interpretive dispositions rather than around logical organizations which just structurally outline their propositional signifieds. Asserting an *active* cognitive role also, in my mind, forecloses a paradigm wherein semantics is *ontologically*, so to speak, a theory of how propositions are encoded in language — such that analysis of how these encodings appear *in the mind* are pragmatic rather than semantic, on the premise that the theory of a system need not be disciplinarily construed as encompassing the theory of cognitive behavior *toward* that system once cognized. Again, mathematics is a different field than the psychology of mathematics. However, such an analogy of propositional "enregisterment" in language to abstract mathematics — where all cognitive activity vis-à-vis a putative logical core of language is cognition *of* a system whose norms we merely passively observe and follow — only works for that subset of linguistic phenomena where the role of cognition is, in a deep structural sense, entirely passive. I believe that the structuring effects of narrative, causative, interpretive construal are at least as significant for language overall as the passive tolerance of simple constructional wrappers for propositional content.

Here my argument depends on there being an irreducibly *active* role for cognition; but I have also presented some ideas about what this role *is*. In particular, I have suggested that the cognitive role in many complex speech-acts is "epistemic": a phenomenon of linguistic structure reflecting epistemic framings and parameters such that produced language artifacts model "interpretive attitudes" emanating from speakers' situational participation. I will now explore further how this *epistemic cognitive role* can lead toward a theory or presentation of linguistic structure — in affect a metagrammar, a theory of the rational forces which become manifest as grammatical intuitions and, through their aegis, syntactic rules.

2 Linguistic Structure and the Accretion of Detail

As I see it, the primary task for linguistic analysis is to document how linguistic constructions signify propositional content. The centrality of *cognitive* linguistics, and cognitive grammar, derives from observing how constructions do not in the general case just "transparently" or "passively" connote predicate structures, the way that `J·N` patterns mechanically call up predicate-subject connections. Instead of recapitulating predicate structure directly, language structure reflects propositional or *interpretive* attitudes, narrative, causative, or integrative interpretations which convey how speakers track and convey situations. In short, rather than seeing linguistic structure as a passive vehicle for rendering logically-ordered ideas, we should treat linguistic performances as dynamic processes which *build up to* propositional contents, manifesting evolutive principles which (often subconsciously) depend on speakers' situational immersion as well as abstract syntactic and semantic conventions.

This perspective summarizes my thematic or philosophical motivation for the specific formalizing approach I take here with respect to Cognitive Grammar. My goal, as cited earlier, is to develop formal models which would be recognized as structural variations on popular representations in formal linguistics — dependency

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grammar, constituency grammar, categorial grammar, type-theoretic semantics — while also being faithful to the cognitive-grammatic perspective. In particular, the structural parameters exposed by formal models — e.g., phrase boundaries or inter-word relations — should as much as possible have cognitive-grammatic interpretations, referring to central notions such as cognitive schema, conceptualization, and landmark/trajector configurations.

Aside from philosophy, I also have more mundane considerations: to properly situate cognitive grammar in an overall linguistic context, it helps to have an intermediate perspective which allows the contrasting priorities, methodologies, or scientific commitments of cognitive grammar alongside other linguistic "schools" to be assessed together. One important paradigmatic area of contention, I think, is that cognitive grammar appears to de-emphasize the logical substratum of semantics which, on other perspectives, is the central artery of language itself. There is a nontrivial core of language within which propositional content is encoded in linguistic constructions following entrenched rules. Within *this core*, language acts like a sort of "meta-logical" system: not something logically structured — in the formal sense of predicate (plus maybe modal, temporal, epistemic, etc.) logic — in itself, but a system whose structural principles can be shown to communicate logical structures under suitable substitutions and transformations. Cognitive Grammar should indeed accommodate these cases; but I think they are neither predominant nor prototypical in language as a whole, so they should not be reified as a the canonical filter for distinguishing semantics proper from pragmatics (or from theories of extra-linguistic reasoning).

This implies that while linguistic constructions encode propositional content, we need a detailed (and cognitively "active") theory of how, in formulating and understanding linguistic performances, we map constructions to their correlative propositions. Constructions are not in the general case direct "wrappers" for a given propositional arrangement — like `J·N` for predicate-subject; instead we have to analyze the internal structure of constructions to elucidate how they contribute to an overarching communication for rational content.

Such an interpretation for the rationale behind constructional analysis moreover helps us posit a cognitive grounding for our choice of linguistic representation. The frameworks through which language structures are described are typically oriented around grammatic (and by extension semantic) rules: insofar as one takes phrases (a mid-level scale intermediate between words and sentences) as a structural primitive, for example, then phrase-descriptions serve the representational purpose of delineating what makes valid phrases well-formed. Conversely, if we take inter-word relations as the focal structural primitive, sentences are well-formed if they have a coherent collection of such relationships. More to the point, we want to explain *why* sentences are (felt as) well-formed. With a focus on phrase-structure, we can explain well-formedness in terms of how phrases are nested together. For example, we can say that subphrases have some singular synopsis which allows them to play an expected structural role in a larger phrase — a verb-phrase standing in for a verb, say. Or, in terms of inter-word relations, we can identify the structure within a sentence such that each word is integrated into the whole — i.e., each word has relations to some other word, with the overall chain of connections spanning the full sentence — and moreover the sentence possesses specific relations (such as a verb to a subject) marking that the sentence conveys a complete idea.

Thematically, a linguistic representation is, in effect, both a theoretical posit and a presentational or pedagogical device illustrating a theory. By "linguistic representation" I mean specifically, in this context, a digram or otherwise annotated rendering of a sentence which permits explanatory elements to be interspersed among the words, such as lines or curves connecting or encircling groups of words, as well as textual notations such as Part of Speech labels. The point of these visual displays is to convey, in effect, a *data structure* which supplements to original sentence with extra theoretically-motivated content, such as Parts of Speech associated with individual words, relational labels associated with word-pairs, and set-constructions on words representing phrases. Such a data structure summarizes an account of why the sentence is valid, and carries the meaning it does, in terms of a grammar and semantics whose principles are laid out by the relevant theory: so the presence of a labeled word-pair, in the context of dependency grammar, embodies a theoretical commitment to some collection of interword relation-types as the backbone of grammar. That is, the theoretical explanation for why grammar

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works as it does in some particular sentence can be summarized by visually restaging the sentence as a connected network — that is, a *labeled graph*, with Part of Speech labels on words and/or "dependency" labels (in the sense of "Universal Depencies" for multi-lingual dependency grammar) on graph-edges.

Such diagrammatic presentations are therefore at one level proxies for lengthier textual analyses of a sentence's grammatic operation, as some theory sees it. However, in addition to this expository role, interword or phrasal data structures are *posits* of the theory in the sense that for each sentence there is deemed to be at least one (typically one optimal) data structure which captures the sentence's functional propriety; how it functions as a correct embodiment of the language system. To the extent that a sentence has one clear meaning, a systematic linguistic theory will generally hold that there is one clear mechanism *through which* the sentence has that meaning. This is not to deny that people may process the same sentence a little differently, but — excluding cases of actual ambiguity or obfuscation — each person's conceptualization of a sentence will be similar enough that differences in reception (at least among competent speakers) can be ignored.

In that case, we can not only posit that the meaning of *the neighbors' dogs were barking* (spoken in a "normal" context) is necessarily to report on the vocalizations of some canines, but we are permitted to assume a necessary marshaling of syntactic and semantic processing to explain *why* every competent speaker would read that propositional content into that sentence. So for each sentence there is a canonical processing, a structural or processual organization which inheres in the sentence as an objective feature of how it functions as a valid exercise of the language system, no less intrinsic than its meaning. The "data structures" which annotate sentence are implicitly, then, I would argue, targeting this processual reification: they are a way of putting theoretical flesh on the underlying hypothesis that sentences acquire their meaning through processually conventionalized routes.

For sake of discussion, I will refer to any schematic reconstruction of a sentence (or potentially a larger or smaller linguistic unit) as a "processual data structure", meaning some formal model representing the process through which language artifacts acquire their meaning (which in turn can be associated with some propositional content). By *data structure* I mean that for a given sentence we can posit a larger structure composed of explanatory parameters which document how a given syntactic or semantic principle is manifest in a given word's, interword-relation's, or phrase's functioning within the sentence. Alongside phrases, relations, and parts of speech — that is, these being elements of processual data structures which attach to words individually or collectively — parameters can include morphological "tags" asserted on words (indicating that the word is presented in a manner signifying case or tense, say); links between words and a lexicon; and indications of details such as vocal stress patterns, disfluency, intonation, and other performative givens which can affect a sentence's meaning even if they are not normally treated as part of syntax or semantics.

Different theories will recognize a different inventory of relevant parameters (although a notation may refer in ad-hoc ways to details which other theories would represent more formally; e.g., words may be boldfaced or capitalized to indicate vocal emphasis, even if the relevant theory does not usually consider speech patterns). We can therefore adopt a rather abstract, metatheoretical perspective by considering which theoretical parameters are internally utilized by which theories. For their central analysis, for example, theories may include only phrase-structures, only interword relations, or both; they may include only words as the canonical lexical elements or admit certain smaller-scale units, like "'s" for possessives; they may or may not pair structural re-presentations of sentences with structurally annotated lexicons, where for example an identifier code associated with a word in (what I am calling) a processual data structure matches the word to a lexical entry. Representational paradigms can also differ in how they handle (if at all) various communicative units which are not usually lexified, such as proper-name acronyms, punctuation, interwoven dialog (where a pause or interruption at a certain point may be deemed semiotically relevant), or speech effects in general.

As I have already suggested, my goal here is to propose a formal model which is appropriate for cognitive grammar — mostly preserving the philosophical commitments of key figures such as Langacker and Leonard Talmy (at least as a goal) and yielding representations which help to document cognitive activity sited in linguistic formations. Ideally, insofar as cognitive grammar would give a

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particular treatment for a sentence — focusing on a landmark/trajector configuration, let's say — the "processual data structure" used to encapsulate such analysis would comprise parameters which thematically notate components in the cognitive-grammatic treatment and diagram how they relate to particular words (or word-pairs or phrases).

Minimally, my proposed representations are derived from Dependency Grammar in that interword relations are taken as the crucial theoretical construct (more so than phrases). As a result, the "processual data structure" associated with any sentence can be seen as a directed, labeled graph, or "parse graph", with words represented as graph nodes. (I will generally argue against isolating non-word lexical elements, so e.g. a possessive like *Warren's* is treated as one node, not two). Nodes are then labeled with grammatical categories, and edges between nodes labeled with notations suggesting the kind of relationship obtaining between the incident nodes.

My system of node and edge labels is also influenced by categorial grammar; in particular, I adopt the conventional that certain grammatic categories are derived from other categories. Insofar as words from one category are used in conjunction with a word from another category, resulting in a phrase or transformation assignable to a third category (potentially the same as the second), the first category is derivative on the latter two. The adjective category is derivative on *noun* because adjectives are modifiers which trigger some reconceptualizing of a noun-idea, resulting in a new, or at least altered, noun (technically perhaps a noun phrase but conceptually a noun). Or, consider a preposition like *toward*, which combines with a noun to produce a form of adverb (a locative designation which modifies a verb, as in *walk toward the store*). Here the categorial ascription for *toward* is derived from the *noun* and *adverb* (in a fixed order: *toward* conceptually transforms a noun *to* an adverb).

In general, for a pair of grammatic categories (not necessarily distinct) there is a potential additional category profiling conceptual transitions which produce an instance of the second category in the presence of the first. To use more mathematical language, the derived category profiles transformations which *input* the first category and *output* the second. This construction is similar to the maxim in mathematical type theory that functions between two types constitute a third type, or in computational type theory that procedures with respective tuples of input and output types derive a further type.

A common framework holds that the essential linguistic types — or grammatic categories — are *nouns* and *propositions*; I use the latter term for sentences as well as clauses, contained within sentences, that embody a complete propositional idea. All further categories can then be derived as "transformations" that take inputs and produce outputs from these core categories, or prior derived categories recursively. In particular, verbs profile transformations that produce propositions from nouns. In Categorial Combinatory Grammar, a verb can be characterized via notation like N/P, meaning that a verb (phrase) combines with a noun (phrase) *preceding* the verb to yield a proposition, e.g., a complete sentence: *the dogs barked*. This representation would also distinguish combinations by word order (the modifier preceding or following the modified, or "target"; the two forms of sequence marked by using either back or forward slashes). Here I abstract from word-order and use an arrow, borrowing from type theory, to represent either a back or forward slash: so the idea that a verb expects a noun to form a proposition would be written $V \dashrightarrow N \dashrightarrow P$ (this notation will be further clarified below).

Here I will sketch a framework that combines the basic intuitions of categorial and dependency grammars: a word whose categorization belongs to a derived category serves to transform or modify some "target" word; this in turn can be modeled as a relation *between* the modifier and the target, and the "graph" of these relations forms the core of a parse graph. At the same time, I will suggest conceptual interpretation of relationships; I do not picture formal models as merely observing grammatic "behaviors" (cf. Langacker's *Introduction*, page 93). The idea that adjectives transform nouns into "other nouns" can be given a strictly behavioral gloss by reading it as a structural condition: when occurring in well-formed sentences, an adjective links to a noun (or noun-phrase) to produce a noun-phrase that substitutes for a nominal lexeme in larger phrases. So for any adjective we can *find* the noun it modifies and ascertain how the resulting phrase is used as a noun in some larger phrase — the fact that this "search" resolves successfully is mandated by sentence validity, and failure to find the requisite context for the adjective is a signal that the enclosing sentence

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is not, in fact, well-formed.

In contrast to a purely behavioral description, however, we can interpret these same phenomena conceptually. Once we encounter a lexeme which appears adjectival, we *conceptually* expect to find a noun which it modifies. We cannot conceive *black*, say, apart from some object whose surface or appearance is black. Assuming that a sentence originates from a speaker's rational and honestly-portrayed interaction within a situation, the speaker would have no reason to enunciate *black* without cognizing the color, and therefore cognizing a predicated object. Likewise for any other adjective; in this sense adjectives create conceptual expectations that window onto speakers' rational construals of situations. Sentences fulfill expectations by presenting words or phrases which complete ideas that seem to have been left open by the previously spoken (or written) sentence-fragment.

Sometimes expectations refer backward, as often in personal pronouns (*I invited John, but he's on vacation*) — we expect *he* or *she* to proxy a referent priorly established in the discourse, maybe the sentence. In the more general case though they refer forward, so we can say that the presence of lexemes from "derivative" grammatic categories creates an expectation of a conceptual completion that is then satisfied by a subsequently occurring word or phrase. Sentences are grammatically correct, then, insofar as they *do* resolve their midstream expectations. Grammatical behavior — e.g. that adjectives must be followed by nouns — is therefore not forced to be a theoretical primitive, but instead can be analyzed as the conventionalization of conceptual expectations and resolutions. Language, on this perspective, reveals certain recurring patterns on how expectations are created and then fulfilled; when sufficiently entrenched as well-formedness criteria, these patterns *become* grammatical behavior.

When expectations are left unresolved, we may not necessarily experience the results as conceptually lacking: hearing someone say only *there is a black* (with no "modifiand") probably does not result in out feeling a sense of *conceptual* incompleteness. Rather, we assume that the sentence has been interrupted, or that on the face it is grammatically wrong (for whatever reason: maybe the speaker is incompetent, or was interrupted, or is still deciding what to say next). The fact that we experience mismatched expectations as violations of syntactic rules, rather than conceptual anomalies, may cloak the fact that these expectations are intrinsically conceptual. However, this comports with my theory of the origin of grammatic intuitions: we are used to the flow of expectations according with the unfolding of grammar. We *become* used to this alignment the more that we immerse ourselves in language; as a result, we come to subconsciously register the posing and resolving of expectations, being more explicitly aware of the linguistic materialization of these patterns than their conceptual substrate. Once the agreement between the smooth creation and dissolving of expectations' incompleteness is disrupted, we *experience* this defect as an anomaly in linguistic form.

Via such a theory, I hypothesize then that grammatic rules are emergent phenomena whose origins lie in conceptual expectations, and specifically in patterns such that expectations are raised and then satisfied. Once these patterns become entrenched — in particular, via grammatic categories — they can nevertheless be given a formal treatment. I will now examine one specific formal (or quasi-formal) model, which I do not deign to present as a worked-theory but as a set of intuitions that were also elaborated in Part I.

2.1 *Cognitive Transform Grammar*

I will refer to the framework proposed here as "Cognitive Transform Grammar". On this theory, the full syntactic interpretation of a sentence can be given, at least in germinal form, through collections of two-word relationships. The grammatical pattern, in turn, emerges from cognitive relations enacted between paired words. In particular, one word is a *modifier* and a second is a *ground* or *target*. The modifier's effect is to reconceive or complete the concept (or conceptual nexus) already established for the target.

I adopt certain representational conventions which are, as much as possible, motivated by cognitive tendencies rather than being formally arbitrary. Nevertheless, as a formal systems, representations in general will sometimes have rules driven by a desire to reduce data structures' parameters, rather than by deep theoretical reasoning. For example, I will generally avoid including phrases or any other "above-word-scale" elements in parse graphs.

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It would certainly be possible to iconify both words and phrases via graph nodes, with one form of inter-node relation being the inclusion of a word in a phrase. I choose however the leave phrase-hierarchies implicit, partly for the theoretical reason that phrases are (I believe) *conceptually* derived from the accumulation of conceptual refinements via "cognitive transforms", so I'd like to preserve this intuition in the notation.

In a case like *toward the store*, which (as suggested earlier) I read as "transforming" a noun to an adjective, the ground of this transform evidently a phrase, *the store*. I will use "ground" informally for a concept altered by a modifier, whether expressed in a word or phrase. However, formally speaking I represent "transforms" as graphs only between words. Note that *the store* itself represents a transformation: the determinant "the" serves to clothe the generic concept *store* into a more context-specific referent. The concept then modified by *toward* is *store* only *after* it is "acted upon" by the effect of the "the"-modification. Rather than picturing this as a relation between a modifier and a phrasal ground, we can also see this situation as a "chain" of modifications, one presupposing another.

With the analogy of "functional" types in mathematics or computers, we can see intermediate modifications as having an *input* and an *output*. Here, *the* "inputs" a noun (*store*) and "outputs" an altered version of that concept; in particular, one now cognized under the aegis of a singular determinant. The output of *the* is then an input for *toward*, which adds its own alteration to the evolving "store" concept. We can accordingly trace this chain as a series of steps between individual words, each step representing how one word modifies a concept priorly modified by its predecessor in the chain. This kind of picture helps motivate the idea of modeling "cognitive transforms" wholly via inter-word relations. The graph structure in the case of *toward the store* is simple, in that the transforms evince a linear chain backward through the sentence: *(toward ▷ (the ▷ store))*. The arrows in this "graph" (subgraph, technically) point from the target to the modifier: *the* is a modifier for *store*, but a target for *toward*. This indicates that *the* stands in for a transform whose *output* becomes *toward*'s *input*.

Carrying these ideas over to a formal model, phrases are excluded from direct representation because it may be tacitly understood with any intermediate target-modifier pairing — "intermediate" in the sense that the target is also a modifier for a different target — that the "arrow" direction represents not just the single target word as a *ground* for modification, but the collection of prior transforms forming a chain leading *to* that target. For example, *the* is target for *toward*, but conceptually this means that the accumulated concept resulting from *the*'s own modification of its own ground is assumed to be carried along in the *the*/*toward* interaction (notationally, the *the*/*toward* arrow, or directed graph-edge).

The *processual data structures* I propose for modeling Cognitive Transform Grammar are a variety of hypergraph built around edges representing cognitive transforms, via modifier/target pairs. The model stipulates that each word can be the target for at most one modifier. This means that one can form a chain following from one target to another, uniquely, and I stipulate that for any single sentence such chains will always lead to a single "root" word. At this level of description the parse graphs are therefore *trees*. I will however introduce certain additional structures through which parse-graphs actually become a form of hypergraph, albeit with acyclic directed edges, that is, with a kernel tree-like structure.

I also stipulate that all the edges in a parse-graph — all the cognitive transforms, representationally — can be given a specific ordering. At least locally, ordering has a theoretical basis as can be seen from the *toward the store* case: the *toward* transform presupposes the one for *the* in the sense that the latter precedes it in the output-to-input chain. The rationale for an *overall* ordering, across an entire sentence, is more complex, but will hopefully emerge in my following discussion.

While each word may have at most one modifier, a modifier may transform multiple targets. Consider *The dogs were barking very loudly*. I will present an analysis by considering word-pairs (in this sentence, but not necessarily in general, adjacent vis-à-vis sentence order). Here *were barking* establishes a past progressive tense: I read this as a transform which yields a verb (i.e., a conceptual outcome which profiles an event or process according to the overall ideational desiderata for verbs, for example in Langacker's *Introduction* page 108). More precisely, *barking* is (I claim) conceptually adjectival, but by blending this concept with a temporal reference frame, we employ a conventionalized modification which refocuses the original concept toward a profiling of something

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bearing the concept as an act on that thing's part — cf. *I am hungry for* as a less ornate vernacular replacing *I hunger for*. When the adjective is a gerund — therefore morphologically based on a verb — the transform *to* the verb category uncovers the original verb, but with added temporal specification. There is more to say about this treatment of progressives, but I will forestall the analysis for now.

Moving on within "barking very loudly", the transform relationship between *very* and *loudly* seems straightforwardly adverbial: the modification alters an adverb, here adding a measure of incremental emphasis (a contrary "decremental" transform would be hedges like *rather* or *a little*). Also *the* modifies *dogs* via singular determinant, reiterating my sketch for *the store*. These, then, are basic word-pairs in *The dogs were barking very loudly*. Next, *very loudly* "outputs" an adverb (it also "inputs" one), which means the outcome of that transformation needs to link with a verb, to become its ground — specifically, here, the verb concept resulting from *were barking*. So the outcome of one transform becomes a modifier for the outcome of a second.

Following the principle that targets link in chains — an edge between one modifier-word and a second meaning that the "output" of the former's transform becomes "input" to the latter — we here have the structure that *were*, which is the modifier in *were barking*, is then the target for *very*, which is the modifier in *very loud*. (This may feel counterintuitive in that "were" seems like an auxiliary word, so really what is being modified here is *barking*: semiotically, the key communication is presumably *barking loundy*; as I will discuss below, the transform structure linking sentences, on this model, does not necessarily foreground lexemes which are the most semantically important). I delay considerations of sentences' overall meaning, according to which some ideas may emerge as more central than others; here I want to sketch the series of transforms through which the overall meaning arises. In this spirit *very* links to *were*, as modifier-to-target, because of how the transforms are ordered: the kind of transform signified by an adjective logically depends on a verb, so that *were*, whose output supplies that verb, precedes *very* in the formal transform-order.

Also, *very* now has two targets. We have *very loud*, which yields a refined (here an "augmented") adverb, and *very* (encapsulating *very loud*) adverbially modifying *were barking*. I will differentiate multiple targets for one modifier in terms of "stages". Here, *very* encompasses two different *stages* of transformation: first, it modifies an adverb to form a new adverb; then, in a second stage, the outcome modifies a verb ground. I adopt the notational convention that directed edges in a parse graph are labeled with a number designating their stage: so in a minimal example the links between *very*, *loudly*, and *were* could be expressed as *((very* $\triangleright_1$ *loudly)* $\triangleright_2$ *(were* $\triangleright$ *barking)*: the subscripts on the edges distinguish the first transform-stage for *very* from the second.

Indirectly, stages also may profile phrases: the phrase *very loudly*, for instance, represents the first-stage transform for *very*; formally, then, the combination of a modifier-node with a specific stage designation serves as kind of notational proxy for a phrase. As will be developed further, below, I treat edges sharing a stage and a modifier as grouped together, an aggregative structure which converts parse-graphs into *hypergraphs*. The aggregation which bundles certain edges together, under certain circumstances, I call a *channel*; here I can then employ certain concepts in a theory of "channelized hypergraphs" that I have elsewhere written about in a computational context.

An adverb like *very*, in contexts where it modifies a different adverb, implies two stages because the transform output (itself an adverb) "expects" a further ground. A different sort of transform combination is represented by transitive verbs, which need both a subject and object to arrive at a complete idea. I will still analyze the verb's effects as a sum of individual transformations involving separate modifier/target pairs. The verb-to-subject connection seems somehow privileged, since it is omnipresent; whereas verb-to-object, and still more so verb-to-direct-object, is less universal. Most transitive verbs also have intransitive versions; and ditransitive verbs also transitive ones:

- (54) I walked earlier this morning.
- (55) I walked for two hours.
- (56) I walked the dogs earlier this morning.
- (57) I brought wine to the party.
- (58) John brought Champagne!
- (59) I brought Champagne for John.
- (60) I gave Champagne to John.

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- (61) I wrote a check for the charity.
- (62) I wrote a check to the charity.
- (63) I gave a check to the charity.
- (64) I gave a donation to the charity.

The point of these examples is that not every instance of verb-modification should be read as a transitive or ditransitive verb with its implicit direct or indirect objects; and in many constructions direct or indirect objects may seem to be optional, in the sense that the verb can express a complete idea without them. To what degree do these represent distinct senses for the verb, or just different options for refining the verb's meanings via modifiers? I will argue that these questions evoke different intuitions about how cognitive transforms modify the conceptual meanings we attribute to verbs.

2.2 *Transform Columns and Verb Objects*

Insofar as a verb profiles an event or action, there are many desiderata that can potentially be predicated of the profiled phenomena — *where*, *when*, and *for how long* the action occurred; for whose benefit; and so forth. In general these details are available as supplements to the core process profiled by the verb itself, and are introduced linguistically by subordinate clauses. The duration of time for my walk, or what landmarks I walked past, are evidently not central enough to the meaning of *walk* to have special status as direct or indirect objects ("central" in a specific sense I examine later in Section 5.3). Where I walked *to* may or may not be seen as a direct object, depending on whether *walk* is construed as fundamentally describing a goal-directed movement (like *visited*):

- (65) I walked to the store.
- (66) I visited the store.
- (67) I walked toward the store.
- (68) I walked past the store.
- (69) I walked around the puddle.

That is, to what degree does *to* in (65) describe a spatial path analogous to (67)-(69) — as such basically augmenting the information in *walk* somewhat tangentially — or is (65) a special sense of *walk* which is more akin to *go* or *headed toward*? The preposition *to* may be singled out as implying the more goal-oriented interpretation on *walk*, but arguably there are similar examples with other prepositions:

- (70) I'm headed toward the store.
- (71) This bus is rerouted along Queen Street.
- (72) Traffic was diverted around the highway.
- (73) The steps lead through the underpass.
- (74) The boat is heading under the bridge.
- (75) Please make an omelet for the dogs.
- (76) Please make the dogs an omelet.

It seems as if *toward* in *headed toward*, for instance, is a direct object for *head* insofar as it does more than add details about setting; the verb *headed* is intrinsically incomplete without clarification of a direction one heads *toward*.

In some cases, though, movement verbs take two or more spatial or path specifications, only one of which appears to be a direct object:

- (77) I'm heading out.
- (78) I'm heading out to the store.
- (79) We have to drive to the entrance.
- (80) We have to drive past the highway.
- (81) We have to drive past the highway to the entrance.

I would hypothesize that our conceptual expectations call for one somehow primary or *reified* goal-specification, and other spatial information gets separated out as extra detail along with many other possible elaborations on an action-profile (time, duration, purpose). In short, the grammatical expectations of direct and indirect object represent a conventionalized way of packaging and subdividing the content which may be associated with a verb: certain facets of detail are grammatically highlighted, but the level of detail actively expected through the verb is restricted relative to the full detail which could potentially be situationally added.

Note that, compact ditransitive forms like *I brought John some wine* notwithstanding, indirect objects typically occur last in sentence order, after a subject and direct object. Indirect objects can then be grouped along with potentially numerous "satellites" trailing away from the verb itself:

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- (82) We have to go to the counter by the cashier near the front of the store for a ticket.
- (83) The waiter carved some duck for Grandma at the table with an ornate knife.

Only some of these add-ons are feasible as direct or indirect objects, e.g., candidates for a dropped preposition as in *carved Grandma some duck*.

Every detail added to a verb-concept cognitively transforms the verb in some way, but syntactic patterns suggest that only certain such transforms are "reified", or marked via distinct components of subject or direct or indirect object. An intransitive verb without *some* detail may feel incomplete, but this is probably situational; it is hard to imagine senses where an unadorned verb-plus-subject construction would have any conceptual specificity outside of context:

- (84) I studied.
- (85) I studied math.
- (86) I studied for two hours.
- (87) I studied last night.
- (88) I studied in a bookstore.

The first sentence seems incomplete, although it is fine if anchored in surrounding discourse, e.g. after *What did you do last night*? Such incompleteness does not seem to imply that the intransitive form of *study* is less useful or impactful than the transitive; instead, the two forms profile the action of "studying" with different degrees of emphasis on its relation to surrounding detail. The final three sentences profile the action as a completed process, but rather generically: the specific information focuses on temporal or spatial surroundings where the action transpired, more than considerations we might deem "internal" to the action. On the other hand, (85) makes no specific reference to where, when, or for how long the studying occurred, but it gives more info about the studying itself. Given that comparison, (84) seems more like (85) in asserting no parameters spatiotemporally contextualizing the action, but this may not be true in the actual dialog where (84) is produced; as a standalone sentence (84) is more likely to be heard as acquiring completeness from prior discourse. On this kind of evidence, whether or not a verb takes a direct object depends on whether there is some *internal* detail which the sentence highlights, or whether the communicated details are more "external" to the action-concept in the sense of framing the action in a spatial, temporal, durational, and functional context. As such, *math* is a direct object for *study*; it is an indirect object in cases such as *she taught me math*; but the patterns in (86)-(88) represent verb detailing which is neither direct or indirect object but rather conceptual descriptions adding specificity to the speaker's account of the profiled event/process (although 87 has an alternative reading that might occasionally be in effect wherein *last night* is actually *what* was studied, e.g. a political scientist examining a recent debate). Having pointed out these distinctions, however, my point is that we need to explain *why* certain detailing is introduced (i.e., we are inclined to choose phraseology which introduces them) via direct and/or indirect objects as opposed to via supplemental clauses or phrases (note that the distinction between direct and indirect objecthood in the general case is less salient than the distinction of both to supplemental phrasing; direct objects in one context become indirect in others, as in *I brought her there* vs. *I went there*).

Another way to review this line or argument is to consider how a direct object is implicated in the verb-to-subject relationship. Given an intransitive setting, the verb-subject combination profiles an action with some conceptual completeness, however much in just an outline or minimal-information fashion. To the degree that our conceptualization of that action is schematically complete, we are then in a position to fill in "external" (e.g. spacetime-positioning) details, which are cognized as refinements of the action-sketch. In a *transitive* case, however, the verb/subject combination still leaves some essential lacunae. To say *I brought*, without its logical continuation, is to present a propositionally embryonic content which is too preliminary to be further elucidated with desiderata of space, time, duration, or purpose. In this sense *brought*, or other necessarily transitive verbs, excite logical expectations that need to be resolved "before" (in some formal sense of sequencing) the external details are assimilated.

According to the standard Categorial model, verbs are transformations (or modifications or "functions") which produce propositions from nouns: whereas *the dogs* is conceptually abstract and unspecific, *the dogs were barking* achieves something like propositional closure. This means that the verb category is *derivative* on nouns and propositions; and that the verb is a *modifier* whereas

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the noun is a *ground* thus modified. This account is complicated, however, by *transitive* verbs raising expectations even in the presence of their noun-subject: here it seems as if verbs need *two different* grounds, or perhaps a multi-part ground with two different nominal foundations (subject and object), to produce a propositional signification as is its grammatic and conceptual role.

Schematically, the outcome of a verb/subject pairing in the case of a *transitive* verb is not a proposition, but an intermediate position which needs a further noun-target to complete its propositional process. The relationships between the verb and its subject and object, both, then, are somehow incomplete and interdependent. I will still analyze them as two distinct two-word relationships; however, the cognitive status of these relationships is influenced by their mutual dependency. In general, a verb transforms a noun by enmeshing it in a propositional context: with *The dogs were barking* we mentally comport to *the dogs* in a manner reflecting their status as a propositional focal point — the intellectual content rationalized via the sentence's idea emerges from some property or action that will be predicated of the dogs. This dynamic remains in force for transitive verbs: in a fragment like *John brought*, however incomplete, we are still being prepped for a logic wherein it will be some facticity about John that anchors the assertion's rational content.

Even for transitive verbs, then, the verb exercises a cognitive transform on the subject, revising the "mood" through which we entertain the subject as an intellectual focus: here we attend to that concept in the guise of a predicative anchor, something whose factuality supplies the empirical basis for construing the sentence as an assertion of propositional attitudes ("factuality" here meaning an overall metaphysical participation in rationalizable states of affairs). From this kind of reasoning I argue that the model of verbs modifying subject-nouns as their targets is well-founded, irregardless of any distinctions between transitive, intransitive, and ditransitive verbs. In a transitive case, though, the verb/subject remains propositionally incomplete, so that the verb then needs an *additional* target (the direct object), which it then modifies in turn.

The proposal that verbs modify direct objects may seem less plausible than in the case of subjects: after all, the direct object might seem more, on semantic grounds, to be modifying the verb than vice-versa. To *study math* or *walk away* may seem to name a special kind of studying and walking. Moreover, sometimes an object seems to be "part of" a verb, in the sense of being lexically or semantically attached to it: consider nominalizations like *goalscorer* or *prizewinner*. In these cases, informal semantic observations would imply that the direct object is modifying the verb — giving some "base" verb a new meaning. I do not rule out occasions when a verb-to-object structure would actually be analyzed with the verb as the target; however, I also think there is a cognitive premise for preserving the verb-as-modifier in typical transitive cases.

To the degree that *math* is a scholastic discipline, for example, it fits within constructions like *study math*, *pass math*, *fail math*, *flunk math*, *repeat math*. Part of the conceptual repertoire we attach to almost any noun is a sense of how the noun may be involved with profiles of actions, events, or processes, even if not as a verb's subject. These potentialities tend to emerge from a noun's status as person, place, thing, institution, abstraction, and so forth. There are certain actions which we can envision being predicated of a restaurant as *subject*, say: it may *open* (or *close*), *serve wine*, *take reservations*, or *hire a sommelier* (these senses focus on the restaurant as a social entity more than a building or location). Conversely, other aspects of *restaurant* present as a direct object: since we commonly judge restaurants based on the quality of food and service, they are targets of assessment verbs such as *like*, *recommend*, or *review*. Since they are also locations that can serve as destinations or end-points of a spatial displacement, we can *visit*, *see*, or *stumble upon* them. As commercial enterprises they are potentially *inspected*, *shut down*, *shuttered*, *reopened* (by new owners), *sold*, or *venerated*.

In the presence of combination with a verb, conceptual aspects of direct objects are therefore highlighted which reflect something's disposition to be included in a predication actionally anchored elsewhere. Part of the nature of math is to be *studied*; part of the nature of a restaurant is to be *liked*. So we can approach the verb's effects, cognitively modifying the object's concept, as to foreground these conceptual aspects (whose exact nature will depend on the kind of entity the noun profiles).

On this theory, then, a verb transforms a subject by focusing in on its concept as a ground of predication;

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something whose facticity permits rational construals. On the other hand, a verb transforms a direct object by highlighting how it becomes part of the empirical parameters constituting a state of affairs; it is not the thing whose nature anchors a facticity, but something whose relation to such an anchor constitutes one of its parameters of factical specificity. Subjects and objects thereby have distinct epistemic roles in situational reasoning, and verbs transform subjects and objects in part by foregrounding aspects of their concepts which are relevant to those roles.

Via such considerations I claim that modeling verbs as modifiers for both subjects and direct objects is cognitively plausible, even if on strict semantic considerations we might reverse the status of modifier and ground in the verb/object case. In particular, a transitive verb simultaneously modifies both its subject and object. I distinguish this construction, however, from examples such as adverbs, which (as I argue above) also have two (or more) different targets, representing different "stages" of modification. Here, I use alternative terminology: I do not treat the verb/subject and verb/object modifications as different *stages*, but rather as co-existing transformations within *one* stage. Note that different transform-stages are in some functional sense independent of one another: I can, say, form a chain of adjectives (*his favorite slinky black cocktail dress*). Each stage adds on more detail while also deferring the resolution of the adjectival expectation until the eventual noun. The effect is then a "chain" of stages where new modifiers could potentially be inserted, or to some degree their order be reversed, implying some conceptual autonomy among the re-conconceptualizations which each stage triggers. By contrast, the verb/subject and verb/object transforms are more tightly coupled; the presence of each fundamentally determines how the cognitive process which fills in the other's significance plays out. Also, unlike stages, these co-existing transforms cannot be chained indefinitely; at most verbs can have subjects and direct and indirect objects.

For sake of argument, I will call transforms such as those between verbs and subjects or objects *columns*, in lieu of *stages*. The idea of "column" derives from a premise that verbs are conventionally understood as intransitive, transitive, or ditransitive, and on that basis garner explicit expectations of one, two, or three target nouns. Each noun thereby fits within a pre-ordained constructional template, rather like the columns of a table.

To be sure, verbs may *also* be modified by their own modifiers, so that prior transform stages precede the transform columns. In *I brought wine belatedly*, the adverb's modification is a different stage from the propositional completeness of *I brought wine*, and serves mostly to decorate the verb with added detail. Structurally, *belatedly* modifies *brought* at one stage and then (the output of this transform) modifies *I* and *wine* as subject and object. Notationally, then, *belatedly* is a modifier for all three of the other words (and actually becomes the sentence's root). In a parse-graph, we need to track two different structures differentiating multiple transforms: the "stage" difference between *belatedly* as adverb and (upon transform-output) as verb; and the "column" difference between verb/subject and verb/object. I accordingly use two different indices, writing a stage number first and then a column number, for edge labels. Visually, a graph labeled via this system might look like ((belatedly •▷ brought) ○▷ I wine).[3]

My theoretical contrast between *stages* and *columns* — calling for distinct representational parameters — has the consequence that parse-graphs may differ by virtue of whether transforms are treated as distinct stages or as distinct within one stage. I would argue that most structure within a sentence fits the looser "multi-stage" pattern rather than the proscriptive "multi-column" coupling as with transitive and ditransitive verbs. That is, there are not many forms of cognitive transformation where the interdependence of two or three transforms is so tight as to spur grammatic entrenchment (where, say, expectations of direct and maybe indirect objects become entrenched in a partition of verbs into three subcategories). Apart from verbs, there are only a few cases where I believe multiple columns (as opposed to stages) are called for analytically. One example comes from constructions like *I saw Mary, Paul, and Peter*: here I find *and* to be plausibly a modifier which takes several grounds as distinct columns. I say this because there seems to be no conceptual reason to see the aggregation as occupying different "conceptual" stages, apart from

[3] I use the notation with open-tail and closed-tail arrows to show graphs inline with text, rather than needing figural diagrams: an open circle at the start of an arrow indicates that the modifier at one end of the arrow is not the word visually near to the arrowhead but, rather, an emphasized node elsewhere in the line; the point here is to avoid a "stack" of arrows all pointing to the same node.

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the sentence order. Here too, the transforms seem to be "bound together".

Order of exposition can of course be relevant, as in *I visited London, Paris, and Frankfurt*: we are more likely to hear this as asserting the order in which the speaker traveled to those cities. Still, the net effect is to aggregate the three places as a combined fulfillment of *to*: we mentally construct an internally structured locative picture, with the three cities as points in the totality. That is, the effect of *and* is to modify our construal of the location references in the city-names: we come to treat them not as particular locations, but as points in a larger aggregate. This aggregate may be further structured by construing a temporal order; but such an ordering effect is supplemental to the basic idea of forming a location-collection from a disparate set of locations. I would say that each location is a "column" in aggregate formation because they conceptually transition from being isolated to being aggregated collectively; I do not perceive a conceptual sense of the aggregate being logically built up in stages.

Another pattern of construction I would consider "multi-column" are those involving subordinate clauses as sub-sentence propositions, or perhaps propositions minus the subject: *I thought he left already* or *a bag for carrying the groceries*. Unless we want to posit an "unmarked" transform of a proposition to a noun, a verb like *thought* can be parsed as taking a proposition (rather than a noun) for a direct object. In the second example, I contend, *for* takes some elements of verb constructions (a verb and direct object) and yields an adjective (*for carrying the groceries* can modify a noun). I consider the "direct object" transforms here as "columns", tightly bound to a paired transform (whether verb/subject or preposition/verb). In these cases the analysis probably reflects similarities to the normal transitive verb as a compound transform with both grounds being (categorially) a noun.

I will focus further discussion on this canonical case, then. In particular, I will explore how "column-based" constructions contrast with "stage" transforms in the accretion of conceptual detail associated with a verb.

2.3 The Cognitive Distinction between Stages and Columns

A verb can be conceptually expounded upon in many ways; only a few are syntactically privileged through transitive or ditransitive constructions. We can cite grammatic evidence for this discrepancy; consider:

- (89) I baked a cake for Grandma.
- (90) I baked Grandma a cake.
- (91) I gave a cake to Grandma.
- (92) I gave Grandma a cake.
- (93) ?I baked and gave Grandma a cake.
- (94) I baked Grandma a cake and gave it to her last night.
- (95) I baked Grandma a cake with the recipe she gave me.

The idea *Grandma's cake* can be expanded via different avenues, but only one of which can serve in any sentence as an indirect object, suitable for prepositionless ditransitive syntax.

Having observed this apparent norm in grammar, we can then ask *why* English, at least, is structured this way. Indeed, elaborations which are "reified" one context can be relegated to secondary added detail — *dereified*, so to speak — elsewhere:

- (96) I'm heading out.
- (97) I'm heading out to the store.

In the first sentence *out* reads like a direct object, giving a direction and destination to *heading*; but in (97) it comes across as more tangential. Perhaps *out to the store* serves as a compound path-description; or perhaps *heading out* is a compound verb, roughly the same as *leaving*. In either case for (97), *out* augments rather than intrinsically specifies the action concept: it either ornaments the path construal by noting that going *to the store* includes leaving the place where the speaker is currently; or it merges with *heading* to form a de facto lexical unit wherein departure from the current location is semantically part of the profiled action.

The theoretical problem these examples can pose is that the *cognitive transform* model, as I call it, qua formal representation, may come across as overdetermined.

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We should at least consider the possibility that no exclusive analysis of the contrast between (say) *heading out* and *heading out to* matches our actual linguistic processing. Perhaps mentally we somehow allow *out* to "float", vaguely attaching to *heading* as an extra specifier, *and* perhaps as an entrenched compound, and perhaps also attached to *to the store* as a path elaboration.

To choose one analysis over another is to notate the parse differently: reading *out to the store* as more of a phrasal unit implies *out* modifying *to the store*; while *heading out* as a couple implies that *out* modifies *heading*, either as a detail-adding adverb or as part of a lexically recurring compound verb. Each alternative produces a different parse-graph, so mapping the sentence to one graph or another implies the "correctness" of one appraisal over the other. A "cognitive transform grammar" has to justify that this determinism is not arbitrary; not an artifact of a representational technique imposing a theoretical straightjacket on phenomena which are more fluid and underdetermined.

To address this, consider scenarios where someone might actually enunciate (97). Perhaps two people are studying together in a library; the speaker interrupts the other's concentration to explain that she's leaving. Or, vary the situation somewhat: the addressee looks up and sees her standing up and taking her bag. Perhaps she varies the intonation somewhat, adding a pause between *heading* and *out to the store*. Given the nonverbal interactions between the two people, the speaker may (subconsciously, perhaps) respond to the other's cue that he sees her going *somewhere*. She might, circumstances being different, be heading *to the stack*, or *to the washroom*. It is not obvious that her planned movement entails leaving the building, which would be the normal interpretation of *heading out*.

In this reading of circumstances, there is a conceptual gap between *heading* and *out* because the addressee already knows (or so the speaker intimates) that she is heading *somewhere*. The components *heading* and *out* therefore have different epistemic status, so to speak; the *out* part is "new information" from the addressee's point of view in a way that *heading* is not (he might indeed anticipate that she *is* going somewhere out of the building, but that is only a likelihood given that she has plausible destinations *in*side). It is at least possible that these differences are reflected in the intonation and delivery of the sentence, maybe not deliberately. The speaker could be distracted, saying the first two words (maybe in response to a quizzical look) and then needing to focus on completing the sentence. We are not usually conscious of "processing time" when *composing* a spoken sentence, but occasionally there are gaps as attention ebbs and flows from linguistic processes, and these may reveal conceptual discontinuities in the artifact that results. Of course, the speaker might also consciously group *I'm heading* and *out to the store* together (respectively) vocally, responding to the cue I proposed that the other person knows she is heading *somewhere*. Conversely, she may actually express the idea with a different audible gap, as if two sentences: *I'm heading out. To the store.*

With speech variations, then, the speaker may in fact present the sentence in patterns that convey intent in subtly different ways. In that eventuality, different parses are in fact appropriate. If (as I've focused on) the key difference in the current example lies with whether *out* is attached to *to the store* or to *heading*, and in the second case as a regular adverb or part of a compound phrase, then enunciation patterns could incline us to one or another reading. With an explanation of how these differences emerge, we can see how the parse alternatives for *out* actually point to slightly different content with respect to how the sentence relates to dialogic context. The speaker may be responding to different cues and different assessments of the listener's epistemic assessment and inquiry — what is particularly relevant for her to tell him, from his point of view.

This does not mean that anyone saying (97) would necessarily be thinking through the possible variations, or even that vocalization has to reflect divergent patterns in conceiving the sentence as it is spoken. However, such differences *might* be communicated via alternative intonations. If the sentence is "neutral", not audibly implying one interpretation or another, then I would argue that it is in such a restricted sense ambiguous, not fully disclosing which *epistemic* pattern orients it. Such ambiguity is barely noticeable here, because the construals are only slightly different. However, the speaker could *potentially* craft the sentence around the idea that her addressee wants her to clarify *where* she is going; or conversely that, reading his book, she has to get his attention to tell him that she is going somewhere in the first place. This divergence yields competing framings for the epistemic background she attributes to him; and

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in turn the sentence relates to this background in slightly competing ways. If we agree that how expressions orient to epistemic backgrounds is part of their meaning, then the parse-differences do reflect some measure of ambiguity in (97)'s precise meaning.

This reading, to be sure, depends on a form of ambiguity where alternative meanings do not specifically conflict with one another. For a similar, more "semantic" example, consider the double sense of a word like *rice* in, say, a rice *pilaf*:

- (98) The rice has a nice yellow color that comes from turmeric.
- (99) Make sure the rice doesn't burn.

In these cases we can hear *rice* as designating rice itself *inside* the pilaf, or else the pilaf as a whole, which also has other ingredients (compare *I haven't yet added the rice to the pilaf*). Such difference, strictly speaking, propagates to (98) and (99) — we might be concerned about *some rice grains* burning, or observe that rice grains are stained by turmeric. We might also worry about the pilaf (other ingredients too) burning, or notice that the whole dish has a yellow color. In terms of propositional content, however, the competing precise facts are similar or compatible enough that we may place them together: (99) worries about burning both the rice and the whole dish, without the technical possibility of differentiating them (qua referents of *the rice*) being consciously noted by (99)'s speaker. So (99) may reveal an ambiguity but does not really decide which meaning is preferred. Whoever hears (99) may therefore conclude that, while a speaker *could potentially* intend one meaning expressly, the potential difference might not even be noticed when formulating the sentence. In the latter case the precise meaning of (99) may be read as a kind of superposition of the two fine-grained alternatives.

Another case of "partial" ambiguity comes to mind in light of one of Langacker's case studies, which involves the similarities between the following (despite variant constructions on the subordinate clause):

- (100) The effect was discovered by some scientists who were working in this lab.
- (101) The effect was discovered by some scientists working in this lab.
- (102) The effect was discovered by some scientists in this lab.

I find that a greater divergence of meaning between the sentences comes out if we substitute something else for *effect*; say, *vandalism*:

- (103) The vandalism was discovered by some scientists who were working in this lab.
- (104) The vandalism was discovered by some scientists working in this lab.
- (105) The vandalism was discovered by some scientists in this lab.

The presumed circumstances are that a specific act of vandalism resulted in a specific observable damage or disruption (broken equipment, or a spray-painted wall, etc.), and this *evidence* of vandalism is "discovered". A variation is that the discoverers came across the vandals during the act. A still more unusual (but not logically impossible) reading is something like an archaeology lab discovering evidence of ancient vandalism from analysis of artifacts. These variations point to how potential for ambiguity can be broader than we realize, because we tend to instinctively rule out contrary interpretations in context. The most straightforward reading of (103)-(105), though, is that vandalism occurred in the lab and was discovered after the fact.

We can still conceive two somewhat different scenarios, though: one reading (implied more strongly in (103)) is that the discovery happened *while* working in the lab. Note that *working in the lab* can be evaluated on two different time frames: this could refer to work done physically present in the lab, over a few hours; or more diffusely to the fact of someone having an institutional affiliation with the lab, presumably spending time there doing research, but without the implication that verbs attributed to them profile events occurring in the lab *spatially*. In *One of the researchers got married/pregnant/cancer while working in the lab*, we would not guess that the wedding, or any love's consummation, happened *in the lab* itself (but consider replacing *pregnant* with *drunk* or *burned*). Langacker's original examples show some of this potential double-sense also: were the scientists literally *in the lab* at the moment they "realized" *the effect* exists (assuming there was such a single moment)? For (100)-(102) that does not really seem relevant; i.e., we do not appear to need to resolve that question to make sense of their meaning. For (103)-(105) however the distinction *might* be relevant. If *working in the lab* just asserts the discoverers' affiliation,

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they may have seen damage as soon as they entered the lab (and were not actually working), or perhaps even remotely (perhaps noticing something amiss on a computer network). Whether they were physically present, and what they were doing at the time of discovery (maybe or maybe not *working* in the lab) could influence our appraisal of the vandalism's details.

At least, we can imagine someone hearing (103)-(105) as finding it relevant to know whether the discoverers were concretely *working in the lab* at the time they realized the lab was vandalized. The sentences, then, are ambiguous on that matter; it is plausible that someone would press for clarification if they are told only (103)-(105). Moreover, I think (105) makes it slightly more likely that we would infer *working* as applying to the *time* of discovery, because (104) profiles *working in the lab* as a grounded process, via a finite clause. By establishing somewhat disparate "probabilities" in the space of alternative readings, (103)-(105) have, we should recognize, some non-isomorphism in meaning.

It is, however, entirely possible that their addressees would fail to notice or attend to this variation. In practice, (103)-(105) could well be indeterminate in terms of whether the lab-affiliates were specifically *working* at the time of discovery, without that imprecision propagating to a gap in signification in its proper discourse context. The actual meaning of the sentences would then perhaps be some sort of disjunction among their ignored granular potentials.

I use these "rice" and "vandalism" examples to motivate my reading of *I'm heading out to the store*: even if a theory (here, Cognitive Transform Grammar) proposes competing parses which seem more sharply differentiated than communicative intent warrants, we can treat these alternatives as "superpositions" of slightly different meanings reflecting discrete construals which the speaker *could potentially* mark deliberately, but could also either ignore or neglect to notice. We might analyze one parse-graph (say, *heading out* as a compound verb) as a reasonable "default" interpretation in the sense that it formulates the sentence most compatibly with how the speaker and addressee would assess its epistemic context, to the degree that they consciously do so. But alternative parses may indeed present minimally alternative meanings, which have some conceptual presence insofar as the addressee might, consciously or not, recognize that the speaker could in fact be conceiving the sentence through one of those alternative forms. The speaker may *compel* that impression by using an intonation pattern less consistent with the "default" parse, but *failure* to signal such a deviation does not decisively communicate that the variant meanings (reading "meaning" here very narrowly) are specifically *not* intended.

With that said, cases like *heading out to the store* do reveal that a sentence can be given different parses which each satisfy the conditions stipulated in my proposed Cognitive Transform Grammar. Such differences are not theoretical anomalies; they reflect potential variation in meaning, but admittedly often minor and subtle ones. Even relatively minimal "superposition" of actual (potential) differences in precise communicated content are, I would suggest, sufficient to demonstrate how a theory yielding such contrasts as theoretical artifacts is not *overdetermined* (as it would be when predicting a *truly* superfluous multiplicity of meanings).

To make the theory more detailed, I would like to address which criteria point to one parse or another, given the potential triviality of their semantic separation. In short, taking the representational rules and parameters — the column/stage distinction and the conformance of modifier/target articulation to a tree-form, leaf-to-root orientation — as given, what conceptual patterns are revealed by, or philosophically legitimate, this structural paradigm? Can we give cognitive motivation for why linguistic performances may be organized in a system which my representational norms would diagram? I will explore this methodological rationale-apologia in the next section.

3 Cognitive Transforms and the Accretion of Detail

Thus far, I have argued that modifier-transform pairs form grammatic building blocks which, according to combination via certain rules, reconstruct the syntactic forms of sentences while also revealing their conceptual provenance. Adequate parse representations require a distinguishing of *stages* and *columns*, with notation marking each parse-graph edge (modeling a transform) via a unique stage/column duo. I also mentioned that parse-graphs have the extra organizational structure of

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channels, aggregating columns and distinguishing "input" and "output" edges (for networking where a modifier in one transform is a target in a second). The "channelized" graphs are then *hypergraphs*, and their use as representational targets for structural morphism according to grammatic rules becomes an example of *hypergraph grammar*.

The specific category of structures definable as hypergraphs via stages and channels (where stages are formally an ordering on channels) is more general than (natural) linguistics. Elsewhere I have used similar formalisms to analyze computer source code; and the data accompanying this paper illustrates how Channelized Hypergraphs can be an intermediate representation for computer languages — specifically, a *hypergraph virtual machine* can translate these structures into executable instructions which are mapped to predefined software procedures, indexed in computer memory. Hypergraphs with these properties are, accordingly, systematic enough to coordinate the interactions among computational processes in a general sense; they can be the foundation of rigid, formal languages, e.g. for computer programming.

Elsewhere I have proposed that constructional rules for Channelized Hypergraphs can be specified according to a *channel algebra*. Technical details on how such algebras are defined (not that they are terribly mathematically sophisticated) is outside the scope of this paper, but in overview each channel algebra establishes criteria according to which parse graphs (or as I more generally call them *source graphs*) are computationally well-formed; that is, they model feasible orchestrations of how multiple procedures are to be sequentially ranked and then evaluated. Honing allowable structures for natural language parse graphs also produces a channel algebra. The range of structures acceptable as models of natural language are actually simpler and more restricted than for programming languages.

In sum, among the Category of Channelized Hypergraphs constructionally regulated by a "channel algebra", those capturing linguistic patterns are actually tightly constrained. This implies that there are processual and/or conceptual dynamics generating language structure. The hypergraph mechanism is not only a summarial restaging of language artifacts, but is pointing us toward insights about which forces shape the coordinative instincts among language elements that become syntactic conventions. I will try to elucidate these dynamics through several lines of argument.

3.1 Propositions and Transform Dynamics

In general, sentences yield complete ideas; in this sense, all the transforms which collectively lead to the sentence root are oriented to eventually yield a proposition. Here again I treat propositions as a grammatical category, albeit one rarely occupied by individual lexemes (although see *He said so* or *I didn't know that*). The decisive transform, then, is one which yields a proposition — which usually means a verb is the decisive modifier (the sentence's "root verb"), although one might argue that the transform "signatures" like conversion *between* propositions is also possible (e.g., *Really, Sanders would have been the better nominee in 2016*). The subject of the root verb can then be called the *root subject* of the sentence; all transforms evinced by the sentence are, accordingly, structurally situated in a dynamic whose core axis leads from the root subject to the final proposition.

As outlined earlier, Cognitive Transform Grammar is amenable to a type theory based on the fundamental notion that procedures, processes, or functions "mapping" between types yields additional types (in mathematics this multiplying aspect of type systems is identified as type Categories being "Cartesian Closed"). I have used the terminology that a type system is *Channelized* when a specific form of "summation" among channels (as abstractly specified, e.g. in a procedural signature) yields a distinct type. Analogously, under the premise that in broad surveys of syntactic norms grammatical *categories* are analogs of procedural *types* (in the computer-programming sense), we can identify grammatical categories as formed from other categories via transform-pairs, perhaps aggregates of transform-pairs combined as columns within one channel. A ditransitive verb, let's say, is a "type" defined by the requirement that (construed as a modifier) the verb has three distinct grounds to be modified — subject, direct, and indirect object — each of which is (categorially) a noun.

Last section I defended the model wherein verbs are analyzed as (conceptually) modifying their direct objects. Similar arguments apply to *indirect* objects: the effect of a noun-concept being registered in an indirect object

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"slot" is to conceptualize that concept in a distinct register, often in a quasi-spatial or processual fashion:

- (106) I brought you some wine.
- (107) We bought him some school supplies.
- (108) I carved Grandma some duck.
- (109) The coach hit the infielders some ground balls.

Each of these constructions posits the indirect object as the endpoint of a spatial trajectory, although the path is profiled more in terms of the subject's motivations than the specific spatial coordinates. Literally, (106) and (107) (even (108), on reflection) profile a spatial movement between the subject and indirect object (the *direct* object being the mover), but the conceptual emphasis is on someone being the *recipient* of that object. (Likewise in (109), the implication is to emphasize not that the baseballs are hit *toward* the fielders, but that their path is deliberately induced so for them to practice fielding). In a typical ditransitive construction, that is, there is a conceptual overlay of spatial and "benefactive" dimensions: the indirect object is both a path end-point and one part of a giver/receiver coordination. Insofar as use-cases for these verbs tend to align along familiar conceptual patterns, e.g. this locative/benefactive overlay, the appearance of a noun-concept *as* indirect object tends to foreground the sense in which it can fit into such a conceptual matrix (e.g., to be a "receiver" of something as well as a spatial endpoint). A person can be a *receiver* and *destination* insofar as taking physical possession of something (literally or symbolically it becomes *on your person*, in your spatial proximity) stands for becoming its "owner" or "possessor"; meanwhile, we also have social customs of giving, receiving, buying, selling, and in general recognizing each others' right to our possessions (plus ritualized transfers of such right). These spatial and social senses conceptually overlap, creating a hybrid locative/benefactive prototype, and a verb's taking a noun as indirect object reconceptualizes the latter according to this kind of framing (or some other recurring ditransitive patterns).

So a ditransitive verb effectuates new cognitive construals vis-à-vis its three modified grounds, and only in the context of these three transforms does the verb produce something that should be interpreted as a complete idea. We can formally notate this template by arguing that the ditransitive verb's "signature" combines three nouns and a proposition — e.g., $N \dashrightarrow N \dashrightarrow N \dashrightarrow P$ — where I use arrows between the distinct columns *and* the eventual proposition to indicate that the intermediate transforms can be logically ordered.[4]

I will discuss the "sequencing" among columns below; but here I want to conceptually examine these type-theoretic "signatures", or how the type-construction modeling the syntactic categories which modifiers expect as their grounds (and also what kind of aggregate is required, such as three distinct nouns in the ditransitive case) convey modifiers' cognitive attributes.

Applications of type theory in linguistics can address different concerns, across syntax and semantics. To avoid confusion, I propose the term *macrotypes* to mean large-scale classifications such as syntactic categories, as opposed to finer-grained units like the senses of one lexeme (which I would call *microtypes*). Here *macrotype* can be seen as essentially a renaming of *syntactic category*, which avoids using the term *category* that in turn has numerous unrelated meanings across fields which, ideally, a multi-disciplinary linguistic methodology will integrate (I adopt these terms in the same way in Part I, e.g. in Section 2.2 of that essay).

In short, then, verbs, nouns, propositions, adjectives, adverbs, and so forth, are *macrotypes*, or more precisely collations of related macrotypes (e.g., intransitive, transitive, and ditransitive verbs). We can assume that all macrotypes other than nouns and propositions are *derived*, and so they have a *signature* describing the patterns whereby they produce "concepts" classifiable as some macrotype upon moifying *grounds* with their own macrotypes. I use *macrotype* to characterize both specific words and also phrases and concepts; to say that a *concept* is a noun, for example, is to say that it would be linguistically rendered via a word or phrase categorially classified as a noun. In general, though, I try to minimize talk about *phrases*, in favor of *conceptual outcomes* associated with the modifier at the "head" of a phrase. That is, to classify a phrase as a noun, for example, is to say that the final transform producing the phrase's associated concept is one linguistically represented by a modifier which *yields* a noun, so that the *concept* is

[4] I do introduce a visual cue — one or two dots above the arrow — to distinguish sequencing *between columns* vs. *between channels*: the three nouns are all columns within *one* channel; whereas the final proposition is a different channel, representing the "outcome" of the verb's transformations taken in combination.

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governed by the *noun* macrotype.

In principle, any collection of types can yield a new type (since any tuple of types can be functional *inputs* and *outputs*). Only a few possible type-signatures, however, actually correspond to linguistic macrotypes. Here again we find that natural language is restricted compared, say, to programming languages, in this context with respect to the range of derivative macrotypes which are systematically recognized as syntactic categories. Again too, this may reflect the dynamics of sentences building up to a propositional conclusion, with all sentence-components attached to a central root-subject/root-verb connection.

To elaborate, I will make some observations about which macrotypes seem to have categorial status in natural language (i.e., to be incorporated into grammatical norms, as syntactic categories). Note that, within the linguistic type system, the *proposition* macrotype is singled out as the root of all complete sentences ("proposition" here referring to the syntactic category; I use *propositional content* to designate the *idea* carried by a proposition-typed phrase). This also means that macrotypes are more or less "close" to propositions in terms of how many transforms, among recognized macrotypes, are needed as intermediaries before a complete proposition: adjectives, for example, yield nouns, which then need a further transform. I will say that adjectives (and for similar reasons adverbs) are more "peripheral", as a macrotype, compared to nouns and verbs.

Observe also that derived macrotypes tend to operate between macrotypes which are equally "peripheral" in this sense (often *the same* type), or *less* peripheral, but rarely *more* so. Macrotypes' transforms tend to take us *toward* propositions, not "away" from them (in the "space" of macrotypes). For adjectives and some adverbs, the *input* and *output* types are the same, at least if we construe macrotypes most broadly. With a more complex type system — e.g., distinguishing nouns with determinate content (*Elizabeth Warren*, *this book*, *the dogs*) from abstract concepts (*book*, *dog*) — transforms seem to trend toward more logical specificity even within one macrotype (e.g. we have demonstratives to transition from abstract concepts to determinate content, but few lexemes to go in the opposite direction). I will consider these more refined categorizations *within* macrotypes later.

Sticking just with macrotypes most broadly laid out, though, note that there are very few cases of a modifier transforming from one to a different *more peripheral* macrotype. In place of phrasal units that would effectuate such "peripheralizing" transforms, we tend to have lexemes doing double duty: in particular, verbs or nouns reassigned roles as adjectives (*hockey stick* and *bowling alley* rather than *stick for hockey* or *alley for bowling*). So when some grammatical mutation is desired that would reinterpret a lexeme normally used as a macrotype such as a noun or verb, so that it become a more "peripheral" macrotype like an adjective, conventions are to just preserve the lexeme as a single word (which the hearer presumably grants its new role from context) rather than to embed the word in a phrasal transform (e.g. how *that* nominalizes a proposition, which is in turn "peripheralizing", a counter-example to the tendency for transforms to move *away* from more peripheral types, or as I'll put it *counter-peripheral*).

In short, peripheralizing transforms tend to occur through mental substitutions at the lexical level rather than peripheralizing modifiers which head a phrasal construction. Moreover, patterns like noun-to-adjective or verb-to-adjective are more common when there is a simple (particularly one-word) target for the newly minted adjective (*score sheet*, not *score piece of paper*). Noun-to-verb reassignments are exotic-sounding, perhaps deliberately received as bending the rules of English. I have in mind cases like:

- (110) Don't think you can Champagne me into forgiving you.
- (111) If they healthy scratch him enough he might accept a trade.

Perhaps such verb-producing shifts are rarer than adjective-producing equivalents because to "resolve" the peripheralizing transform then requires multiple further transforms (considering the transitive or ditransitive case), as opposed to one compact counter-peripheral step. The less idiosyncratic approach to sentences like (110) and (111) would be to just factor the complex expressions into separate clauses:

- (112) Don't think you can just buy me Champagne and I'll forgive you.
- (113) If they make him a "healthy scratch" enough times (i.e.,

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leave a player off a sport team's active roster even though he is not injured), he might accept a trade.

On this evidence, peripheralizing changes in categorial roles are rare, and especially in cases where the "counterperipheral" ground that would "resolve" the resulting expectation is phrasal or multi-part (e.g., multi-column). Still more rare are peripheralizing *transforms* wherein some function word forces a categorial reassignment to a more peripheral macrotype. Earlier (without using this specific terminology) I analyzed *for* as a counter-peripheral transform acting on a verb and noun to yield an adjective, e.g. *for holding the groceries*. In this case the verb/noun combination is a kind of incomplete proposition, missing a subject; the noun then modified by the adjectival outcome (of *for*'s transform) can then "slot in" and complete the proposition (*This bag holds the groceries*). So we can speculate that peripheralizing transforms are more acceptable when they yield a construction which is "almost" proposition-yielding.

In general, though, we can observe certain patterns in the system of recognized macrotypes: most transforms are counter-peripheral, either transforming between two conceptualizations within one macrotype or in a step closer to a propositional outcome; contrary re-conceptualizations (such as a noun-to-verb) are more likely expressed via subordinate, often propositionally complete clauses; and peripheralizing modifications are more likely to occur at the lexical than the phrasal (or word-pair) level.

Ultimately, I believe these observations are reasonable if we consider the epistemic dynamics informing sentence structure, which I will now consider further.

3.2 The Epistemic Dynamics of Columns and Stages

As I pointed out earlier, verbs can be expounded upon with many added details, but only a few of these can be *columns* for which the verb itself is a modifier (rather than its being the target of an adverbial modifier). The question of *which* content is treated as direct or indirect object, rather than a secondary detail, seems to be a matter of context. Material which is an object in one sentence can be an added detail in another:

- (114) This bus drops passengers off downtown.
- (115) This bus drops passengers off along Queen street.
- (116) This bus drops passengers off downtown along Queen street.
- (117) This bus will take you downtown via Queen street.

These sentences differ in the extent to which *along Queen street* is factored as an intrinsic part of the bus's destination or rather a supplemental detail of the route taken to get there. If we endow a passenger's *destination* with particular conceptual focus, the focus would exclude the intermediate route if her interest is simply on getting "downtown" generically, or to a prominent landmark (say, a bus terminal). On the other hand, if she were heading toward a specific address along Queen street, she might be concerned about the bus's path *within* downtown, so the description "along Queen street" becomes part of the construal of the destination.

This situation should be interpreted functionally as well as spatially: someone interested in a sentence like (115) presumably intends to travel downtown, and thinks of the bus as a vehicle to serve that purpose. Accordingly, the bus's destination is functionally salient, because it directly impacts on her purposeful assessment of the situation, whereas details like the intermediate route are functionally peripheral. If *along main street* is in fact also salient for her in this sense — or more precisely if the speaker believes it could be — it would be appropriate to consider *downtown along Queen street* as an indirect object phrase (i.e., the whole four-word group is the direct object); if not, *along Queen street* is more of a supplementing modifier to *drops off* (and "downtown", just that one word, is the direct object). As with *heading out to the store*, it is permissable to identify alternative parses which suggest slightly different sentence-meanings (at least, different in light of all contextual details). The meaning we should attribute to (115) depends subtly on whether the speaker believes that *along Queen street* is functionally important for the addressee — whether it is thereby central to (115)'s information content or is just an aside, introduced perhaps in a spirit of conversational casualness (in that, for instance, conducting a dialog with enunciations appearing as brief as possible to be informative can come across as brusque or unfriendly). But we can accept that the conversants may not consciously register this difference, so the received and/or intended meaning may be suitable for a "superposition"

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of competing parses.

This example suggests that whether a verb-affecting detail is aggregated within the expected subject, direct, or indirect object "columns" depends on whether it has *functional* bearing on the verb in question. That is, in a general case verbs represent actions with particular functional intent or precondition (wherein a functionally ordered situation is the backdrop wherein the action may occur). Some details are intrinsic to the basic functional framing of the action, while others profile secondary functional relationships, such as those which are instrumental, spatializing, or rationalizing:

- (118) I opened the wine with an antique corkscrew.
- (119) I opened the wine in the kitchen.
- (120) I opened the wine to aerate.
- (121) I opened the wine for John.
- (122) I opened the wine because John asked me to.
- (123) I opened the wine in the kitchen for John so it could aerate because he asked me to.

As the final sample in this group suggests, extra details can be added in a chain stretching over multiple clauses. Addressees, as such, need to figuratively draw a line between the span within discourse marking verbs' objects and a potential following segment providing verb-modifying details.

As I have argued, at least in the model I propose here, verbs modify their subject and direct objects, while they are *modified by* adverbs (including adverbial clauses trailing the objects). This means that the "boundary" between the direct or indirect object (or their phrases) and subsequent phrases (attached to the same verb) partitions this content into segments *modified by* and *modifying* the verb. Obviously, some of the latter is heard later, implying that we *project* supplemental details "backward" across the sentence structure, and against processing time, mentally grouping the addenda with the verb itself (analogous to non-clausal adverbs specifically placed *before* the verb). In particular, I model all adverbial content (regardless of its sentence position) via stages *prior* to the "columnal" channel where the verb yields a resulting proposition.

As I have suggested, each parse-graph implies that all formally intrinsic word-pairs can be given a distinguished ordering. More specifically, transforms can be ordered via the stage in which they occur and then, within one stage, via their column. The verb-to-subject transform, say, precedes verb-to-object (i.e., direct object, and then in turn the indirect object if applicable) and is preceded by all adverb-to-verb stages. This is obviously not the same as word-order or how the sentence is processed; nor does it necessarily reflect the most mechanical logical tableau of the sentence's propositional content. However, I would present as a thesis to investigate that the transform ordering, mandated by the specific hypergraph "cognitive transform" model, captures some of the mental organization through which we assemble a reading of the sentence, in between the initial surface reception and our eventual interpretation of its logical significance.

The representational transform-ordering, then, is not just an artifact of a particular diagrammatic convention, but a possible insight into how the cognitive processes triggered by each sentence are organized. Insofar as the verb is the key juncture yielding determinate propositional content, it serves as a nexus for variegated details and significations. Each sentence's meaning, in large part, can be read in terms of all the qualifications placed on its root verb (albeit that some of these qualifications are expressed in isolated clauses with their own verb-heads and therefore a nested version of this same structure). We can isolate the subject, and (when warranted) objects, as the culminative stage of an accretion of verb-details, with all tangential content theorized via preparatory stages. Here I am not suggesting that we experience residual addenda like *for Grandma* and *via Queen street* as logically anterior to the verb's focal action, as if we have to pretend that we form a complete mental image of what the verb signifies before ever incorporating its subject and objects. Obviously, upon hearing that someone carved the duck *for Grandma*, our reception of the last phrase is influenced by our prior knowing the foretold propositional context. But, plausibly, we perform a mental restaging once we confirm that the sentence is complete, and "slot" information appertaining to the verb in a structured package which partitions all the details into subject and objects, on the one hand, and supplemental data, on the other.

Presumably this archetype exists because it is a convenient mechanism for making sense of the propositional content which the verb, in proper context, eventually signifies. The "trail" of secondary details allows the relevant state of affairs to be described as rigorously as the

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situation warrants. On the other hand, the more tightly coupled verb/subject and verb/object connections allow the focal information in the verb construction to be packaged up, depending on surrounding context:

- (124) Giving John advice is impossible.
- (125) You promised to make us pancakes!

Clearly the speaker wants to compress a complete idea into a semantic (and presumably verbal) unit so as to them comment *on* the idea ((125) is not about pancakes being made but about a *promise* to bring about the circumstances where pancakes are being made; similarly (124) is not just about a "giving" occasion where "advice" is the transferred content and *John* the recipient).

In short, ditransitive (-like) constructions which do (or do not) "short-circuit" the use of full nested clauses allow expressive flexibility, so that speakers can signal by phraseological compactness (and/or speech patterns, such as being quicker to enunciate clauses yielding complete ideas being placed in a larger context) where they want addressees to focus attention. For instance, the coexistance of ditransitive patterns with and without prepositions allows the sentence to be restructured according to whether the expression comprising the direct or indirect object is more complex:

- (126) I gave John a Cabernet Franc from the winery he visited during a trip along the Niagara escarpment last summer.
- (127) We'll award a prize to the first caller who correctly identifies who scored the game-winning goal last night.

The choice of which object to place first or second, in these cases, is obviously motivated by one object (and not the other) requiring a lengthy nested clause.

Of course, verbs also form clauses which modify other verbs. This means that stating the core verb/subject/object construction compactly helps orient a non-root verb's clause in its larger context. Compare:

- (128) The instructor hit them ground balls to practice fielding and throwing in one motion.
- (129) The instructor hit ground balls toward the infieldsers so that they could practice fielding and throwing in one motion.

Moreover, suppressing one or another object (or even the subject) allows a nested clause to be transformed into a modifier:

- (130) I found the wine that John recommended.
- (131) Please use brown rice when making the pilaf.

My point is that the verb/subject and verb/object combinations have a kind of combinatorial flexibility, allowing word-order variations for the most fluid discourse, plus various deferments or elisions which allow a nested clause to join its context in a variety of ways (e.g., a subjectless infinitive verb with its own otherwise complete clause in (130), or similarly *when*+gerund in (131)).

Adverbial clauses, by contrast, do not have the same level of flexibility. They can be predicated as addenda on a verb, but not "gapped out" to form an incomplete idea needing resolution, or repositioned outside conventions that adverbial clauses that lead with a preposition go at the end of a verb construction, while adverbs proper go at the beginning. Given these limitations, we need more complex structures to model signifying intent when we *do* want to focus on details that would be functionally tangential to a verb-construction as usually interpreted:

- (132) What was it that you used to open the wine?
- (133) Which avenue does this bus go down when it drops off passengers?

This brings me to the overarching point that — at least in English — many of the conceptual details we would intend to insert into a sentence have to be presented via subordinate clauses. The kind of compact transforms offered by adjectives or adverbs paired directly with their targets — and by verb/subject/object columns — are often insufficient mechanisms to fully transform how a language-act signifies its content, enough to render the expression a complete encoding of the idea the speaker endeavors to convey. I will discuss this organizational tendency further in the next subsection.

An additional consideration when analyzing verb-modifiers concerns the relations between bonafide adverbs (asserting details and secondary information) and transforms associated with more central syntactic markers, such as mood and tense. Adverbs within a gerund construction, let's say, can migrate to different spots:

- (134) Those dogs are barking loudly.
- (135) Those dogs really keep barking.

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- (136) Those dogs are really barking.
- (137) Those dogs are really barking loudly.
- (138) Those dogs are barking — really loudly.

If we hear the gerund pair as just English's idiomatic progressive tense, then the most logical transform order, at least for analysis, is to treat *loudly* in (134) as modifying the couple *are barking*, just as it would modify the past tense *barked*. However, one might also hear *bark loudly* as a compound verb, like (in many circumstances) *heading out*:

- (139) She is heading out early.
- (140) She is heading out with the dogs.

In (139), say, I find the most natural analysis forms the transform *heading out* (in effect creating a gerund for the two-part verb), *then* the *is* (to form a present progressive), and finally *early* supplements the verb-profile. This analysis would probably not run the same way for (134)-(138) because *bark loudly* does not have the same lexical entrenchment as *head out*. Nevertheless, these cases argue against assigning fixed rules for the "order" in which modifiers act on verbs — here meaning not "processing" order, but the kind of organizational, reconstructed order I alluded to several paragraphs ago, in terms of mentally assembling our interpretation of a verb-clause.

This does not mean, however, that this order is semiotically arbitrary. We should lean toward grouping a modifier most tightly with a verb when the pair forms a lexically recurring phrase; while acknowledging that there are gradations between highly standardized compound verbs (*reach base*, *catch up*, *take off*, *let go*, *walk around*, *watch television*) and verb/adverb combinations which just happen to be used often (*ask politely*, *land safely*, *eat well*, *graduate with honors*). In the context of a multiword conjugation (like a progressive tense), whether we model the modifier which often pairs with the verb as a transform (logically) *before* or *after* the tense-forming depends on how tightly the pair is perceived as a phrasal unit, which is often semantically significant through the lens of compositionality. As a compound verb gets lexically entrenched, its meaning tends to depart from a more literal reading of its components (in *catch up* one is not literally catching anything; in *watch television* it is not like we're watching the TV qua object).

Meanwhile, in the case of an intensifier like *really*, we could perceive it as adding emphasis to different parts of the construction — either *loudly* itself, *or* the phrasal *were barking loudly* as a more holistic emphasis. In (135)-(137) above I am actually inclined to connect *really* with the auxiliary *are* or *keep*, the idea being that the very notion of a *progressive tense* can acquire multiple cognitive refinements. So amending *are* to *are really* signals that the speaker is trying to emphasize the perpetuation of the action (this continuity is intrinsic to the progressive tense) in a particular way. Potentially, *are really* implies that the action's continuance is in itself surprising, noteworthy, or exaggerated.

Adverbs, then, can be seen as modifying their target verb *in particular* or more broadly as characterizing the overall state, event, or process which the verb profiles. In the latter shade of interpretation an adverb (or adverb-like clause) can be mixed among all the other clauses lending detail (of varying degrees of import for the "main idea") to the verb, whereas in the former case we are more likely to have usage-patterns where the adverb "binds closely" to the verb, as a quasi-lexical unit or at least as a "floating" modifier which can nevertheless only "slot in" to the sentence in specific locations.

3.3 *Clausal Organization*

The simplest example of clauses nesting into other constructions derives from propositionally complete clauses, which are "transformed" to nouns via a subordinator such as *that*:

- (141) We know that Warren and Sanders appeal to the same cohort of voters.
- (142) I know that Szechuan recipes call for hot pepper, but John can't eat spicy food.

It is commonly asserted that the subordinator is unnecessary, and so its presence or absence has no real semantic import (except perhaps in making long subordinate clauses less awkward, or for stylistic reasons; using *that* sounds less informal). I would venture, however, that we are more likely to (even subconsciously) drop *that* when we believe the addressee already is familiar with the propositional content of the following clause:

- (143) I told you Toronto would win!

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- (144) I know you like hot pepper, but John can't eat spicy food.

That is, we are more disposed to *include* the subordinator if we perceive that the audience is not necessarily expecting a propositional phrase at that point, or if the referenced proposition has not been previously entertained in the dialog. In a sense, this reprises with respect to propositional clauses the case for using determinative forms (like *the*) to reference nouns. We would readily drop *that* if we are citing a proposition very similar to one the addressee has already enunciated (e.g. *Can I add hot pepper?* for (144)). By extension, then, even if the clause is not entirely unoriginal in this sense, we are inclined to drop the subordinator if the prior conversational context makes the content of the subsequent clause not unexpected; it fits comfortably into the current state of the dialog (two people talking about a recipe in (144), or talking about the 2019 NBA Basketball finals in (143)). The "dropped" version sounds more informal, then, because informal discourse is more likely when the conversants have this degree of shared anticipation of the contours of the dialog, more so than formal or technical writing/discourse. But with that said, the two versions are not then semantically identical, even if the differentiating effect is not always in play — the choice to include or leave out a subordinator can signify an assessment, on the speaker's part, of the relative novelty (or lack thereof) of the topics broached in the subsequent clause.

In terms of macrotype, a clausal verb can be typed as a normal proposition-yielding verb to the degree that the clause is propositionally complete. For nonfinite clauses, the corresponding nonfinite verbs would not have a conventional verb signature where a proposition is produced from one, two, or three nouns. For discussion, I will use the term *protoverb* in lieu of "nonfinite", assuming that protoverbs are fundamentally a different macrotype (although most or all lexemes categorized as verbs can, according to context, be used as protoverbs — this perhaps being an example of how one lexical category can span numerous macrotypes).

Protoverbs mirror the columnar structure of verbs, except for one column being deleted from their signature; and they exchange the propositional outcome-type for a noun or adjective (or perhaps other macrotype). In (124), *giving* is then a protoverb yielding a noun, and for (125) the infinitive *to make* can be modeled as *to* transfoming *make from* a verb *to* a protoverb. Protoverbs would actually comprise multiple macrotypes depending on whether the "elided" column is subject, direct object, or indirect object; on whether the transform result is a noun, adjective, or something else; and whether the lexeme in its normal verb form is transitive or ditransitive. (I assume intransitive cases like *Swimming is fun* and *To err is human* are not protoverbs but rather verbs lexically re-typed to nouns or, in the latter, mapped to a noun by the infinitive). The same nonfinite clause (reflected in its protoverb's macrotype) may serve as a noun, adjective, or perhaps otherwise, varying with context:

- (145) He is struggling to hold the groceries.
- (146) We need a bag to hold to groceries.
- (147) She is trying to get our attention.
- (148) She is shouting to get our attention.

I assume here that *struggle* and *try* are normal transitive verbs whose object is a noun, albeit often one which (for semantic reasons) we expect to be based on a verb — semantically, a verb refigured as a noun, to conceptually profile the abstract essence of the verb rather than one specific instantiation. In simple cases (*I want to win*) this mapping can be done without any clause, but (145) and (147) involve transitive verbs which need to be elaborated with a corresponding object. With that detail, the subordinate verb (re-typed as a protoverb) transforms "into" a noun (cognitively, at least), which then becomes the object of a different verb. In (148), on the other hand, it seems correct to read *to get our attention* as an *adverb*, not a verb, because it modifies (by ascribing a rationale to) her shouting. And (146) is a case of a protoverb mapping to an adjective, because the clause modifies *a bag*.

Assuming this analysis, nonfinite clauses can be structured or interpreted to fill the roles of most key lexical categories, including nouns, adjectives, and adverbs; this means that in any context where such an expression is needed, a subordinate-clause construction is a viable fallback. We can then treat this as a dynamic in English syntax: the grammar makes available certain constructions, such as *J*+*N* (*J* for adjective), *A*+*V* (*A* for adverb), and *N*+*N* pairs (the last for cases where the first noun is re-typed to an adjective), which signal cognitive transforms concisely, and within brief phrasal units that can

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be elegantly embedded in larger phrases.

However, these same sorts of transforms can be realized with subordinate clauses. This places selective pressures working against non-clausal constructions that would yield complex and unyieldy phrases, because English speakers will deem their clausal analogs to be more acceptable. We have, say, a *bag to hold the groceries* rather than a *hold-the-groceries bag*, or a *drill to practice fielding* rather than a *fielding-practice drill* (unless in this case we hear *fielding practice* as a lexical compound noun, which is plausible in the specialized language of baseball). Clauses may themselves be complex, but they have a rigorous quasi-propositional organization, and a systematic range of subordinators, which helps "orchestrate" clauses' internal structure and the relation of clauses to one another.

Alongside these grammatical tendencies, though, we should consider their consequences for cognitive processing of sentences. According to my overarching paradigm, sentence-understanding involves co-ordinating a series of cognitive transforms (signaled by modifier-words whose effects can be marked in purely syntactic terms, e.g. the input and output macrotypes, as well as analyzed conceptually/semantically). The transforms collectively build up detail to arrive at a complete idea; a rendering of propositional content which describes states of affairs as seen by the speaker, to a level of detail relevant to her communicative intent. In particular, each sentence element or component is ultimately meaningful in terms of a detail it adds to a holistic situational picture; adjectives and adverbs, for instance, add detail by conceptually refining our sense of their target nouns and verbs.

In the context of discussing subordinate clauses, this perspective yields the observation that conceptual details are often inserted via clauses, which are themselves internally organized and often complex components. At the conceptual level, clauses then induce a kind of split-level focus when interpreting a sentence: on the one hand, the clause has to be anchored in a sense of supplying supplemental information about some concept which lies outside it, connecting it to the larger sentence; but on the other hand each clause has its own quasi-propositional structure, so that *internally* it has its own pattern of cognitive focus, its own schematics (landmark/trajector gestalts, for instance).

On this basis, we have an avenue for studying subordinate clauses in terms of the spatial, temporal, and logical form of their *internal* conceptualizations:

- (149) We should look for the wine that John recommended last summer.
- (150) I have to shout because the cars are making a lot of noise outside.
- (151) Warren presented more detailed policy proposals than Sanders, at each of the debates where they were both onstage.

Each of these subordinate clauses has a spatial, temporal, or contextual framework which deviates from the surrounding sentence (*last summer*, *outside*). The third is the more elaborate, because the speaker is taking a holistic view, where each of the debates referenced could, potentially, be a separate topic that gets exclusive focus in subsequent conversation. In (151) the speaker (and presumably all conversants) works from a summarial vantage encompassing, in their thoughts, a series of more specific contexts (viz., each debate) which could form their own discursive space (not just in terms of their actual spatial environs, but their abstract space of facticity and themes). So in (151) the contrast between the setting for the enunciation and the clausal alternate space is more abstract than the *inside/outside*, or *now/last summer* contrast.

Nevertheless, we can argue that every linguistic construction which, at the semantic level, serves as a "space builder" (using Gilles Fauconnier's term) may have a corresponding clausal manifestation. The fact that clauses do need to set up their own space, time, and context, deviating from the main sentence, may explain why they occupy their own phrasal nexus rather than serve to modify their eventual target more directly.

Often, on the other hand, clausal constructions can be bypassed if there is a pithier designation, which may depend on context, or on the presence of some entrenched idiomatic conventions. We clearly recognize the pattern behind the verb *try* preceding a noun for food, drink, or something critically experienced (in the sense that we can assess the experience's pleasurability — *try this bubble bath*; *try that cologne*). But *try*'s object appears to typically be shorthand for an implicit clause:

- (152) I'd like to try this restaurant.
- (153) I'd like to try that mountain.
- (154) The city is trying ranked-choice voting next election.

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- (155) I'm going to try binoculars at the next game.

By convention we understand (152) to mean desire to *eat at* the restaurant (although there may be special circumstances where (152) could be utterred with a completely different sense, e.g. someone visiting numerous restaurants hoping to *use the bathroom* or *apply for a job* or *hang a flyer*). We hear (153) as intent to *climb* the mountain, and would probably be puzzled if it were used in a context other than mountain-climbing. So (152)-(155) could be rephrased with clauses which explicate a specific verb: *eat at* this restaurant, *attempt to climb* that mountain, *implement a system of* ranked-choice voting. The speaker may choose a shorter form — e.g., a single noun or simpler noun-phrase — if it seems obvious from context how the noun relates to *try*; i.e., how to extrapolate from the noun to an activity usually associated with that word-sense (*climb* a mountain, etc.). These cases again show, however, the dynamic role which clausal constructions can play in shaping discourse: we always have the option of reverting to lengthier clauses when a stripped-down alternative proves enigmatic for hearers (*Next game I'll bring a pair of binoculars so I'll be able to see the action on the field*). The fact that speakers *can* adopt subordinate clauses rather than short forms like *try binoculars* — which need more interpretative effort — exerts pressure on speakers to select clausal forms beyond some threshold of complexity.

3.4 Transform, Constituency, and Dependency Grammar

The fact that subordinate clauses form self-contained units, serving as nouns, adectives, or adverbs in a larger context, may seem like evidence for the usefulness of constituency grammars, since we have a whole phrasal complex serving a unitary role at a higher scale. On the other hand, the internal organization of clauses may seem like a case for dependency grammars, since the semantically most significant lexemes (e.g. verbs and nouns) get centralized. The verb as clause-head "dominates" over secondary details, such as adverbs and adverbial phrases, which in terms of semantic importance are tangential. As a nexus for gathering, potentially, multiple such tangents, the verb packages the contents of its phrase and then connects qua dependent with a root verb (or another verb "closer" to the root).

In contract to conventional Dependency Grammar, Cognitive Transform Grammar does not try to estimate semantic "importance", or use this notion as a criterion for defining head/dependent relations. Philosophically, even if we are committed to the general idea of Dependency Graphs modeling syntax via ordered inter-word relations, it is not obvious as to which word in a pair "depends on" the other. We might say that an adverb "needs" a verb to have any concrete significance, but in (what I have called) a verb-to-preverb transform, like *to make*, the verb itself in some syntactic sense "needs" *to* because there is no accepted automatic lexical retyping, without some auxiliary word, which induces a verb-to-preverb "type-cast" (unlike, say, noun-to-adjective in *hockey stick*).

Via Cognitive Transform Grammar, I propose to sideline judgments about relative significance entirely (at least for underlying parse-graphs) and consider modifier-target relations instead of (the more loaded) "head"/"dependent" contrast. A formal ordering on transform-pairs, as well as the stage/column structure, allows modifiers to be ranked as closer or further from the sentence root, and the more "central" modifier plays the role of "head" in any word-pair, even if it is *semantically* tangential. This means that seemingly insignificant lexemes, like adverbs, prepositions, or auxiliary words, may become the root of a sentence (or a subordinate clause). I believe this is acceptable because the purpose of a parse-graph is not to summarize overall conceptualization, but to formally organize the steps which conceptualizations take en route to an overall propositional understanding. On *top* of the parse-graph we can add further analysis, including further word-pair connections (e.g., pronoun to antecedent), which fill in semantic details.

One potential weakness of this approach — although I will argue it actually demonstrates its rationale — is that "root" modifiers (both clausal and sentence roots) would seem to abstract away type-level specifications established for their ground. To see what I mean, consider again sentences involving *try*, like:

- (156) He reluctantly tried Champagne for the first time.
- (157) She will try hard to ski during our vacation.

As I have discussed, *try* is only understood when its direct object is a noun that profiles an action or activity

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— in particular, a noun derived from a subordinate clause. Forms like (156) can be analyzed as variants on more elaborate versions where a clause is explicit (e.g., tried *tasting Champagne*). So *try*'s object has to be interpreted such that it mentally converts either to a clause or to some abstract conception of a verb (as in *try skiing*). Moreover, *try*'s *subject* generally has to be interpreted as something sentient, capable of purposeful action (we don't usually accept constructions like *the apple tried to fall* or *the tree tried growing*). These specifications on *try* are narrower than can be represented simply by naming a macrotype as transitive verb, which takes two nouns and yields a proposition. The two nouns cannot be random; they have to be specific *kinds* of nouns, to be of some type less "macro" than just *noun* full stop.

However we wish to actually represent these extra requirements, the key point for now is that such requirements apply not only to *try* as one word, but to any phrase formed by modifying *try*, e.g. *try during our vacation* or *try for the first time*. This might seem to be an argument for treating *try* as a *head*, because there the one word encapsulates a suite of specifications. In the format I propose, those specifications instead have to be seen as duplicated across nodes, from the *try* node to those of its modifiers (*hard*, *eagerly*, plus *for* and *during* as roots of the adverbial phrases, referring back to the last two examples). All the conceptual expectations of a verb like (for the current example) *try* become transferred to other words linked to the verb (and by extension to *phrases* such as *try later* or *try for the first time*). In a constituency grammar where phrases are nodes "above" other nodes (according to tree models where the root is "on top") this parent/child relationship provides a natural container for "scoping" effects of this kind, because we can say that conceptual restrictions or construction-patterns (e.g. *try* implies *a person* trying *an activity*) remain in force "above" a node once they are established *at* a node. But in Dependency Grammar, with parse *graphs* in lieu of *tree*, we do not have an *a priori* scoping mechanism to delineate when conceptual effects along these lines "propagate" across nodes (there is no *a priori* "up" direction to propagate toward), so an account of propagation has to be more directly investigated as a component of the theory, rather than an artifact of meta-structure (which is arguably a feature rather than a problem).

For a simpler example involving similar issues, consider plurals:

- (158) They have a lot of regional beers on tap, and I've tried most of them.
- (159) They have a lot of regional beer on tap, and I order some whenever I come here.

Beer can be a mass, count singular, or count plural noun; and the modifiers here (*regional*, *on tap*, *a lot of*) are neutral between mass and count plural. On the other hand, the choice between *them* and *some* later in the sentences must agree on the mass/plural alternative; the only word which marks the relevant phrase (*a lot of regional beer(s) on tap*) one way or the other is *beer(s)* itself. There is, then, a particularly salient connection between *them* and *beers* (and *some* and *beer*), because singular or plural marking on the second word of the pair determines the first word. In a traditional Dependency Grammar, *beer* would indeed be the "nexus" to which the supplemental *on tap* (and etc.) connect (on which they "depend"), so that the semantically crucial lexeme also marks the appropriate registers in need of morphosyntactic align (e.g., singular/plural).

In the models for Cognitive Transform Grammar, on the other hand, specifications — e.g., mass vs. count-plural on *beer(s)* — "propagate" across nodes; here, from *beer* and *beers* to the phrases identifying the noun in its full concept (*a lot of regional beer(s) on tap*). Cognitively, this is quite plausible: surely we hear the phrase *regional beers* as plural in the same manner as *beer*. In this sense it is reasonable to stipulate that specifications more specific than coarse macrotypes alone would represent — a noun being plural, a verb needing a "sentient" subject — likewise propagate from targets to modifiers in a parse graph.

Another illustration of related "propagation" comes from alternative "Ontological" construals of a noun; e.g., a *newspaper* can be an object, a place, or an institution:

- (160) My favorite newspaper is on the table.
- (161) My favorite newspaper hired a new editor.
- (162) I walk past my favorite newspaper everyday.

We have to infer from context which sense of "newspaper" applies in which use-case. But once we have clarity on whether the intended conception profiles the newspaper in the "Ontological register" as a bounded object, a

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geospatial location, or a social institution, this classification clearly propagates outward to containing phrases, such as (in (160)-(162)) *my favorite newspaper*.

As an analytic device for these sorts of linguistic cases, I propose the term "mesotype" to represent a level of classification between individual words and macrotypes, including "top-level" macrotypes like noun, proposition, verb, adjective, adverb, and preverb (this is terminology I used in Part I). More specifically, I propose a type hierarchy where those aforementioned macrotypes (with no further qualifications) are the least granular, followed by subdivisions which tend to be morphologically marked: mass, count singular, and count plural nouns; intransitive, transitive, and ditransitive verbs; propositions in different performative registers (assertions, commands, requests); and the adjective and adverb modifiers typed correspondingly (e.g. how *many* both inputs and outputs count plural nouns). At a finer type level, *mesotypes* introduce semantic and "Ontological" criteria not syntactically marked: nouns of abstract, inanimate, artifactual, sentient, human, sociocultural entities, for example, or perfective vs. imperfective verbs (cf. Langacker *intro*, page 148). Finally, *microtypes* are at the most granular semantic pole, representing individual lexical entries or closely related lexical groups, like *apple* or *fruit*. I argue for such a classification scheme in this context so as to have machinery for identifying the *sort of* restrictions, conceptualization, or expectations would "propagate" across parse-graphs in different contexts (*macrotypes* evince different expectations and etc. than *mesotypes*, and *mesotypes* than *microtypes*, and vice-versa all around).

I do not intend the "layers" of the hierarchy implied here to be completely defined *a priori*; arguably there are fuzzy cases amenable to competing interpretations on the meso-to-macrotype axis or the meso-to-microtype. For instance, a locative construction implies that the object is a noun designating location, and it has grammatical marking at least in some sence — locative interpretations are endemic to indirect objects, and prepositions such as *toward* and *over*, introducing adverbial phrases, require location-like targets. One might on this basis claim that locations, as a special grammatical category, are built in to the English syntactic system, rather then being overlaid semantic specifications. Moreover, locations do not seem to fit the conventional mass/count distinction: they typically function as both a *mass* of smaller locations and as *singular* integral regions, depending on context:

- (163) We are driving across Pennsylvania.
- (164) We are driving within Pennsylvania.
- (165) We are driving toward Pennsylvania.
- (166) We are driving to Pennsylvania.

Note that (166) implies a path originating *outside* the state and terminating *inside*, which thereby has two different portions separated by the location's boundary.

On such evidence it is plausible to treat locations as a separate macrotype of nouns, on roughly the same "conceptual granularity" scale as mass, count singular, and count plural. A counter-argument, however, might note that many nouns become interpreted as locations in the proper context:

- (167) I passed a glass of Champagne to John.
- (168) I send good wishes to the children.
- (169) I hung a leaflet on the whiteboard.
- (170) Their best player was traded to the Lakers.
- (171) Turning now to hockey, the Leafs just fired their coach.
- (172) He will get another job: it's not like they sent him into retirement.

This flexibility implies that locative marking is a cue to influence how we semantically construe the "location", rather than a specific lexical category. The nominal concepts interpreted as locations cover a spectrum of number — plurals (*the children*), mass (*hockey* and *retirement* in these contexts; e.g. *hockey* qua the space of topics relevant to reporting on that sport), singular (*John*) — and also of Ontological status (John is a person; the Lakers a "social institution"; hockey an "idea" or topic; retirement a stretch of time; a whiteboard is an inanimate object). These patterns of semantic construals complicate the idea that "locations" can be reified as some specific subtype of nouns — although plausibly one could isolate a specific class of nouns which designate locations in the most direct sense (spatial, temporal, or geographic regions), distinguishing cases where a locative framing is internal to a noun's meaning as opposed to requiring some context-specific reinterpretation. In either case, there seems to be no fixed analysis that would rank the theoretical value of placing location-nouns more in the "macrotype" or "mesotype" region in the "space" of linguistic types' granularity.

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Moving in the opposite meso-to-micro direction in this "space", consider specifications such as how *cook* or *dine on* (save for a few specific idioms) only make sense in relation to food. This restriction appears somewhat analogous to patterns which would be identified on the mesotype scale: for instance, only social institutions can *hire* or *fire* someone (and only people can be hired and fired). Conversely, we could argue that any word's lexical sense constrains the contexts where it should be used, not for any linguistic reasons but simply because some proper linguistic constructions do not make empirical sense: we say *orange juice* but not *coffee juice*. The meaning of *juice* is roughly a liquid derived from a foodstuff (usually fruit or vegetable) by squeezing or pressing. This inevitably places restrictions on how the word is used, but it is not clear that we can connect such restriction to any larger "Ontological" pattern (compare to the similarities in analysis of where *hire* and *fire* may be used). The restrictions on *juice*, then, I would associate with the "microtype" scale. But *food* — as involved in being cooked, tasted, eaten, foraged, etc. — seems more general than *juice* but less general than *sentient thing* or *social institution*.

One motivation for distinguishing different "layers of granularity" for a linguistic type system is to identify principles of acceptability — including by defining triggers for *rejecting* acceptability. We clearly deem *many beer* as full-out wrong (rather than just an enigmatic usage that may have some context-specific interpretation). I would say that this is a *syntactic* anomaly; it would be evidently problematic even within a parse-graph representation, anterior to semantic or interpretive considerations. I would, however, say that — for example — "idea powder" is a *semantic* anomaly: we construe *powder* as a substance made from grinding some object, so we have an Ontological basis for rejecting the adjectival *idea* as a "kind" of powder (but the phrase is not *primia facie* malformed *grammatically*).[5] And I would say that *coffee juice* is *lexically* anomalous for reasons just articulated.

Corresponding, then, to the contrast between *syntactic*, *semantic*, and *lexical* anomalies, the overall partition of linguistic types into *macrotypes*, *mesotypes*, and *microtypes* allows us to classify the nature of the anomalies. Since speakers are motivated to *avoid* anomalies, this helps expose selective pressures which guide us to choose particular words and phrases. We can roughly classify these pressures into, most generally, a desire to be grammatically correct; then, a desire to integrate concepts in ways that are conceptually coherent, such as recognizing what facts can only be predicated of a person or a group of people; finally, a desire to use words according to lexical conventions that match conversants' expectations enough to not impede conversation. The macro-, meso-, and micro-type distinction provides a kind of holistic classification of the spectrum of considerations which factor into speakers' model of selection principles setting boundaries on acceptable usage.

According to this analysis, then, we tend to approach each word at three distinct levels. Concerning *dogs*, say, we are simultaneously aware of the macrotype status as a plural noun; of the mesotype status as sentient animals; and of the microtype status as canines that are (or could be) pets. We try to ensure that any usage of *dogs* "checks each of those boxes" — that it would agree with addressees' sense of propriety on all three levels. In light of my earlier discussion of "propagation", moreover, these considerations propagate outward to phrases (and also to pronouns, say). All of the usage rules we instinctively apply to *dogs* we would by default transfer to *black dogs*, *neighbor's dogs*, *barking dogs*, and so forth.

This last point indicates that we need to track the provenance of type-expressed specifications across a parse graph. I have in mind cases like:

- (173) My neighbor fired her dog-walker.
- (174) My neighbor's dogs fired their dog-walker.

The second reveals a "mesotype-level" anomaly (since dogs do not fire people in any not-seriously-metaphorical sense). In a Dependency Grammar wherein *dogs* (that specific lexeme) is the subject for *fired*, this specification — *fire*'s subject must be a person or people (a multi-person institution) — would be directly manifest in the verb/subject relation. The verb, as the head, establish syntactic and semantic requirements which the dependent must obey, on pain of anomaly. In my proposed representation, however, the actual word-relations for-

[5] There is a website of puzzling Chinese-English culinary translations which presents the name of one dish as *Napoleon fries the idea powder* (which explains this example's provenance; I wasn't creative enough to conjure it mysef). That site also mentions *France many privates*, *The bureau swallows to take the fish idea powder*, *Butter many privates*, and *The bureau pig chooses the rice*.

mally modeled depend on transform order: so in (173) the noun-phrase *neighbor's dogs* results from the transform *neighbor's*, so that becomes the node connected to *fired*. The dog's-can't-fire anomaly therefore is not expressly visible in the diagrammed word-pair, but must instead be inferred from how specifications on *dogs* propagate to *neighbor's* insofar as the latter modifies the former.

I think this analytic indirection is actually more theoretically warranted than the alternative: type-expressed (i.e., macro-, meso-, or microtype-level) specifications are more properly seen as concepual patterns which traverse parse-graphs (to the degree that they model, with some analytic restructuring, the conceptual processes of sentence-understanding) rather than as localized rules tested in isolation (e.g., with respect to one word-pair). This point leans toward broad themes of how parse-graphs model the holistic integration of conceptual features of different varieties — usage requirements but also extralinguistic context, illocutionary intent, anaphora resolution, etc. — and how our dispositions and beliefs about the current discourse state propagate across linguistic structures (as modeled by parse graphs). I will turn attention toward these more holistic issues in the next section.

4 Hypergraph Grammar and Conceptual Spaces

This section will focus on one attempt to formalize Conceptual Space Theory as a paradigm for both semantics and syntax, and amenable to computational analysis. I refer specifically to Coecke *et. al.*'s model based on Hypergraph Categories [2], whose motivation, I would argue, is somewhat comparable to my focus on *cognitive transforms*. In particular, their hypergraph structure invokes the Category Theoretic sense of *morphisms*, which are taken as the foundation of semantics: each word is construed as a morphism in some semantic Category (using this term in a mathematical sense, not related to "lexical" categories). This applies also to nouns (and *sentences*, analogous to what I call *propositions*, embodied in finite clauses rather than words). The Coecke *et. al.* model marshals a feature of hypergraphs wherein we can define (direct) edges which are not (on one side or another) connected to any nodes. In conventional graphs, each edge connects exactly one node on eiher side; for hypergraphs, however, the *head set* and *tail set* of edges' nodes can be of varying sizes (including empty).

When applied to morphisms in Category Theory, this means that hypergraphs can model morphisms with outputs but no imputs, and vice versa. Applied to linguistic data, input-less morphisms become nouns, and output-less morphisms become propositions (qua macrotype, using my terms). There is a good cognitive rationale for this approach, at least if we want to treat words not only as linguistic artifacts but as, in some sense, names or triggers for certain intellectual processes. A noun, we might say, enters into the discursive space as the "output" of a cognitive process — an act of recall and situating whereby we consult the word's lexical meaning and figure out how it applies in the current context. Parallelwise, a proposition can be treated as the final integration of linguistic data, which are "input" into our cerebral faculties. The point is that nouns have no *linguistically manifest* inputs — and propositions no manifest outputs in surface language, usually (except for cases like *I told you so*, in resolving the *so* referent) — but we can still plausibly treat these as cognitive processes which generate outputs or take inputs, respectively.

With this added structure, all linguistic elements can be treated as interconnected via crossovers between inputs and outputs: when nouns are modifier targets, we can envision them as mental procedures that "output" their nominal content; when propositions are transform outcomes, they are *inputs* to our cognitive machinery for synthesizing and contextualizing language artifacts. So the output-to-input link becomes common to all inter-word relations regardless of their lexical category. The resulting architecture, then, is similar to the notion of parse-graphs which I have developed under the guise of "Cognitive Transform Grammar". A sentence is a space of linguistic and conceptual "transforms" or "morphisms", which are interwoven via input/output connections: the output of one transform is the input to another. The network structure of these connections defines a flow of "information" or construal between different sentence elements. An example of "flow" in this sense would be specification propagation as analyzed in the last section: mesotype requirements transferring from *dogs* to *neighbor's dogs* or singular/plural specification carrying over from *beer(s)* to *beer(s) on tap* to *a lot of beer(s) on tap*.

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In contrast to Coecke *et. al.*, my orientation here is more explicitly cognitive: I see formal models as suggestive, summarial views on the structural articulation of mental language-understanding processes, rather than as logical distillations of semantic machinery. The linguistic literature on Hypergraph Categories (and similar mathematically-inspired methodology) has a tendency, in my opinion, to gravitate toward relatively context-neutral semantic constructions, and ones which do not require a lot of interpretive finesse. One of the aforementioned authors' more expansive examples, for instance, is the phrase *yellow bananas*, which they read in terms of (effectively) objective qualities of bananas (their taste, color, texture, and classification as a kind of fruit) in combination with the predicate *yellow* (also treated "objectively" as a region of color space). They argue that the conjunction of the two concepts yields a more specific concept analyzable, in some formal sense, as an intersection of the two — specifically, narrowing the set of bananas to those which are yellow (and not green) in color. They moreover set out mathematical formulae defining this concept-pairing in quantitative terms (not to imply that mathematical reasoning is part of semantics, I assume, but rather as merely a demonstration that certain mathematical principles in the superposition of spaces, suitably understood, have analogs in the scoping of semanticized concepts).

I question how far these quantitative models can go, since all but the most trivial concept-combinations seem to represent *selective* blending which is hard to picture mathematically. For instance, *fried green bananas* are not particularly green, and I am not sure how to "quantify" *fried* the way that we can assign *yellow* to a mathematically well-defined color-space (*hot*, *sliced*, and *crispy* are all concepts I vaguely feel are applicable to *fried bananas*; but I would dispute that *fried* is somehow a conjoined predicate of those three — instead the adjective seems to stand in for a complete idea, a clause, like *the bananas have been fried*). With this caveat, however, the hypergraph model of the structural "network" at play in a sentence does seem to remain a valuable paradigm, however we wish to model the concepts circulating through the structure. Given *imported yellow bananas*, say, there is certainly a sense that our conceptualization undergoes an accretion which blends the predication of *yellow* and of *imported*, and that output-to-input connections — the outcome of *yellow* qua modifier is input to *imported* — serve to suture the conceptualizations confirming that one specific ground-concept is being declared as *yellow and* as *imported* (instead of one yellow thing and another imported thing).

In hypergraph grammar, sentences' syntactic form defines paths which lead (in semantically meaningful ways) between words, so that paths are formed by output-input connections. Along these paths we find some conceptual content which gets progressively modified and elaborated. Coecke *et. al.* turns to Peter Gärdenfors's Conceptual Space theory for a semantic framework adequate for, in effect, how inter-word "paths" produce aggregate conceptual meanings. At the same time — perhaps to reiterate that this is a structurally organized process — they endeavor to define the transformations along such "paths" (in my terms) in mathematical terms. This is probably a good account of grammar's role in relation to semantics: syntax is constrained by the need, for each utterance, to impress on the hearer *the right path* to combine concepts appropriately. For instance, a path must join *imported* to *yellow* so as to fix that the yellow things (bananas) are also the imported things. So the broad outline of the Hypergraph-plus-Conceptual Space "project" is to use Conceptual Spaces as the conceptual terrain on which progressively more determinate significations can be defined, such that the need to convey that specific accretion of conceptual details defines the parameters and telos which engenders syntactic form. For each grammatically specified path among words on the syntactic side, there is a corresponding path within (a suitably expansive) set of Conceptual Spaces on the semantic side.

Intuitionwise, I believe this perspective aligns with (what I call) Cognitive Transforms; my point of contention, however, lies with (I believe) narrowly quantitative models of Conceptual Spaces. To make the syntactic-path-to-conceptual-accretion concordance applicable to the broad spectrum of linguistic phenomena, we need a more general, context-sensitive and nuanced picture of Conceptual Spaces, which can perhaps draw on the diverse literature varying Conceptual Space models as one branch of Cognitive Linguistics. I will now consider some potential features of such an expanded Conceptual Space Theory.

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4.1 Conceptual Spaces and Cognitive Grammar

Spaces such as color and taste, which have convenient representations in terms of axes and quantities, are recurring examples in Conceptual Space Theory. However, this theory has been applied to conceptualizations in many domains, including verbs and movement-patterns; spatial paths and configurations; scientific theories; and structural parameters in the context of computer modeling, such as markup languages (a specific "Conceptual Space Markup Language" has been formulated which allows conceptual details, according to tenets of the theory, to be asserted with respect to fields and dimensions within digital/computational data structures). As such, we should not be disinclined to consider possible Conceptual Space formulations even if, in some domain of semantic relevance, we have trouble finding quantitative parameters as clear-cut as, say, *hue*, *saturation*, and *value* in color space.

On the other hand, even in its branching directions Conceptual Space Theory does foreground the (minimally quantitative) notion of "convexivity", and show a preference for concepts which can be paired (or gathered into sets more generally) on grounds of magnitude in *some* sense: tall/short; around/across (see [3, page 13]), ancestor/descendant (or more generally defining the domain of kinship relations by degrees of relation and forward or backward in generation).[6] The cumulative effect is a system of analysis which foregrounds comparative boundaries between "competing" concepts (in the sense that borderline cases may be ambiguous between them) and/or concepts whose differences can be accounted for numerically in some property or domain.

I intend to extend this conception of Conceptual Spaces to place more emphasis on concepts' situational interconnectedness. Concepts are often paired up not in the sense of competing or dimensionally contrastive (e.g. tall/short) prototypes within some larger space, but rather in terms of *functional* connections: in general, for any given concept there is a family of interrelated concepts linked via co-operation in some situation. The concept *knife*, say, is inextricable from both a substance cut and a person doing the action; the concept *fried* inextricable from a foodstuff cooked as such and also a pan or pot where the food is placed while frying.

When highlighting functional interactions, several factors come to the fore. First, concepts are often delimited by their relation to *verbs*: functional relations are usually established on the basis of actions or events in which different constituents play different roles: the action of *carving* links the knife to the duck, or the chisel to the wood. Second, functional relations such as nouns to verbs (and by extension to other nouns) are dependent on situational context: for example, the culinary role of knives comes to the fore in kitchens and dining rooms; so our most common knife-conceptualization becomes properly "activated" in these settings. There are other contexts where we sometimes encounter knives (as weapons; as cutting tools for non-kitchen chores), and the knife "prototype" (to the degree that such a thing exists) is different in these contexts than the table knife for dining or the kitchen knife for cooking. So the first step in reviewing the conceptual "space" in which knives, say (continuing the example) are mentally situated, is to determine which context is appropriate.

A third observation is that, even when we can identify groups of interrelated and overlapping concepts, the contextual and functionalizing aspects seem more essential to assessing concepts' proper use than assessing boundaries between concepts which are "peers" in a sense. So *knife* can be contrasted with *axe*, *dagger*, *sword*, *saw*, *cleaver*, and *reamer*. We can find certain quantitative measures which help define the relevant conceptual differences: knives are shorter than swords, narrower than cleavers, with smooth or serrated rather than saw-tooth blades, and so on. Perhaps these comparisons are relevant to visual cues which condition us to recognize when some implement is a knife rather than, say, a saw (but context surely also factors in, because we *expect* to find a knife in a kitchen and a saw in a woodshop, not vice-versa). But our inclination to construe an object as a knife (or, by contrast, a fork, spoon, glass, or plate) is surely driven more by an anticipatory sense of how situations will be functionally organized. As we sit down to dinner, say, our mental map of the circumstance encompasses a matrix of expected components (the food, our place-settings, the different kinds of utensils). We are thus primed to anticipate certain specific objects, and perceived things in our surroundings fill in these preconceived slots. We recognize something as a knife because our situational intuitions up to that point prompt us to

[6] See "What is a domain? Dimensional structures versus meronomic relations", page 449.

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assume that knives will be among the objects present.

One question then is to consider how these contextualizing effects can be modeled in terms of Conceptual Spaces. One option is to consider different *times* of relations which a concept may entertain with a verb — directed perhaps by declension cases. A knife's predominant conceptual role is instrumental — the tool involved in situations where someone is cutting something. Occasionally *knife* may be in "patientive" relation to a verb (*I sharpened the knife*), or the subject of a verb, as in *This knife costs a hundred dollars.* A knife could be *locative* (*Nervously I fixed my gaze on the knife I was holding*, *A marble rolled on the table toward a knife*); but only in the generic sense that *any* physical object could potentially be the endpoint of a spatial path (there is no special conceptualization available via the locative analogous to *give* a gift *to* someone, or *avoid* some unwelcome outcome, or *skirt around* a question or topic).

We can repeat this exercise for many concepts: define contexts where they are often functionally relevant, and, for each context, identify typical actions and events (lending themselves to verb constructions) and the conceptual roles the concept in question may entertain relative to these, grouping roles according to construals not unlike grammatic cases (nominative, instrumental, agentive, patientive, benefactive, locative, *distributive*, etc.). This point is tangential to cases themselves, and morphology; however we can consider conceptually in what sense, interpretation, or circumstance something could be an *agent*, *patient*, *location*, etc. We might observe, for example, that instances of *nominative* or *distributive* conceptualizations for nouns seem most plausible when construing knives in the sense of commercial products (*Twenty dollars per knife (in a set)*).

A related (and somewhat overlapping) classification could be to consider concepts in light of different Ontological registers, or "modes of existing" — what earlier I referenced in terms of "mesotypes". For example, a knife is not usually construed as a *social institution*, but a particularly famous line of knives might be cited as a proxy for its maker (analogous to *This watch is a prestigious Swiss brand*). A knife would rarely or ever be deemed living, or sentient. Other noun-concepts, however, are more flexible: a newspaper, say, can be figured as object, place, or institution; also as a commercial item (*Sunday's paper costs five dollars*), a stretch of time (*The paper takes less time than watching the news*), an abstract textual content printed in each copy (*Today's paper has an error on page four*), an information source (*The paper has all the movie times*), something sentient (*This paper believes Warren is the strongest candidate*), or even metaphorically as a living being (*That paper has swallowed many small local papers*).

How a noun-concept fits in to a particular context can depend simultaneously on the sort of relationship it has to a verb *and* on the Ontologial register through which the concept is construed. The newspaper example shows a locative conceptualization in different registers:

- (175) His commute started an hour ago at the paper.
- (176) Her career started at the paper.
- (177) Start your weekend with Sunday's paper.
- (178) Socioeconomic research starts with your local paper.

I'll propose the term *meso-form* to capture the ideo of "Ontological register" as a factor in conceptualization — which facet of something's being-in-the-world, e.g. as place, object, or institution, is highlighted in a certain profiling. Meso-forms are then the conceptual parallels to mesotypes: a mesotype-level grade of classification brings together word-senses which derive from applying the same meso-form to numerous different lexemes or lexically entrenched concepts. Meso-forms and mesotypes thereby share the same order of granuarity; mesoforms are conceptual attitudes more specific than the uppermost conception of nouns profiling "obects" or verbs profiling "processes" (Langacker *Introduction* page 104), but coarser than the lexically established conceptualizations we learn for each sense of each word.

Aiming at a comparable spectrum of conceptual specificity/generality, I'll propose the term *case-form* to express the mode of conceptualization involved in treating a noun-concept in a specific relational role vis-à-vis a verb concept, with the idea that many of these "relational roles" reciprocate noun-cases. I contend that meso-forms and case-forms combine to supply a conceptualizing system, which fills in details readied for completion within the aegis of a given verb (establishing the functional nexus through which concepts are construed) in a given (empirical) context. That is, I envision a framework where contexts, verbs, case-forms, and meso-forms combine (in order of increasing determinateness) to zoom in on specific conceptual senses and interpretations called

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for in a given linguistic context. I'll dub this the "`CVCM`" model.

The interpretations engendered by `CVCM` construe situations via networks of functional relations; and I assume that a large part of conceptual semantics lies in *which* relation a given concept is understood to fill. For example, a construction like *drive over the bridge* does not merely construe a spatial configuration; we understand *the bridge* to allow crossing over some obstacle which otherwise could make the described path impossible. So the foundational belonging of *the bridge* in this signification is the functional one of supporting/enabling the verb-subject to do the verb; the specific spatial arrangement connoted by *over the bridge* is a matter of detail, but not the crux of the concept. Analogously, *I walked around the parked cars* figures the cars not only as a reference point for portrayal of movement, but as a functional impediment which creates a situation where a subject has to functionally compensate against the obstacle.

Taking this last example further, I would say that functional "attitudes" inform even the most straightforward-seeming spatialized language. Consider:

- (179) I walk past the paper on my way to work.
- (180) I walked from the library straight to class.
- (181) I spend time around that sculpture every weekend.
- (182) I walked through the door, which was unlocked.
- (183) It took us an hour to cross the border.

I read (179) as implying that the newspaper's building is in some sense an "aide" to the speaker's walking — it may help orient her, or perhaps walking the sidewalk beside an office building is more convenient than walking other routes (past stores or transport stops or whatever, where the streets are more crowded). In (180) *the library* is presented as a spatial origin, but the larger point seems to be that the speaker transitioned between two activities (e.g., studying in the library and attending class), and the spatial movement was the concrete implementation of this functional transition. The functional framing predominates, I think, more than the spatial: if the library is fronted by a lion sculpture we would not expect *I walked from the sculpture straight to class* even if this describes essentially the same trajectory. In (181), though, we interpret *the sculpture* as a site of activity (I'm thinking of those landmarks where people congregate, play music, drink booze disguised in coffee cups, and so forth). Both (180) and (181) feature their landmarks not only as places but as sites of activity, which lends them a functional (not merely spatial) role. In (182), the most likely interpretation is that the speaker both *opened* and *walked through* the door, the latter playing the functional role of affording access into a building (not just the spatial status of a boundary between inside and outside). Likewise in (183) we understand *the border* not just as a geographical divider but as a functional barrier where nations can deny entry, thereby framing the border as a *process* since peoples' entry has to be authorized. See:

- (184) The border took an hour.
- (185) The border is closed.

Neither construction makes sense for *border* qua one-dimensional spatial boundary.

I believe we should emphasize the functional-network dimension of concepts when applying both Gärdenfors's Conceptual Space Theory and Langacker's theories of domains and of spatial schema. Functional considerations are relevant even in what may seem like the most phenomenologically elemental domains, like space (as the preceding examples suggest) or color. I will expand on this later in the section.

4.2 Case-Forms and the Semantics of Verbs

In his *Geometry of Meaning* [4] Gärdenfors suggests that Conceptual Space Theory "can be seen as combining frames with prototype theory" (page 49), referring to "semantic frames" in the sense of Charles Fillmore's case grammar. Gärdenfors suggests however that "by highlighting the geometric structure of the relevant domains, one obtains a richer way of modeling various semantic aspects". So "ideas similar to frame theory turn up in the conceptual space analysis of the meanings of verbs", but Gärdenfors suggests that by identifying "geometric structure" operative in verb semantics, his theory adds greater detail to an underlying case grammar framework.

It is true that merely notating which situational roles are played by various objects — by various *participants* in a focal *process*, to use terminology aligned with Langacker's — does not get very far toward a thorough

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semantic analysis. Expressing *cut with a knife*, say, introduces the knife as an instrumentive participant, but we still need to account for how conversants ascribe *meaning* to the clause once the instrumental (plus nomitative and accusative) roles are marked. Gärdenfors fills in some analysis via his analysis of the "structure of events" which then engenders a theory of verb-meanings; in particular, Gärdenfors focuses on the agent/patient relationship and the structure of the agent's effect on the patient. His theory concentrates on two parameters structuring verbs' applicability to situations: a contrast between "force" and "result" and a proposal that verbs profile changes in "single domains". The force/result contrast can be seen in *cut with a knife*, say, where the *force* vector is signified as applying pressure against the patient, through the sharp part of the knife (the blade-edge); and the *result* vector is a path through a "state space" which is the rationale for the cutting. If, say, we cut a whole baker's chocolate block into smaller pieces, the state-change corresponds to the size of each piece being smaller (while the number of pieces increases).

The force/result distinction certainly seems relevant to how many processes (and so the verbs that profile them) are construed. Gärdenfors's "single domain" thesis seems plausible but not without counter-examples: for me, say, *explode*, *collapse*, or *melt* each suggest several dimensions of change. If something *explodes*, we tend to expect an *upward* and *outward* force and also something like fire, heat, or igniting. If a car bursts into flames but stays mostly intact, we would say that it *caught fire* more readily than *exploded*. If, conversely, a car is broken apart (in an accident, say), we might say it *was destroyed*, not that it *exploded*. Granted, "explode" implies an internal force breaking something apart and pushing the parts outward; but *usually* the force is also driven by "fire" of some part; the verb seems less apropos in the case of a bottle broken apart by the internal pressure of *freezing*, as when someone accidentally leaves a glass water bottle in the freezer.

Likewise, *collapse* implies a trajectory both outward and downward: an explosion *upward* would not be described as a *collapse*. But an orderly descent, without the effect of breaking apart and parts scattering, would not be a *collapse* either; we would say *the elevator descended to the lobby*, not *the elevator collapsed on the lobby*. Similarly, *melt* implies that something (chocolate, say) is both being heated and changing shape; melted chocolate is both warm (while it is melted) and liquid. Relatedly, if I say that liquid in a pan has *cooked away* or *cooked off* I imply both that the liquid was heated and that the amount of liquid has diminished. There is of course a *physical* connection between these phenomena: heat turns solids into liquids, and causes liquids to evaporate; but I question whether this physicalistic correlation automatically drives the verb to encompass both aspects of the change. After all, other verbs seem to profile one dimension and sideline the other: I could say that a sauce *boils*, foregrounding its temperature increase and leaving implicit, if anything, the fact that some liquid might evaporate; or conversely that a sauce *reduced* or *thickened* without thematizing that heat and evaporation was the power behind that process. In that case *cook away*, *cook down*, or *cook off* appears to merge two dimensions of change which are separable insofar as other verbs profile one or the other.

Along the same lines, the force behind a bridge collapsing (say) could be seen as a vector pushing both down and outward, so the two facets of the bridge *falling* and *breaking apart* are manifestations of one underlying impetus. Here again, though, I am more convinced by the analysis that we hear the verb profiling two aspects of change which are independently construed and assessed: the fact of the bridge being no longer elevated and the fact of its being ruptured or broken apart; these carry distinct consequences and visual schema. The case for verbs in these examples profiling a process split across at least two dimensions, instead of one hybrid dimension, seems stronger than the converse. Such arguments do not refute Gärdenfors's point that verbs *most often* profile one single dimension of change; but they do reveal this as a tendency rather than a structural invariant in verb meanings.

The motivation behind Gärdenfors's "geometric" elucidation of verb meanings appears to be one of isolating a matrix of parameters by which individual verbs may be classified. Insofar as verbs profile changes which can be rigorously modeled as changes in some state-space, we can give a formal representation of verb meanings. On the other hand, if we consider the full spectrum of participants to verb-profiled processes — not only agents and patients but instruments, benefactors, locations, and so forth — it seems plausible that certain prototypical roles are simply entrenched as lexical features in normal usages. For example, most people first become acquainted

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with knives through cutting food at a dinner table (or a kitchen). Hypothetically, then, the *instrumental* role of a knife in certain specific cutting scenarios — in terms of where and to what ends it occurs, and what substance is cut — is a paradigm which dominates other contexts. Therefore, pairing *knife* as as instrument with *cut* as a verb activates a lexically entrenched notion of "cut" (and of *knife*). To the degree that this pairing serves as a kind of para-lexical gestalt, our automatic activation of the relevant situational "frame" arguably precludes our cognitively attending to the force-dynamics involved in the cutting process.

Recall my proposal that in expressions like *cut ... with a knife* I consider *with* a two-stage modifier, which both modifies *knife* (signaling that we should construe the knife in its guise as an instrument, and not, say, an accusative like *sharpened/polished/bought the knife*) and then modifies *cut* (adding the detail of the instrument used for the cutting). The *with/knife* relation (along with *cut/knife* for context) is then a transform which concretizes how the concept *knife* fits in to the relevant expression: we have to "activate" a proper sense of knife as *instrument*; not agent or patient, or even location or benefactor, etc. (cf. *a bug crawling on the knife*, *my gaze was drawn to the knife in her hand*, *a sheath for the knife*). In general, a verb's relation to a process participant triggers a reconceptualization of that participant, depending on its participatory role.

Gärdenfors's Conceptual Space theory of verbs provides us with a structural framework for modeling the logical (or "geometrical") parameters of such participatory roles. I would question, however, to what degree lexical conventions simply preempt our cognitively exploiting such logical structure as a vehicle for elucidating verb meanings (through the network of process-participant relations forming a complete clause). A further complication is that we often conceptualize processes in relation to other processes: we cut food, for example, so as to more conveniently eat it. Or, we open a bottle of beer so as to drink it. If I open a bottle, or see someone else doing so, I am usually only dimly aware of the actual direction of force and movement whereby the cap is extricated from the bottle. I am more engrossed in the anticipatory protention of grasping the opened bottle and drinking from it.

It is possible to open a beer bottle without a normal bottle opener — with a hammer, say (using the head, on its side, as a pivot). When someone does so, they have not suddenly expanded the lexical network for *hammer* such that the sense *bottle opener* is now one usage. But nor are they applying force-dynamic rules to authorize the applicability of the verb *open*. The more proper gloss on the situation is that there is not very much going on linguistically at all, especially if the action occurs without social interaction. If I am alone, thirsty for beer, wanting a bottle opener but not a hammer, and open the beer with the hammer, almost all my reasoning is extralinguistic (although my deliberations might be spurred by inner dialog — *hmm, where's the bottle opener ... I can't find it ... what could I use to open the beer*?). I certainly am not attending to the semantics of "open" while I endeavor to open the beer with the hammer.

The force/result-vector distinction has some relevance here, too, but I find it mostly an extralinguistic relevance. I need to apply force to the cap to pry it away from the bottle, and the result of that action is the bottle's state changing. I am not necessarily *thinking* about this process with any rigor, but more likely "feeling" it kinaesthetically — I have to position the hammer-head at the right angle and then pull upward in the right way, so the process demands a proper manual gesture executed with the right fine-motor maneuvering, so it is an "embodied" faculty more than a cognitive one. To be sure, once I succeed — and also before I even attempt the gesture — the situation falls into certain linguistic glosses: *I need a way to open this bottle*; *This bottle is now open*. The force-dynamic and result-vector specifics of the process through which the bottle *was* opened presumably influences my proclivity to mentally summarize the situation as *the bottle is now open*.

Still, the significance of the verb *open* here seems mostly to summarize, or provide mental access to, a fundamentally extralinguistic plane of reasoning/experience. In this sense I think we need to be careful about how we posit Conceptual Spaces as building blocks of *semantic* analyses, in which we pursue the *linguistic* derivation of compound meanings from conventionalized smaller units. Semantics is distinct from merely inventorying a lexicon, because the assumption is that lexical elements are arranged in novel combinations to signify non-conventionalized ideas. A good example of "novel combinations", of course, is finite clauses where a verb is paired with multiple participants and roles — agent

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and patient, along with various other roles exposed via "case-forms".

We should concede, however, that sometimes the situational details of participants' roles is established mostly *extra*linguistically. If I cut a piece of meat, my attention is perhaps occupied by anticipation of the subsequent process, eating the bite-size pieces: to flesh out the meaning of *cut* in terms of the force and result vectors can distort the play of conscious awareness, where the parameters of one current process are mentally subsumed under the pragmatic links tieing one process to another. In this case, I consider the act of cutting most specifically as an operational precursor to the act of eating. Conceptually, then, *cut* as a verb profiles this point in a multi-process practical chain more than it profiles the precise mechanics behind its process per se. Likewise, *open* in the sense of opening beer with a hammer essentially (on my reading) provides mental access through one lexeme to an almost entirely extralinguistic form of reasoning. And, perhaps in an opposite direction, certain usages (like *cut* when the instrument is a knife, the patient is food, and the agent is someone cooking or eating) are so conventionalized in word-meanings as to be lexical phenomena more than semantic ones.

In short, I would argue that in many cases the "semantics" of verbs is preempted: either our construal of verb-to-process-participant relations is lexically entrenched and, as such, not a matter of semantic construction; or, the verb merely proxies for extralinguistic modes of awareness; or, we reason through individual processes in networks of functionally related processes rather than through granular awareness of the parameters of one process in particular. What this means is that a potential Conceptual Space analysis of verbs is only a *semantic* analysis in certain circumstances, where lexical, functional/pragmatic, or extralinguistic considerations do not *pre-empt* an actual *semantic* integration of multiple verb/participant relations. If we suggest that verbs are modeled via Conceptual Spaces through an agent/patient connection — that the agent and patient are "points in" or somehow semantically grounded within their respective Conceptual Spaces, and the agent/patient connection merges these spaces — then this "double-space" theory is only a *semantic* analysis of verbs to the degree that the juxtaposition of the two spaces is a *linguistic* construction, one that bears its meaning through a logical interconnection between spaces that yields a point or a path in a hybrid space.

The idea of using Conceptual Spaces to model linguistic *constructions* is perhaps more simply illustrated not with verbs but with, say, adjective/noun constructions. To say *red apple* is of course to combine two different predications, one that something is an apple and the second that it is red. As a *semantic* theory, moreover, we would want to say that this combination is "generative"; that it allows for the expression of novel ideas. Arguably *red apple* is semi-entrenched as a phrase in its own right (like *red hair* or *green apple*), but we could readily vary the example, to, say, *purplish apple*. This is *not* a lexically-entrenched usage. As such, its meaning is somehow compositional: it derives from a structured combination of the meaning of its parts, in some rule-governed manner.

Conceptual Space Theory would like to offer an account of *how* compositional meanings like *purplish apple* are synthesized, by considering the compound expression as a juxtaposition of distinct conceptual spaces. This means that compound meanings can be derived from semantics alone — *semantics* in the sense of a theory for how compound meanings derive from combinations of lexically-entrenched minimal units via the application of linguistic (syntactic and semantic) rules.

But even if we grant that compound meanings can involve the pairing of distinct conceptual spaces, we do not necessarily have a *compositional* theory of this "merging" of spaces. Note first that some combinations are entrenched in different ways. Even if we do not have specific conventionalized phrases like *red hair*, we may have a case like *cut*/*knife*, where the space-doubling — here the agent/patient relation and then the relation of the overall process to its enabling instrument — reflects a kind of originary scenario that grounds the lexical conventions of the words involved. The food/dining context is certainly the central pole of *knife* and arguably the central meaning, or one of then, for *cut*. And in other cases the integration of two conceptual spaces triggers extralinguistic reasoning entirely, or is driven by an anticipatory and/or retrospective account of functionally connected processes, where the granular details of one process recede into the mental background. If we experience *cut* as preparatory for eating, then we tend to think of the process solely in terms of the end result of yielding bite-size pieces — the force-dynamics of the

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cutting process is not, in such cases, in the "zone" of semantic connotations we actively associated with verb. (In other scenarios, though, e.g. when we are stuggling to cut through something, the force dynamic may be foregrounded at the *expense* of other facets).

None of this is to dispute that force and result vectors, or Conceptual Space "merging", is a salient dimension of situations which are approached linguistically. My point is rather that space-juxtapositions marked via grammar are not necessarily semantic *constructions* whose *meaning* is extrapolated from some logical derivation on the spaces insofar as they are juxtaposed. Again, adjective/noun is a useful example. When we use color words (*purplish apple*), the usual implication is that the color names how an object *appears*, and typically describes the surface, or visible exterior (an apple is white or very light yellow *inside*). This is not a hard-and-fast rule. Of a white chocolate truffle dipped in dark chocolate, I might say *this is white (chocolate)*; I might say that a red velvet cake with white frosting (or a clear glass covered lamp with a reddish bulb inside) is *red*. In short, we *occasionally* use color words to describe the *inside* of an object, not its surface.

In short, even fairly straightforward "juxtapositions" of conceptual spaces are *mediated* by a play of lexical, situational, and extralinguistic conventions. The co-presence of two conceptual spaces may trigger extralinguistic associations, or may trigger entrenched lexical patterns. And even when we allow that a compound meaning emerges from the structural interplay of two spaces, we tend to follow some conventional outlining *how* one space is to be thought or predicated alongside another — in what *sense* an object is red, say (usually but not always a red *surface*).

This discussion I think complicates the idea of using Conceptual Spaces as a theory of semantic *constructions*: as a theory wherein the precursors to semantic meanings are "plugged in" to some Conceptual Space combiner and the "output", of a more complete meaning, falls out logically via some intra-linguistic process. Just as often, I claim, any word-pairing which may be theorized as a conceptual-space juxtaposition *triggers* some mental operation which is not strictly semantic — it may be lexical, or pragmatic, or extralinguistic, or some combination. I will explore this further by continuing to look at simple adjective/noun juxtapositions. Continuing an earlier thread, I will present some arguments that even simple-seeming domains like color have hidden complexities that prevent even the straightforward application of a color-modifier to a noun target can be read as a purely "semantic", *intra*-linguistic composition of meanings.

4.3 Functional Relations and Elementary Domains

Color may seem like a prime example of what Langacker calls a "locational" domain and of Gärdenfors's quantifiable structuration of domains: we have a total, finite, dimensionalizable space including all colors, and color-concepts refer to regions (maybe "convex" regions) in this space. However, I am going to argue that even color is more complex than it seems, and that we need to approach color-concepts on functional terms.

Consider real-world situations where color concepts are situationally meaningful (and potentially then expressed linguistically). The most prototypical such situation, perhaps, is using color to help identify something:

- (186) Please hand me the red scarf?
- (187) Have you seen my orange coffee mug?
- (188) Your keys are on the blue table.
- (189) My purse is the black one.
- (190) The yellow column shows last year's data.
- (191) On the mantle was a purple vase.

Color words have a functional purpose, in these cases, of selecting one object from its peers (assuming there are multiple purses in (189), multiple scarves in (186), and that the speaker has different mugs in (187)). It is also possible that the color designation helps the addressee to pick out a designated object in a cluttered visual field, even if there is only one scarf in (186) or one table in (188). In either case, color terms fashion a succinct description of some focal object's surface appearance to help the conversants synchronize their visual attention. The functional purpose of the color-concept is to guide listeners to *that particular* object which the speaker is emphasizing.

In that vein, there are many different descriptive strategies which a speaker might choose to similar ends: maybe *wool scarf* in (186), *glass table* in (188), *chipped mug*

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in (187), *gift purse* or *strapless purse* in (189), *middle column* in (190), or *antique vase* in (191). These obviously involve concepts distinct from color, because they address fundamentally different facets of the object's composition or provenance. However, even if we construct *color* conceptually as a device for individuating objects through the visual properties of their surface, there are still a spectrum of color *patterns* which play an analogous role:

- (192) Please hand me the plaid scarf?
- (193) Have you seen my green-white-orange coffee mug?
- (194) Your keys are on the checkerboard table.
- (195) My purse is the striped one.
- (196) The cross-hatch column shows last year's data.
- (197) On the mantle was a spiral-pattern vase.

I am not convinced that there are functionally viable reasons for treating colors as a separate domain from "patterns" in this sense. Is true that we have a larger inventory of color-words than pattern-words, but this may be due to difficulties in "stabilizing" pattern concepts — to identify which patterns are sufficiently similar or dissimilar enough to warrant being subsumed under one concept (or not). Not that there isn't a certain "language" of visual pattern forms, in terms of symmetries and displacements (*striped* and *checkerboard* patterns have translational symmetry along one or two spatial axis respectively; other patterns have radial or reflectional symmetry — a "polka dot" pattern has double-translational symmetry holistically but radial symmetry for each "dot"). We could conceivably quantify a certain pattern-space by identifying the relevant symmetry modes and their geometric measure (as in, the width of the stripes in a striped pattern measures the amounts of translation where the symmetry is efficacious). However, this putative space does not seem to capture all visually meaningful patterns, nor lend itself to obvious partitions into convex regions that would undergird distinct pattern-concepts.

We could nevertheless present something like this analysis to explain the pattern-words which *do* exist, which appear to describe patterns that are readily recognizable and also readily distinguished from others. This suggests how lexical entrenchment depends not only on some plausible conceptual ground for a distinct lexicalized concept, but also on the practical facility for this concept to play against the dynamics of usage-selection: we favor concepts which drive selective pressures to choose their lexeme in *some* contexts and equally to pass it over in *others*. Only certain pattern concepts appear to be very useful once such dynamics are taken into account (*striped* is perhaps the only spatial-pattern word in frequent English usage). By contrast, several common color words are valuable within this dynamics, and more precise color words work similarly on the assumption that speakers, in the contexts where such words are used, face selective pressures to name hues more exactly.

I think, then, that the dynamics of usage-selection and the merits of words having clear usage criteria can explain the proliferation of color words (as well as their relative popularity), and also the paucity of words for visual patterns. On the other hand, I find this analysis pointing toward an account where colors and patterns are both part of a larger domain which is functionally active in the context of distinguishing objects by their surface appearance. Within this larger domain, colors more than patterns have in general become entrenched via individual words (although we can profile a wider inventory of patterns with descriptive phrases). Indeed, Gärdenfors's point about concepts typically being grounded in "convex regions" within a domain seems apropos and explanatorily useful for comparing entrenchment in the context of colors versus patterns. But I find this more an analysis of its lexical entrenchment than of the domain itself; and the tendency of color-concepts to be "lexicalized" more readily than pattern-concepts does not strike me as a compelling reason to separate colors and patterns as *different* domains. Indeed, we can see solid colors as one sort of pattern, differentiated not by geometric structure but by the phenomenal distinctness of their color qualia.

These arguments notwithstanding, there are conceptual contexts (not just singling out objects of interest) where color-concepts are functionally salient. Sometimes we do want to focus attention on a specific color hue for aesthetic reasons. But here also I believe the color domain co-exists with other sensate qualities that become conceptualized — in particular, optical attributes like *shiny*, *sparkling*, *glittery*, *polished*, *lustrous*, *glistening*, *glowing*, *iridescent*, *opalescent*, *translucent*, etc. When we focus in on the aesthetic feature of a specific color, it is usually not only the given hue that creates an experientially resonant effect; instead we appreciate how

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light plays with or saturates the colored extent, creating visually pleasing effects. Unlike patterns, our descriptive focus in these situations lies with optical virtues borne even by small spatial regions, so we can focus in on one colored region even if the larger object's surface has different colors on it. We do not, that is, normally profile larger patterns in the conceptual attitude of aesthetically foregrounding the visual pleasure evinced by a particular interaction between color and light. But these aesthetic qualities are still not, in my mind, born by color alone, but rather by color in combination with optical properties: the beauty of a vase's purple cannot be phenomenologically separated from how its glaze reflects light; or the beauty of a glass's red from its semi-transparency.

To marshal color-words as naming concepts in this aesthetic-optical sense, then, I believe we need to extend colors into a larger domain also comprising optical concepts like *shiny* or *translucent*. The color-plus-optical domain is different than color-plus-pattern, but this difference reflects the functional divergence in their use-contexts. It is also true that optical attributes could be used to individuate objects (*the shiny handbag*). I think this is a departure from the functional *rules* in force for the color-plus-pattern domain for object-selection: in *shiny handbag* we are using a visual quality as a discrimating feature, but so too in *large handbag* or *round handbag*; the point of *red handbag* or *striped handbag* is to promote as discriminant a concept instantiated by the object's surface, figured mostly as a whole — we are less likely to say *striped handbag* if actually only one small patch or logo is striped. But *striped* is also a property that is naturally predicated of the whole, so being a general characterization of something's *whole* surface seems conceptually intrinsic to *striped*; whereas *shiny* is predicated of surface regions on multiple scales, so that "holistic" element is not essential to the concept.

Another way to say this, using Langacker's terms, is that *striped* is a "configurational" property whereas *shiny* is not. But in this sense color concepts, when used to generally classify objects by their surface appearance, is *also* configurational, because using *red* as a discriminator in *red scarf* only makes sense if most of the surface is red. The implicit rules of using color-concepts to identify objects, then, involve the named color being extended completely (or almost so) over their surface; we create an expectation of the configurational relation between the color and the boundaries of the relevant surface. So the color domain, at least in this anticipatory sense, is configurational in the color-plus-pattern case but not in the color-plus-optical one — which makes sense if we agree that *patterns* are configurational whereas *optical qualities* are not.

Meanwhile, there is a third common use-case for color words as selectors among some restricted set: red and yellow cards in some football codes, say, or *black* and *white* in chess. Here the actual colors are only cues to conceptualization which may not even match actual appearances: with a chess set whose black piece were rendered as red we would still say *black queen*, not *red queen*. Here the functionally relevant domain is not colors "plus" anything, but a small enumeration selected *from* colors. In these smaller domains, most of the quantitative structure available in the larger domain comes out of focus: we do not really think about colors as more or less similar, or darker and lighter, when we are using a choice-space of colors as a fiat grouping device.

In the spirit of these treatments, then, there really is not *one single* color domain; instead there are numerous domains which involve (but are larger and smaller than) colors, each domain applicable in distinct functional contexts. I also believe that color concepts "migrate" across these domains: I do not think that *red* is a different concept when it can contrast with *striped*, as compared to with *shiny* or only with *yellow*. Instead, I think that their ability to manifest via one or another domain is part of the conceptual specificity of colors. To be sure, this means that color-concepts belong to both the color-plus-pattern and color-plus-optical domains; as a result, the "dimensional" structure of the color pyramid (treated as a domain in its own right) has some analytic value. It windows onto features of color-space which allow colors to "migrate between" domains in their particular ways. But I do not see this domain as a defining parametrization of color-concepts; instead, we need to characterize concepts across all domains where they may be situated in one context or another.

From this perspective a *domain* is not the ultimate origin of concepts but a specification which fleshes out context in specific functional contexts. We should characterize color-concepts, for instance, in light of the `CVCM` model I proposed earlier: where does a color attribution fit into the interplay of noun-roles, verbs, context, and

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construals which define the functional network relevant to each situation? Note that in the color-plus-pattern domain concepts are usually adjectives, so they tend to be characteristic or supplemental details posited of their accompanying nouns. In their more aesthetic, color-plus-optical guise colors can also be subjects (*This brown would be perfect for the living room*). But the specific domains through which color words have information-bearing content depends on their "functional-network" context. What makes a concept communicationally effective is an understanding of what propositional content inheres in citing specifically that color: *red card* in football endows the *red* with a different propositional specificity than in *red scarf*. To recognize the information being suggested via a color-word it is necessary to overview the spectrum of concepts which *could* be invoked — not necessarily just by a single word — from its relevant domain. And that space of variation depends on *which* domain is "activated" in the presence of a given `CVCM` structure in the surrounding discourse.

This notion of domains being *activated* suggests how I am treating domains as emergent specifications dependent on a given functional/context background, not as the paleo germination of concepts. This appears to deviate from the tenets (if not as much the formal models) of conventional Conceptual Space Theory, but it is also a point I would emphasize as an addendum to Langacker's theory of domains. With respect to "meronomic" domains, for example, Langacker sees part/whole relations as bases for domains wherein the domain of a finger, say, is a hand; that of a hand, an arm; etc. In these mereological orderings, Langacker seems to argue, one level of scale provides a conceptual "scope" for its immediate successor (in the whole-to-part direction); so *hand* is a scope for *finger*, which is a scope for *knuckle*, while *arm* is a scope for *hand*.

> To some substantial (though undetermined) extent, therefore, concepts form hierarchies of complexity, such that concepts at one level are presupposed by those at the next higher level. To properly characterize a particular notion, one must invoke appropriate levels in the relevant hierarchies, i.e. whichever levels make available those concepts by means of which a characterization is easily and naturally achieved. [6, page 148]

> For a given expression, degree of embedding correlates with degree of foregrounding and directness of mental access. *Knuckle*, for instance, provides direct mental access to FINGER (its immediate scope), which in turn evokes HAND, and so on. The conception of a finger, a hand, an arm, and the body as a whole all figure in the meaning of *knuckle* but lie progressively farther in the background. [para] This layering has various linguistic manifestations. To take just one, a part can often be labeled by a compound: *fingertip*, *ear lobe*, *eyeball*, *toenail*, *bellybutton*, *kneecap*, *thigh bone*, *door knob*, *window pane*, *toilet seat*, *piston ring*, and so on. A noteworthy feature of these compounds is that the component nouns represent adjacent levels in a whole-part hierarchy. ... We can therefore speak of a *door hinge* or a *hinge screw*, but the same entities could hardly be referred to as a **house hinge* or **door screw*. (page 65)

This theory of "meronymic domains" therefore is centered on the thesis of mereological parts providing "direct mental access" to their hierarchically "adjacent" wholes (but less so to more distant wholes).

Without disputing this analysis as a point of fact, I would add more of a functional focus: we tend to conceive situations at a level of scale appropriate for our immediate concerns. If we are bandaging a cut knuckle, we focus on that layer of anatomical partonomy; if we are putting a ring on someone, we focus more on the finger that will hold the ring. We do not "put a ring on her arm". We may be cognizant of the finger as a whole to which the knuckle belongs if we have to maneuver the finger somewhat to apply the bandage, in the first case; and we may be aware of the hand if we need to lift it in a certain way to slip on the ring. So the whole provides a certain contextual framework for the part (while "still larger" wholes, like the arm, less so). However, these are not just economies of conceptualization: in practical tasks the immediate wholes are kinaesthetically, operationally, and so forth, more likely to be enactively relevant. So the patterns by which conceptual focus distributes largely in accord with mereological ordering has, I believe, a functional origin: we build conceptual blueprints for situations in anticipation of, or with feedback from, our enactive purposes.

In Coecke *et. al.*'s *yellow banana* example, the noun *banana* is characterized via a conjunction of quantitative

domains — particularly color, texture, and sweetness. Since this is a demonstrative example, we should not read too much into its simplicity; however, one open question is whether the dimensional predicates are simply properties asserted *of* (say) bananas, or are a *definition* of bananas. The authors actually say:

> The subsets of points representing tastes are explained as follows using the case of banana as an example. Bananas are not at all salty ... and therefore [a "salt" parameter] is set to 0. Bananas are sweet, and therefore the [maximum] sweet is chosen as an extremal point in the set of banana tastes. Bananas can also be somewhat but not totally bitter, and therefore the point [1/4] sweet [and 3/4] bitter is chosen as an extremal point. Similarly bananas can be a little sour, and therefore [7/10] sweet [and 3/10] sour is also chosen as an extremal point. Finally the convex hull of these points is formed giving a set of points corresponding to banana taste.
>
> Note that here, we are using *banana* and *apple* as shorthand for specifications of convex areas of the conceptual space. These could be written out in longhand as sets of inequalities within the colour and taste spaces. [2, pages 16 and 18]

The first passage here is based on a "taste pyramid" whose extremum points are salt, sweet, sour, bitter. Thus the taste and color of a typical banana can be mapped to points in both color and taste space (via such dimensionalizations); and plausibly the spectrum of possible banana colors and tastes defined via *regions* in these spaces. However, there are probably other fruits with similar flavor and color profiles which are not bananas. Defining "banana" and "apple" as "specifications of convex areas of the conceptual space" would seem too broad, because it implies that fruits which overlap in these profiles are conceptually identical.

Granted, though, the point of that example is a compact exposition; perhaps we can add further dimensions (shape, size, etc.) which more rigorously single out the *banana* and *apple* concept. This still raises the question of how well a concept (even if sufficiently detailed) encapsulating "banana-like" qualities is actually a concept of *banana*; I think most people would agree that bananas are ultimately defined through taxonomy and (in light of modern biology) genetics (although conversely most people fluent in the "banana" concept do not know the relevant scientific details). In any case, we should not proceed from the fact that certain dimensional structures inform predicates which are often *attributes* of concept-instances, to the assumption that we can *define* the concept by a sufficiently detailed admixture of dimensions.

By way of illustration, one dimension we associate with bananas in some context is cost. By analogy, when viewing an old vase in an antique store we can appraise it through a matrix of dimensions, including width, height, color (or pattern and/or optical properties), age, price, and perhaps "condition" (on a scale from damaged to "like-new"). It is not clear which of these dimensions should be deemed intinsic to the vase-concept (or equivalently the banana-concept) and which are relational properties relevant only in some contexts (like being *on the mantle*). Presumably bananas were the same fruit before there were people with monetized economies where every product has a point on a "price" axis — so cost would not seem to be an *intrinsic* dimension of bananas. But almost every dimension seems context-sensitive somehow: bananas have a different color when peeled, a different texture when dried or pureed, a different flavor when spiced, and so forth. So any "quality-matrix" itemized to capture the banana concept would need contextualizing caveats: consider the flavor, texture, and color of *unpeeled*, *raw*, *unseasoned* bananas (the fruit in the condition where you might buy it in a store). But in that case we could argue that in a *store* context, the price dimension *is* intrinsic. If there is no way to define dimensional parameters without providing contexts where those dimensions (with their relevant bounding regions) are applicable, then we undermine the premise that some dimensions and not others are conceptually intrinsic.

For such reasons, I believe that we should treat dimensional structures as context-specific predicates *of* concept-instances (thereby associated with concepts), rather than bases for defining concepts in the first place. Various domains pertaining to a concept can be "loaded" as contextually relevant insofar as we apply the concept within a given situation. For sake of discussion, I will use the term *variational domain* to indicate domains which have some quantitative or enumerative structure — similar to a "Quality Dimension" in Conceptual Space

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Theory ([1, page 5]). The "space of variation" in these domains is responsible for the information content borne by a concept — the red card is meaningful because it is *not yellow*, so the red/yellow contrast (not overall color space) provides the parameters which gives the predication its facticity. When we buy a banana from a store, the domain of *price* (which has a variational structure involving dollars and cents, say, among positive decimals to two places) becomes an active participant in our construal of the circumstances. Whether or not this domain is intrinsic to bananas in general, it *is* an intrinsic feature of bananas that, as a food commodity, they *do* invoke the *price* domain in the requisite commercial settings.

I think *variational domains* can play a theoretical role analogous, at least in many analyses, to Conceptual Spaces; however, I see variational domains not as conceptual backgrounds where linguistic operations occur, but as localized specifications attached to specific *points* in linguistic constructions. The Coecke *et. al.* model appears to render all linguistic transformations as morphisms against a preexisting (presumably very large) stack of domains:

> Consider again the sentence '*chickens cross roads*'. The nouns *chickens* and *roads* have type n and so are represented in some vector space N of nouns. The transitive verb *cross* ... is represented by a vector in the vector space N $\bigotimes$ S $\bigotimes$ N, where S is a vector space modelling sentence meaning. (pages 8-9)

In other words, this framework assumes "a vector space modeling sentence meaning", so that each noun and verb within the sentences are smaller vector spaces which, in combination, aggregate to the specific sentence (a *point* in that overall vector space). Their overall picture of how sentence composition relates to *meaning* is summarized as:

> Organize (conceptual) spaces into a category, the **semantics** category, with the same abstract structure as the grammar category [then] Interpret the compositional structure of the grammar category in the semantics category via a functor preserving the type reduction structure ... This functor maps type reductions in the grammar category onto algorithms for composing meanings in the semantics category.

Here, "type reduction" reflects the idea that a verb transforms a noun to a sentence, so that the pair of a verb and a noun, were it typed as a unit, "reduces" to the sentence-type (they express this in terms of "pregroups", which reflects the Categorial Grammar distinction between modifiers appearing to the "left" or "right" of their target; but abstracting this word-order detail we can generically talk of a modifier as akin to a "function" mapping one type to another). In general, though, the key notion is *pairing*, or in a mathematical sense "product": an intransitive verb forms a *product* with a noun, and the result "reduces" as a type (or in my terms a macrotype) to a sentence or proposition.

Coecke *et. al.* then envision products in "meaning space" which reciprocate the pattern of word-pairing defined grammatically. Note that the specific proposal is only that "type reductions in the grammar" map *onto algorithms for composing meanings in the semantics*: in other words, from this language in isolation, the establishment of a word-pair via syntactic structure only triggers an "algorithm for composing meaning". Given *barking dog*, say, syntactically deducing that the first word is intended to modify the second yields an *algorithm* for us to conceive the dog as barking. Saying the syntactic construction "maps onto" the algorithm implies that, once we grasp the syntactic construction (with its relevant ordering and component roles) we come up with a corresponding algorithm — that the construction *barking dog* somehow "triggers" the algorithm not unlike how just the word "dog" triggers our conceptualizing a friendly canine.

This basic picture of syntactic forms "mapping onto algorithms" is compatible with a cognitive paradigm according to which we have entrenched "compound" concepts alongside "singular" ones — *barking dog*, *green banana*, *presidential candidate*, etc. However, their subsequent discussions such as "yellow banana" imply that we can impose some mathematical machinery on the "composition of meanings" — in particular, as mappings within a suitably expansive Conceptual Space. The "algorithms" for composing meanings are, by implication, not so much "selected" from a mental inventory but are rather extramental logical operations preformed within the parameters of the relevant conceptual spaces — *yellow banana*, for instance, logically dilating the overall *banana* region to something more determinate.

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This analysis, then, works best if we can somehow "quantify" the composition of meanings. In that case the "type reduction" of word-pair "products" directly "maps to" a corresponding maneuver in a quantifiable domain. The type reduction for *yellow banana* is, in this spirit, the derivation of a noun from an adjective-noun product; the corresponding "algorithm" is quantitatively modeled by restricting the banana space to yellow colors. Similarly, an intransitive verb in "product" with a noun would collide an (in some sense) quantifiable "verb space" with an (also in some sense) quantifiable "noun space", resulting in a "sentence space".

The notion that something so general as "sentence space" can be *quantified* may be dubious; but it is also true that Conceptual Space Theory has revealed quantitative patterns in non-obvious settings, so we should not prejudge that a larger extent of semantics than we might expect, at least, has some quantitative form. Within this extent it is plausible that quantitative interactions between elements in a word-pair correspond to products in a mathematized grammar "Category". The more immediate concern I would raise emerges from my contention that variational domains come into effect *as a result of* linguistic construction, not antecedent to them.

Suppose, for instance, I have bought a banana from a cashier for fifty cents. The verb *buy* automatically invites four conceptual components: the seller, buyer, product, and the money exchanged in the opposite direction (actually this last component has two dimensions — the *quantity* of money and also its physical form, as when I hand over a dollar bill expecting change). In a sense *buy* appears to invoke a "configurational domain" in that the event which the verb profiles creates a "scope" of which the components of buyer, seller, product, and money are *parts*. This event — a *purchase* — is the domain for these components rather as an arm is a domain for a hand; except that the partonomy here involves abstract situational schema rather than physical composition. I'll specifically propose the term *functional-configurational domain* for a case like *to buy* (or *a purchase*) to highlight that the configured relations are functional, as opposed to, say, spatial (as in Langacker's example of a triangle). Most of the connections between the verb and other words (or phrases, e.g. *for fifty cents*) are then preoccupied with profiling the things which end up, in the talked-about situation, occupying the roles defined by the domain.

It is true that in the course of completing the *functional-configurational* domain, we also have one component whose conceptual specificity involves a "variational" domain — specifically, we can associate an *amount* with the money transferred. So, *this* quantifiable dimension is conceptually part of the overall functional network — but only as a specification joined to one *part* of the network, or one *point* in the functional-configurational domain. I believe that domains with quantitative dimensions most often acquire semiotic relevance in this general manner — the *overarching* domain is functional-configurational, whereas specific occupants of functional "slots" may play this role in such a way that we need we need to conceptualize a variational dimension to achieve full specificity.

What Coecke *et. al.* term an "algorithm for composing meanings" often amounts, in the context of functional networks, simply to assigning a role to a concept: *buying bananas* elaborates the *buy* schema with *bananas* in the role of the commodity. This genre of word-pairing fits into the hypergraph-categorial framework to the extent that we can assess "filling a functional-configurational slot" as a kind of *algorithm*. Less obvious, however, is whether a concept "slotting in" to a situational role can be analyzed in the kind of quantitative, dimensional terms germane to Gärdenfors Conceptual Spaces. The Category-Theoretic intuition that syntactic pairings (qua *products*) can be rendered isomorphic (in a syntax-to-semantic translation) to semantic "products" can only be reconciled with a functional/situational sense of semantic connections if we have a proper sense of a functional-configurational domain and its components as both "spaces", such that the residence of a concept in one components' place is in some sense within a "product space". For example, the purchase-to-commodity relation established via *bought a banana* certainly situates the fruit in the *purchase* schema, but there are no obvious candidates to "dimensionalize" this situating in a fashion comparable to how applying *yellow* to *banana* tapers the concept of "banana-likeness" into something stricter.

Having said that, once a concept is registered within a functional schema, it "carries" the potential for subsequent discussion of its properties, including those conceptualized in quantifiable terms. The banana's color, taste, texture, etc., are all potentially "accessible" from the domain of the purchase insofar as the bananas was what

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was purchased; we might conceivably focus our conceptual attention onto one or another of those dimensions. In this sense a verb like *buy* does "act on" certain quantitative dimensions, but the relevant effect is not modeled as a transformation *within* the dimensions but as a kind of "indexing": from the verb we can *access* numerous dimensions, including "variational" domains, across functionally specified chains of conceptual relation. Assuming we can itemize all the variational domains conceptually relevant to all components in a functional-configurational domain, the multi-domain structure evinced through the verb is a kind of "product" over all those domains; but a product formed in such a way that the domains do not usually interact with one another — instead, they are latently present and may be activated in subsequent thought or discourse (an exception being dimensions expressly relevant for the functional context, such as the *amount* of money which the good costs, when in the *purchase* schema).

Such a "non-interfering" collation of domains to some degree reflects Gärdenfors's notion of *separable* domains, but the substance of this theory is rather different. One contrast is that the "accessible" domains are not (again excepting intrinsic specifications like *buy-cost*) predetermined from the overall situation. For instance, *buy* does not expressly imply a *taste* domain (unlike, say, *eat*); such a dimension is only accessible when the item purchased is food or drink. If you buy a phone card or a transit pass, the *number of minutes* or *number of days* are quantities relevant to the affairs in that scenario, but have no correlates when buying bananas or batteries. With subordinate clauses, moreover, extra domains can come into play via more elongated chains: we buy something *for* someone else, or *for* some event, which happens at some time in the future (these options adding extra spatial or temporal potentials for elaboration). We buy a wine which someone else recommended because they tasted it in some prior place and time. The syntax does not just line up dimensional "spaces" (using Coecke *et. al.*'s metaphor of vector spaces) as collated tuples of independent axes, like the basis vectors in a vector space. Instead, the accessible spaces are integrated in an organized fashion, so that the *chain* leading from the root verb (of a clause documenting a situation) to the specific concept (where a "Conceptual Space"-like domain is relevant) progresses via fixed sorts of connections (verb-to-subject, verb-to-locative-phrase, or benefactive, instrumental, and so forth).

A verb does not, then, predetermine what *kinds* of domains may be accessed through its conceptual nexus (the situation which it profiles by focusing on a given event, action, or process). However, it *does* predetermine a form of "indexing scheme" which orders the accessible domains against the verb via specific patterns of chain-steps: the adjectival modifier to the noun in the benefactive relation to the verb; the adverbial modifier to the verb in the clause modifying the locative; etc. This kind of admixture of domains is, depending on one's perspective, both more and less structured than the compound conceptualizations Gärdenfors would call *separable*: on the one hand, the totality of domains accessible from a verb are not just (in the general case) mutually independent, but (with suitable modifiers and clauses) unconstrained by the verb itself: a given verb (such as *bought*) can be anchored in a situation where many different unforeseen domains become relevant for situational specificity. A verb does not unify only predefined set of domains; instead it forms a conceptual root where practically any kind of domain may become accessible, if it has conceptual bearing on those things which the verb affects (the verb's subject, objects, case-form modifiers, etc.). In this sense the accretion of domains around verbs is less structured than a fixed set of *separable* domains.

On the other hand, though, the verb does not only juxtapose domains; it also provides access to them *through functional chains*, which correspond to syntactic relations such as verb/subject, verb/object, adjective/noun, adverb/verb, and their phrasal variants through subordinate clauses. Via these syntactic patterns, the verb's access to associated conceptual spaces is more structured than a mere collation of separable domains, because we have functionally inflected "paths" from the verb to the concept which a domain supports (i.e., gives informational content to). If I buy a wine rated 90 out of 100 for a party upcoming in six days, the domains of the *90* and the *six* are coexisting in the situational complex, but *buy* isn't just passively tupling them like a cross-product. The two domains lie on separate "functional paths" emanating out from the verb, and so they coexist in our minds only in the context of our holistic appraisal of the situation with its specific functional organization.

To capture the idea of these functionally orchestrated "collations" of domains, I propose the term *hypersepa-*

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rable, meaning not only separable (in the sense of the domains being, in the more general case, independent of one another) but also indiscriminately "piled on". A verb's (or clause's or situation's) family of "conceptually accessible" domains can grow arbitrarily, so long as each "new" domain is linked to the verb (and vis-à-vis a clause to its root verb) via functionally meaningful chains. Each verb and each clause, then, is on this theory associated with a space of "hyperseparable" domains, and this cognitive repertoire could perhaps be characterized as the Conceptual Space associated with the verb (and clause or sentence).

I believe this kind of analysis is the best way to leverage Coecke *et. al.*'s merger of Hypergraph Grammar with Conceptual Space Theory in a manner that is linguistically realistic — in particular, that accommodates how a significant part of linguistic meaning is tied up in explicating functional schema. When quantifiable dimensions do play a significatory role, it is because they ground concepts which are linked to situations via chains of functional organization. Thus *quantifiable dimensions*, or as I've proposed *variational domains*, are one sort of conceptual gestalt "carried along" the mesh of functional networks which are anchored in verbs, and specifically clause-roots. I would say the same, however, for deictic reference, anaphora, metaphor, narratively inflected language, and any other semantic lode *apart from* variational domains (like color, price, size, etc.). That is, I am not convinced there is something dialogically special about quantitative dimensions; they are one genre of specificatory predication, certainly important but no more so than other builders of propositional content.

Once I tell a listener that I have bought a banana, say, they may have no particular reason to attend to any of its properties. Instead, their natural response may be more functional: if I intend to eat the banana, I have to peel it, and my hands will thereby be occupied. While I eat it I presumably won't be able to talk. I will have to find somewhere to discard the peel. My listener will probably make the slight anticipatory adjustments, factoring in the new detail of my banana-acquisition into his vague protentions vis-à-vis my immediate future behavior. The fact of my now possessing said banana does not necessarily become relevant to him in any fashion which calls for quantitative models. Likewise my interest in said procurement (and said eating) only briefly or quietly has quantitative content (the episode where I actually exchange the fifty cents and then, assuming we can dimensionalize taste, the quale of the banana's flavor, which I may only dimly notice).

Usually these sorts of functional deliberations — to take the banana I must pay for it; to eat it I must peel it; to avoid carrying around a banana peel I must trash it — are at the foreground of our conceptual attention. Each of these operational scenarios, in turn, have their own functional nexus, their own verb-anchors. Thus, merely the act of setting up a functional-configurational domain is often the whole significance of a conceptualization (and of the language which expresses it). So in many contexts we should say not that the functional-configurational domain is a kind of recipe for assembling the meaning; often it *is* the meaning.

Still, consider cases where some added specificity *does* come into play. Perhaps my companion asked me if the banana tasted good. That linguistic gesture does bring the "latent" domain of the banana's taste into the foreground. This domain becomes a *potential* for activation as a consequence of the sentence (and/or the fact which the sentence describes) *I bought a banana*, or some such variation. The taste domain is not part of that sentence's *meaning*, but the configurational domain which *is* part of its meaning creates a route to access the taste domain as contextually salient, a route which hovers for a while over our conversation (I would be puzzled though if my friend asked me a month later through whether the banana tasted good). So we can see certain quantitative dimensions or variational domains as potentialities that get activated along routes created by other meanings already in the discourse.

Conceptual spaces may have a secondary role in this analysis, but the same would be said for many other cognitive factors which are doubtlessly important for linguistic understanding. For instance, any sentence uttered which includes the name "John" relies on listeners to know or infer what person is being named. This can be a cognitively intricate process, but it is sutured to the containing sentence via specific functional chains. Analogous comments could be made about resolving pronoun references, or designations made with the aid of extralinguistic gestures (like pointing at *this wine*), or descriptive phases (*this wine* as a phrase grounded in discursive context). We can build various theories about the forms of cognition appropriate for different

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aspects of semantics, but all of these interpretive faculties are situated in the overall dynamics of linguistic understanding via the functional organization of situations, as linguistically embodied in verbs, clauses, and case-forms.

Conceptual Space Theory can in this sense be one of a federation of theories filling out our picture of semantic detailing *around* the verb/clause nexus, but none of these thematics — conceptual spaces, anaphora, referring expressions, etc. — profile the central backbone of linguistic structure.

5 Grounding and Formalization

A significant part of linguistic theorizing is classificatory — itemizing lexical categories, say, or inter-word "link kinds" (in Link Grammar) or relations (in general Dependency Grammar), or declension cases (extended to classifications of participants' roles in situations). Such theoretical list-building, however, raises questions of the explanatory merits of the actual lists which a theory is based on, and/or proposes. The "Universal Dependencies" project, for example, recognizes 37 "universal syntactic relations" across all languages; sentences from any language can be annotated via expository parse-graphs, documenting their apparent syntactic composition, whose edges are labeled with one of the 37 relations. What philosophical status should we ascribe to *those particular* 37 relations, however? Do they reveal some deep structure of cognition, or of semiotic processes in general, or some combination? Are they explanatory windows onto language at some profound level or more like analytic tools refined over time by the requirements of cross-linguistic annotation?

One can find rationales for the specific group of Universal Dependencies currently recognized.[7] In particular, these relations are themselves interrelated; there is a certain theoretical structure to the inventory of 37 which motivates that particular group of relations being accorded canonical status. On the other hand, literature about Universal Dependencies also leaves the impression of engineering a practical toolkit, not just pursuing theoretical analysis wherever it leads. Explication of how a particular "Universal" relation appears in a given language (English, say) often describes diverse cases (implying that there are actually different word-pairing phenomena subsumed under one relation). The "oblique nominal" (*obl*), for example, is identified as connecting *give* and *children* in *give the toys to the children*; *swam* to both *night* and *pool* in *Last night, I swam in the pool*; and *chased* to *dog* in *the cat was chased by the dog*. Or, describing the "nominal subject" relation:

> A nominal subject ... is [normally] the syntactic subject and the proto-agent of a clause. The **nsubj** relation is also used for the nominal subject of a passive verb or verb group, even though the subject is then not typically the proto-agent argument due to valency changing operations. For languages that have a grammaticalized passive transformation, it is strongly recommended to use the subtype **nsubj:pass** in such cases.

The *nsubj* is not just a verb-to-subject relation, because it also connects *red* to *car* in *The car is red*; *barn* to *We* in *We are in the barn*; and *is* to *ghost* in *There is a ghost in the room*.

In short, Universal Dependencies employ one relation-kind to annotate multiple construction contexts; the framework also prioritizes relations that are applicable to many different languages. There may certainly be theoretical motivations for which dependencies are recognized as "universal" and also for the different contexts where each is used; however the evolution of the framework also reflects practical feedback from annotating multi-language corpora. Numerous comments on the web pages about individual relations (like *nsubj* or *obl*), maintained by the Universal Dependencies project, describe changes between different "versions", resulting either in one relation subsuming new cases or conversely a new relation being introduced for special contexts. The impetus behind these changes appears to be observations of the framework's effectiveness as an annotational tool, rather than more abstract linguistic research or theorizing.

Multi-lingual annotated corpora are valuable resources, of course, so these forces shaping the "theory" behind Universal Dependencies are well-motivated. But we still should ponder the theoretical import of the system that emerges from this process, in particular the 37 relations and their "subtypes". Insofar as these specific relations

[7] See https://nlp.stanford.edu/pubs/USD_LREC14_paper_camera_ready.pdf [7] or https://universaldependencies.org/u/dep/.

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have proven useful across many languages, does this confer on them a different, perhaps deeper status, compared to hypothetical dependency relations itemized solely for one language? More generally, are these relations canonized by virtue of modeling most accurately linguistic phenomena themselves; or is another consideration their utility from the viewpoint of manual annotators, which may not be the same thing? To cite one more example, *advcl* (adverbial clause modifier) is used to connect both *happened/falling* in *The accident happened as night was falling*, and *upset/talked* in *He was upset when I talked to him*. Does this reflect a significant underlying similarity between the two cases, or rather a surface-level resemblance which makes it easier for us to transfer the annotation pattern from one case to another, even if this correspondence in annotation does not reflect a comparable parallel in the underlying linguistic principles?

I raise these issues specifically to motivate the question of whether *inventories* of relation-kinds, lexical categories, and so forth, are to be considered the bedrock of theories against which given linguistic phenomena should be measured, or rather as suggestive products of theories that can themselves be stretched in their role of explanantia to explananda. If, say, we have cross-linguistic, cognitive, or even neurological evidence that the 37 Universal Dependencies have some special status, then analyzing a specific English sentence in terms of those 37 would carry a corresponding scientific weight. On the other hand, if the crux of Dependency Grammar is more on the rationale for recognizing certain relations as canonical, rather than commitment to a particular fixed glossary of relations, then analyses would not be losing scientific rigor by proposing new relations, particularly if they appear to apply, in linguistically parallel ways, to a variety of word-pairs.

Any attempt to be truly linguistically *scientific* is bound to stumble against the inherently anarchic nature of linguistic acceptability: while speakers collectively shape language by assenting to novel constructions or not, there is no central authority designing the rules. Novel uses may be accepted if they break the rules, at least in a manner which is still recognizably structured and communicatively productive. To take one example, the compound transitive verb *wine and dine* is derived from a noun and an intransitive verb, neither of which work in the same construction: we do not say *The team wined the free agent and dined him*. The pattern of treating a noun as a verb does give rise to novel usages, like both *gifted* and *primaried* in *He gifted money to candidates being primaried by radicals*. We also even have prepositions and pronouns recycled as verbs (*They outed her on national television*), or (as in French) *tutoyer*.

As I opined earlier, simply using nouns in a verb role (like *healthy scratch him into accepting a trade*) is rare and exotic-sounding in English, at least outside "domain-specific" contexts where there is a natural lexical correspondence between a verb and a noun, like *to bat* and *baseball bat*. A recurring pattern is to identify the instrument or, alternatively, the result of an action as a *noun* lexically mimicking the verb: *a/to club/kick/shout/gallop*, etc. This framework appears absent in *to primary*, where the connection between the noun *primary* and the verb is more complex and indirect. It is not the case the *primarying* someone *results in* a primary occurring (contrast *kick*), or that you *use* a *primary* (noun) for the act of primarying (contrast *club*). Even *gifted* is not as clear-cut in the noun-to-verb rationale as *club* or *kick*.

The exceptionality of *primaried*, to be sure, is probably *why* the word became popular: its abnormality stretches an accepted pattern, but not unrecognizably; meanwhile that abnormality also gives it a jargony, context-specific sense of precision. Since noun-to-verb re-interpretations are not automatically accepted, the stability of a usage like *primaried* reflects a self-conscious commitment of a particular subgroup of English speakers (those who often discuss American politics) to include that word-sense in their terms of art. Analogous comments might fit *wine and dine*, in that the first part reflects the same noun-to-verb pattern; but here the alliteration gives the compound an informal mien which befits *its* sphere of usage. Probably *wine and dine* would not have caught on if not for its rhyming beats, which make it feel proper in the kind of casual but flowery speech register we might find on talk radio, or at parties, and so forth, e.g. where people are themselves wining and dining.

Arguably novel uses become entrenched as idioms or special-purpose word-senses precisely *when* they "break the rules", because it is that deviation from expected norms that make them stand out as a unit, subject to copycat effects, rather than just dissolve into the expanse of normal language. A phrase like *faced a primary challenge* — together with some elucidation that the

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incumbant is more moderate than the challenger — is probably as commonplace as *primaried*; but it is also so normal-sounding that it fails to become a distinct usage which people adopt self-consciously. After enough time, of course, an entrenched usage may simply be taken as an alternate word-sense (like *bat* for *baseball bat*), and the jargony or flowery elan which a not-quite-rule-abiding construction carries, early on, erodes into a more pedestrian polysemy. But such conventionalization only happens when people use an expression often, and *that* tends to happen *because* prople like its whiff of disrepute.

In effect, if we want to understand the dynamics driving which word-meanings and syntactic patterns become accepted in the language, we have to analyze when and why speakers are willing to suspend the language's rules, not just the rules themselves. The noun-to-verb recycling in *primaried* — or say the preposition-to-verb in *outed* — are not automatically acceptable patterns, but they do allude to patterns like noun-to-adjective in *baseball bat* or *dance music*; or adjective-to-noun (note *primary* derives from *primary election*). Thus noun-to-verb is enough on people's radar that they can recognize the pattern when it is applied; but this pattern is also recognized as an exception, not a rule of English grammar, so it is not up to the speaker's discretion to apply it unilaterally. Of course, a community of speakers may also agree to accept a previously dubious pattern *en masse*: consider the decline of the spoken French simple past, or the English present progressive subsuming the simple present; or the emergence of *her* and *they* as gender-neutral pronouns, in some Anglophone circles. Or, Langacker (page 307) cites the example of *shall*/*should* and *can*/*could* losing their status as a present/past pair; modern English speakers rarely say *shall* and often say *could* even in the present tense.

The process of entrenchment does not only play out on the lexical level; it can be both broader or narrower, covering an entire category of patterns or individual words in specific circumstances. New words (like *grok*, say, which tends to mean "understand" when applied to reasoning through technical, especially computer-related ideas, but may be evolving into a broader ornamental alternative to *understand* and *grasp*) come into the lexicon via new technologies or specific event (consider the origin of *gerrymander*), but the cycle of novelty and entrenchment is not always focused on single words, particularly if we consider that many pronouns and auxiliaries are systematic anchors for larger constructions, so idiomatic usages of "low-level" words in that sense are really alternate patterns for complex constructions. In American English we have idiomatic but essentially standardized parlance even at a core linguistic level, such as pronouns:

- (198) How are we doing today?
- (199) Your new car is waiting!
- (200) You guys coming with?
- (201) You all gonna love this!

We recognize *you all* (or *y'all*) as a de facto second-person plural, but only informally — and particularly in contexts where one speaker addresses a large number of listeners, such as onstage to an audience. We hear *you all* also in more intimate settings, but in a small group its territory is often covered instead by *you guys* (even when the guys are gals); (200) also (I'll mention parenthetically) has the trendy intransitive form *come with*.[8] Meanwhile, (198) shows a rather formal but (in some people's mind) potentially condescending figure where *we* hovers between first-person singular and second-person: the question is understood as addressed to *you*, but the speaker also implies (in a kind of pro forma show of empathy) that the addressee's well-being affects her too. In the case of (199), the second-person possessive is not used lawfully (in the contexts I have in mind, e.g. ads) because "you" are not understood to *have* a new car. Instead, the formulation triggers your imagining that you *do* have a new car, enticing you to want one. Semantically, though, the new car only exists in a hypothetical and discourse-novel register appropriate for an indefinite article; as such, *your* is a possessive functioning as a variant on *a* or *some*, which clearly violates a foundational architecture of English. As with second-person *we*, though, English speakers normalize these idiosyncratic uses because they are conservative enough to make sense,

[8] For completeness, I sketch an analysis of why *that* usage is popular: the significance of *come with* is essentially akin to *come with us*, but posing the verb as intransitive implies that it profiles a kind of indefinitely extending process or a state, like the *party* in *party on*. Compared to *come with us*, dropping the direct object connotes less of a an action whose conclusion the speaker foresees, which, by extension, implies the speaker is attending less to its practical premise. We might say *come with us* in the context of a mundane trip to the store, say, conceived in functional terms. Saying *come with* instead implies that the proposed action (that is, the group's going to wherever) has something beyond just utilitarian ends, which ends up coming across as invitational, establishing group solidarity: if you *come with* our group will be larger and the shared good time amplified.

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and because we grok (even if with a whiff of feeling manipulated) their rhetorical inspiration.

Because the progressive revision of rules and norms is as much a part of language as the rules themselves, the analysis of a particular sentence cannot just assume that it is meaningful *because* it instances linguistic rules. It may also violate those norms to some degree, and be successful if the discrepancy is well-motivated and structurally identifiable enough for listeners to both understand and appreciate. Moreover, even if a sentence *is* law-abiding, it may not be completely transparent *which* laws are being followed: recall my questioning whether *head out* should be read as a compound verb or a separate verb and preposition which just happen to be adjacent in word-order.

Given a sentence, in short, we can do a *retroactive* analysis, of why it (seems) to be meaningful; or, if ambiguous, why so; if clear but unconventional, why listeners accept it. We can retroactively analyze why *to primary* or *to wine and dine* have entered the vocabulary of modern American English. We can retroactively articulate "how" we think a sentence works; we can speculate on whether a hypothetical hearer of *I am heading out to lunch* hears *heading out* as a compound unit or *out* as a path-constructor. Such "retroactive" analysis then takes sentences to be, in effect, a kind of social interaction, where after the fact we may look back on the participants' motivations and thought processes. But this retroactiveness also implies that analyses are not definitive; that the parameters of linguistic acceptance are in some degree subjective and may vary from one instance of a usage to another; and that sentences are not mechanically produced from an impersonal formal template.

Insofar as the primary mode of linguistic analysis is in this sense *retroactive*, the status of theoretical frameworks (like Universal Dependencies, say) is essentially provisional. Canonized lexical or word-pair categories are essentially theoretical props which can be applied in the analysis of a given sentence — they help us identify the patterns which govern why *this sentence* works as it does. But such is still the theoretical status of technical concepts made available to a researcher retroactively interpreting some sentence (possibly a hypothetical one) in its specific context. This is a different kind of theoretical status than the mathematical models of physics or economics, say; more akin to the interpretive affordances of sociology or "humanities theory". We can retroactively analyze why Trump won or why redistributionist social policies are often deemed elitist, or why concern for the environment is considered quintessentially secular. Scholars can deploy an arsenal of theoretical constructs to explain such phenomena, from race, class, and gender to theories of cultural representation and the politicization of group identity. But any theory is showing just one window onto complex phenomena; and we sense an active role on the scholars' part in choosing which theoretical tradition to highlight and how to exposit the theory in the context of her specific analysis.

In this analytic spirit, the purpose of a theory is to bequeath a set of theoretical constructs to a theoretician for applying to given case-studies as she sees fit. The theoretical apparatus is part of the scholarly background, but it requires the interpretive instincts and acuity of a an individual person to apply the theory against the phenomena which it might explain. This epistemic setup presupposes a definitive, active, interpretive role for the researcher who applies a theory. I would argue that this "meta-methodology" is different from that of normal physical science, for instance, where — even if new mathematical models or scientific paradigms call for creative, innovative reasoning — an established theory is understood as applying to its explananda with an impetus that derives from the phenomena themselves, without an active, interpretive analytic role. In other words, scientific models are not just tools which analysts deploy for interpretive maneuvers; the scientist is more passively observing the fit of data to model, seeing explanatory progress as a structural feature of the theory rather than a leveraging of her own creativity in applying and restaging a theory against a concrete set of facts.

Given these two modes of theorizing, then, where does linguistics fit? Are theoretical posits like the 37 Universal Dependencies fixed paradigms that we should try to dispassionately apply to linguistic phenomena? Or are they more like investigatory devices that sketch out a mode of scientifically-aspirational analysis, but which we should take as basically a rough draft, an outline of theoreticity that may be expanded and reshaped in the pursuit of each theorist's particular interpretation?

I have no *a priori* commitments to one or another vision of theorizing; overall I believe *language* straddles

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both features of loosely-regulated social phenomena that can only be theorized roughly and hermeneutically, and of formal systems amenable to something like mathematical analysis. Formal rules are only partially generative because novel constructions can be communicationally efficacious precisely because they violate some norms; on the other hand, this rhetorical effect works *because* hearers recognize and rationalize that departure, so a comprehensive survey of linguistic meaning should retroactively model the structural contrast between unexpected constructions and those which conversants would not mark as "unusual"; which in turn calls for models of which constructions *are* "expected". Linguistic theory can embrace the formalization of "normal" sentences precisely to theorize the frisson evoked by performances that stretch the language to communicative effect.

In general then I believe the practical core of linguistic theory should be to retroactively identify why sentences are experienced as structurally unremarkable or alternatively as meaningfully, productively, constructively nonstandard. Theoretical posits like lexical and bilexical categories are tools to effectuate such analyses by supplying building-blocks for models of standardized linguistic constructions. Rather than working to established a fixed categorial inventory, I prefer to argue for the underlying processes through which both lexical and (as I call it) bilexical categories are posited. I indeed claim that the parameters of a theory of lexical and bilexical categories are to some measure subjective and interpretive, affected by our analysis of individual cases.

As a case in point, consider the question of whether bonafide verbs (qua macrotype of elements which yield a finite clause in the presence of between one and three nouns) should always be analyzed in those terms. A case like *I believe Warren will win* suggests that the object of *believe* can be a proposition — so either we should posit that the proposition gets re-interpreted as a noun (the *fact* of such-and-such being the case) or else that some specific class of verbs has a nonstandard "signature" wherein the direct object is seen as a proposition, not a noun. Note that in apparently all candidates for such treatment, the subject has to be understood as something "sentient", so there are "mesotype"-level parameters on the acceptability of the object-as-proposition interpretation.

I will return to those semantic issues below, but first consider the syntactic motivation for plausibly differentiating object-as-proposition from normal verb "macrotyping". Consider examples like:

- (202) I expect them to win.
- (203) I expect for them to win.
- (204) I expect that they will win.
- (205) I expect that of them.
- (206) I ask alot of them.
- (207) I ask that of you.
- (208) I ask that to you.
- (209) I ask you that.
- (210) I ask for you to be in good health.
- (211) I ask you to stay in good health.

Note we cannot comfortably say *I expect to win of them* or *I ask you to be in good health* — the latter is more awkward than (210); (211) recognizes a certain agency in *you* which befits the relevant sense of *ask*. Conversely, (210) is more poetic or ritualistic, "asking" fate or karma to play an agent-like role. So one point here is that the indirect object paired with *ask*, as in *ask you*, appears to compress either *ask to you* (some specific question) or *ask of you* (some action or behavior), but not *ask for you* (in the sense of desiring some outcome relating to "you" apart from "your" purposeful action).

Contrast, then, *expect*, for which the ditransitive indirect object seems shorthand for either *of* or *for*. It is plausible to model *expect* around *ask*, as in *I expect (of) them to play hard and win*; but the more common meaning of *expect* seems to be closer to *anticipate* or *prognosticate*. If a sportscaster predicts an underperforming team to beat an inferior opponent, she might *expect them to play poorly but win anyhow*, but this is expecting an overall outcome; it is not a personal interaction with the team itself expecting something *of* them. Still, the ditransitive indirect object works for *expect*, but not in apparently similar contexts: *predict them to win* is dubious, *predict them to beat Toronto* still more so, and *anticipate them to win* sounds just wrong. This evidence implies that anything after *expect* could uniformly be treated as a clause (*them to win* meaning essentially *that they will win*).

In that case *them to beat Toronto* could be read as a finite clause, so that *to beat Toronto* drops out as an intransitive verb (in the sense of needing only one noun to

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arrive at a proposition); then *to beat* becomes transitive and "verb-like" except that the resulting phrase, with direct object (but not subject), results in a verb. That is, *to beat* is of a macrotype which yields a *verb* when paired with a noun which is semantically the direct object of *beat*: a clause-construction with "subject gap" and *verb* outcome. Ergo *to* maps *beat* to such a type — a quasi transitive verb yielding a verb-role clause gapped in the "subject" position.

However, I am not sure this is a completely formal, or non-subjective, analysis. An alternative reading is that *to beat Toronto* is just a phrase playing a nominal role, the direct object for *expect* just as *them* is its indirect object. Under this alternative, *to beat Toronto* does not connect with *them* to yield a proposition; instead *to beat Toronto* and *them* are both objects of *expect*. One indicator for this formulation is that *them* needs the morphology of a direct object. (Other evidence might come from intonation — if *them* and the words in *to beat Toronto* are spoken in roughly the same pitch/accent register, which in a sense vocally recapitulates the model of key verb-clause components as "columns", in a sense lining up with parallel epistemic significance to produce verb-profile details). One counter-argument, though, is that such a ditransitive model elides the semantic contrast between *expect* and *ask*, or, say, *want*.[9]

In short, while I believe relevant analyses exist which make no reference to a complex macrotype such as I proposed for *beat* (involving gaps and verb-roles), there are parallel analyses of the same cases in which proposing such a type may have some merit. I use this example to motivate the idea that the macrotypes of a language — or, analogously, perhaps by extension, its taxonomy of inter-word relations/links — are not necessarily fixed as if by some governing body. They may not even be fixed in the context of one theoretical framework. Instead, once a methodological paradigm specifies the *role* afforded both to macrotypes and to interword relation-kinds, with the stipulation that an inventory of these types and relations should allow syntactic phenomena in a language to be studied, particular analyses might pull or stretch the inventory somewhat — introducing new macrotypes or relations when these seem well-motivated as retroactive vehicles for interpreting sentences.

Near the beginning of this paper I mentioned the contrast in acceptability between (5) *That she will graduate in June is expected by her mother*, (6) *That they would encounter problems was expected by everybody*, and (8) *That they will finish on time is expected by the painters*. Despite similar constructions, there are some variations between these examples. One point is that in (6) and (8), the subject of the subordinate clause is also the subject of the main clause (*everybody* is who would encounter problems; *the painters* are who will finish on time). Also, (5) and (8) have a *future tense* subordinate clause with a *present* main clause; by contrast, in (6) both clauses are in the past. The most anomalous sentence here, in my mind, is (8), and perhaps these two points offer an explanation: in (8) both clauses have the same subject *and* the main clause desribes a *present* mental act relating to a *future* condition. In this situation, it seems as if the two conceptualizations are actually bundled together: the painters, in the course of planning or reviewing their project, are inclined to believe that they will finish on time. The length of time a project will take going forward seems like a natural component of the conceptual package forming our holistic sense of a project (alongside its current state, what has been accomplished, what is still needed, etc.). In effect, in this one case *expect* and *finish on time* seem, just by typical conceptual organization, to be two facets of an overall ideation, which perhaps is a *semantic* reason why the architecture of (8) — separating these conceptual processes into two clauses — feels strained.

As I pointed out earlier, though, in the context of a sketchier reading, anomalies — as in (8) — may only be apparent given a holistic integration of all sentence elements, in light of their unified conceptual picture. We should not, then, assume that underlying constructional patterns are *syntactically* anomalous, at least to such a degree that they impede proper interpretation and integration. Instead, there is something about the overall conceptual gestalt which makes the chosen syntactic form seem anomalous or suboptimal for *that particular* linguistic act.

Returning to the "mesotype" issues pertaining to *expect* or *ask*, these belong to a class of verbs whose subjects are "sentient" and whose objects profile some thought,

[9] Langacker, see pages 432-433, analyzes *expect* as taking complements which may be nominals, clauses, or both, as in *We expect this movie to make a lot of money*. This is consistent but tangential to the discussion I present here, because identifying the "expected" parameter as a *complement* side-steps the specification that such complement is also *expect*'s direct object.

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belief, or proposition; in the latter case the proposition is understood as an article of belief or potential belief entertained by some thinking agent. One could plausibly hold that the apparent theoretical contrast between different syntactic models for these verbs is an artifact of the gap between semantic specifications and syntactic formalization. That is, the actual phenomenon to be described concerns semantic requirements on when using verbs like *believe* or *expect* is appropriate: the subject must be "sentient" and the direct object must conceptually profile some thought or proposition. The essential point is that the object *profiles* a proposition. Whether it does so by *being* (by macrotype) a proposition — or by being a *noun* which *signifies* a proposition — may be a distinction without a salient difference.

I would say more precisely that there are different strategies for modeling usage requirements, and we have some theoretical latitude in deciding that criteria of normal usage should be introduced at the coarsest level of lexical categorization (i.e., macrotypes) or at some other level. Consider anomalous cases like *I expect turkey*, which superficially violates the maxim that the object of *expect* is proposition-like. To resolve the anomaly, hearers have to construe how *turkey* conveys a proposition in the current discourse context, perhaps intimating that the speakers expects *there to be* turkey (on Thanksgiving, say), or *to eat* turkey. The signifying logic here clearly involves an anomaly which gets resolved (the anomaly is not particularly an innovative usage, in this case, but a common pattern whereby speakers allow situational contexts to fill in details that get unspoken; surface-level norm-violations occur because the discourse as manifest strategically elides certain inferred content). In short, the analysis depends on identifying linguistic sites of "missing" information and on how this very absence triggers conversants to defer to context, thereby indirectly signifiying the material (such as the speaker's intention to *eat* the turkey) which is strategically missing.

In short, *absence of content* plays a signifying role in *I expect turkey* (say), but we need to analyze *why* there is something missing; why, that is, hearers *perceive* something missing so that they are compelled to infer it from context. In this case the anomaly is sited in *expect*'s direct object, which *should* be proposition-like; because it's not, we experience the anomaly as a *gap*. Specifically, we feel that some verb is conceptually missing; the turkey has to be profiled in the context of some action or process (like serving, or eating). The signifying economy of *expect turkey* depends on *expect* raising the expectation, so to speak, of a proposition-like direct object. We therefore should represent how that expectation is created and then only obliquely resolved.

I would emphasize, however, that such an account of *expect*'s expectations may be described at different levels. We could notate at the macrotype level that *expect* by its very macrotyped nature demands a proposition in direct-object place. Thence the anomaly is apparent, but it also classifies *expect* as something other than a normal verb. If we skip over the requirements at the *macrotype* level, then we *on that level* simply assert that *expect*, as a verb, pairs with a direct-object noun. The actual *expect turkey* anomaly, then, is not apparent *at that level*. We could instead say that *expect* has a "mesotype" requiring a sentient subject and a proposition-like direct object. Or we could say that *expect* has microtype-level specifications — lexical norms for when that word should be used — which register *expect turkey* as abnormal.

Insofar as anomaly-modeling can work at all three levels (macrotype, mesotype, microtype), the decision how to apply the analysis vis-à-vis any one sentence may be arbitrary. The ultimate choice of what sort of analysis to conduct with an emphasis on the macrotype, mesotype, and microtype levels may be guided more rigorously by a more holistic survey of analyses. The level of categorization most suitable for modeling different kinds of norms and anomalies may emerge from sketching these analyses over numerous examples, observing how the different levels play off one another.

In this spirit, then, I want to consider here how "requirements" are expressed and operative across macrotype, mesotype, microtype. For an overarching framework of conceptual organization where our models of these distinct levels can be situated, I will orient my discussion to Langacker's concept of *grounding*, and the progression from ungrounded to grounded noun-concepts as enforced by phrase-construction.

5.1 *Grounding and Transform Dogmas*

Considering (along with Langacker) *nouns* broadly enough to encompass both *lexical nouns* and *nominal phrases* (page 10), there is an essential bifurcation be-

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tween *grounded* and *ungrounded* nouns. A grounded nominal has a definitive conceptual, representational, and epistemic status relative to the speaker. Note that this applies even via "indefinite" articles, like *a dog (is barking)*. A nominal grounded by *a* could refer to a specific thing; the significance of the indefinite is to mark that said item has not previously been referenced in the discourse. Conversely, a grounded nominal need not profile specific individuals, as in *every dog likes peanut butter* or *she wants a dog*. In normal circumstances we do not hear her wanting a *specific* dog, but the referential status of *a dog* is still grounded in the epistemic attitudes of the speaker: we specifically construe that there is *not* a specific dog in the speaker's mind, but for sake of discourse we "conjure" a hypothetical concept of a dog as a conceptual proxy for "any dog whatsoever".

Grounding, in short, does not specifically address whether a grounded nominal profiles a real, fictive, imaginary, generic, or otherwise abstract and "conceptual" entity; it merely establishes that the real and/or mental status of that thing is *specified* and signified. Grounding is complete when we *know*, perhaps inferentially, whether the grounded noun is something real or just a figment of intellect, and then its mental status in either case: if real, how does the speaker and addressees encounter the referent — by direct perception, hearsay, memory? If existing only in the mind, is it imaginary for just one person, or a fiction that has some worldy status (Snoopy is not a "real" dog but he has some objective specificity as a collectively recognized narrative character — it is *true*, say, that Snoopy is a beagle), or something nonconcrete because underspecified (as in *She wants a dog*)?

Some lexical nouns, like pronouns and proper names, are understood as grounded without further modification. Unmarked plurals can also be grounded automatically in the sense of an almost-maximal reference to the noun construed as a collection of instances: so *dogs like peanut butter* implicitly grounds *dogs* with the sense of *most*, *all*, or *typical* dogs. Much more common, however, is for nouns to be externally grounded by a transformation effectuated by modifiers such as *the/this/that/those/these*, *many/all/some/each/every*, possessives, magnitudes (*five dogs*, *a lot of fish*), and adjectives in a plural context (*Democratic candidates*, *Macron supporters*, *baseball teams*, etc.).

Langacker points out that the grounding element is often the "outermost" step in a phrase-construction, in cases where a noun has *several* modifiers, as in *those two lazy cats* (page 311). Langacker also contrasts the role of the grounding element from other sorts of modifiers, such as "a nongrounding quantifier (three), an adjective (broken), or the lexical noun (chairs)" in *the three broken chairs* (page 275).

> There is thus a strong tendency for a grounding element to occupy a peripheral position in the structure of a nominal. [It] provides the least information concerning the nominal referent per se ... the definite article tells us nothing at all about the chairs themselves. It merely indicates their status as a discourse referent (a matter of how the interlocutors direct their attention to it). A grounding element can thus be thought of (at least in functional terms) as the final step in putting together a nominal or a finite clause. As the most peripheral component, it specifies an epistemic relationship between the ground and the profiled thing or process, as characterized by the remainder of the nominal or clausal expression.

At the beginning of this essay I pointed out Langacker's implicit suggestion in this specific analysis that modifiers tend to occur in a regulated sequence: a *non-grounding quantifier*, say, *precedes* the grounding, but *follows* descriptive adjectives (such as *lazy* in *the three lazy cats*) — of course, precedence here refers to a sequence of conceptual transforms, not to sentence word-order (which is often inverse to transform-order). I argued before that the standardization of this sequence is a fact, if it is relatively entrenched in English usage, which is challenging for both constituency and dependency grammars. In the current discussion I want to emphasize the contextual requirements that these patterns impose, particularly on grounding elements themselves — we hear these modifiers as operating in an environment where the noun-concepts they modify are *not* grounded, but the nominal which is their "outcome" *is* grounded; and so these modifiers provide the ungrounded-to-grounded transition.

Without further specification, a grounding element (construed by analogy to a "function") both "inputs" and "outputs" a noun (in "compact" notation, N:N). To capture the specific effect where an *ungrounded* noun becomes a *grounded* one, we have to decide on what aspect

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of linguistic structure this specification should be identified. For example, we could introduce *grounded* and *ungrounded* as narrower subtypes of the *noun* macrotype (N_G and N_U, say), and assign grounding modifiers like *this* a macrotype built on these subtypes, e.g. $N_U \dashrightarrow N_G$). My hesitation on such a system is similar to comments I made earlier with respect to plurals. There are actually several different large-scale subtypes of nouns, including *mass*, *count*, *singular*, *plural*, *grounded*, and *ungrounded*. These criteria may inersect in complex ways. The full details may be difficult to capture solely within a system that tries to narrow macrotypes on the "inputs" or "outputs" to and from transformations: that some modifier only accepts pluaral nouns, say, or only ungrounded nouns. We arguably are better with some mechanism other than type-signatures to represent these requirements.

The problem of stating and enforcing requirements on function-like types is not specific to natural language; in fact, it is also significant in programming language implementations, and the sort of applied type theory which applies to computer languages. Requirements on computational procedures are generally orthogonal to a type system, but has some similarities to type attribution as a mechanism for stating conditions on when and whether a given procedure is executed. Consider an algorithm which compares two lists, and is optimized for the case where the two lists are the same size. This requirement — the lists being equal in length — is a precondition on the algorithm being used properly. A list-comparison procedure might actually be split into three different routines, one for same-size lists, and one each for where the first or second is longer. Every procedure then has a different set of requirements, and it is clear which procedure should be selected in each situation. The process by which requirements dictate which version of a procedure to execute resembles how procedures are distinguished on the basis of *types*: a procedure's signature indicates which set of input types are required for it to be called. However, expressing conditions such as *two lists must be the same size* is not usually a restriction which can be modeled by a programming language's type system.

In general, type systems are not sufficiently *expressive* enough to indicate all pre- and post-conditions which are specified and/or guaranteed by a procedure. Programming language theory has developed various techniques for managing this limitation (including human-readable but not machine-enforced documentation, relying on programmers to use procedures according to their indications but not automatically confirming proper compliance). More rigorous *requirements engineering* concepts include *dependent types*, *typestate*, and *effect systems*, which each augment conventional type systems so that more fine-grained requirements, particularly on function-like types (those assigned to distinct procedures) can be directly modeled through type attribution. While discussion of these various formalisms is outside the scope of this paper, I will propose some minimal terms and concepts which are applicable to formal/programming languages as well as, potentially, for "natural" linguistics.

First of all, I will call a *tenet* some predicate that may be asserted on instances of a given type; in computational terms, a tenet on a type is a boolean-valued function whose inputs include at least one instance of that type. Tenets on input types are then potential preconditions for function-like types: it may be required that a procedure only be executed if a tenet on one of its inputs evaluates to *true*. In the context of mathematical calculations, certain operations (like division) cannot be performed on the number *zero*: a precondition on a division function, then, for instance, can be expressed via the *tenet* that the second argument to such a function is non-zero. Likewise, tenets on *output* types are potential postconditions or guarantees: a function may always produce an output which satisfies some condition. For instance, a *square* function on most numeric types (excluding complex numbers) is guaranteed to produce a non-negative outcome. This postcondition can be expressed via a tenet, applicable to all normal numeric types (including signed integers or signed floating-point numbers) that the number is non-negative.

Although tenets are different from types, the two ideas overlap somewhat. On the one hand, the instances of a type for which a tenet applies, taken as a collective, is potentially a subtype: for a given tenet t on a type $\mathfrak{t}$, we have a potential $\mathfrak{t}_t$ which is the portion of $\mathfrak{t}$'s extension where t holds (this is a potential but not necessarily an actual type — in a programming language context potential types are only "actualized" when certain intrinsic procedures associated with that type are implemented). Conversely, the fact of a type instance being reinterpretable as another type can become a tenet

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on the former type. To return to the example of non-negative numbers, from the type of *signed integers*, say, non-negative numbers can be "cast" to the type *unsigned integer* without modification; thus being castable to the unsigned type is a tenet on the signed type.

I will call the "potential" type induced by a tenet t on a type $\mathfrak{t}$ a *pseudotype*, one "based on" (or just *on*) $\mathfrak{t}$. A pseudotype on $\mathfrak{t}$ is a *potential* subtype, which (extensionally) comprises $\mathfrak{t}$ restricted to instances where some tenet (or combination of tenets) holds. By extension, a "pseudosignature" of a function-like type can then be a variant of the signature which replaces input or output types with pseudotypes on them, in cases where the function's pre- and/or postconditions are modeled by the corresponding tenets. A *square* function on double-precision floats, say, can be "pseudosigned" such that its output pseudotype is *unsigned double* with the "non-negative" tenet.

These ideas are acceptable in the context of natural language types also. In particular, the stipulation that a grounding element *inputs* non-grounded nouns, and *outputs* gounded ones, corresponds to a pseudosignature where the input is N_U and the output is N_G; this is the same $N_U \dashrightarrow N_G$ formulation I considered earlier, except that N_U and N_G are now considered pseudotypes rather than macrotypes. The concept of pseudosignatures, however, is more flexible insofar as a given function-like value (or a given lexeme, in the linguistic context) can have multiple pseudosignatures, whereas its actual type can have only one signature. For instance, apart from grounding effects *these* and *those* both input and output count-plural nouns, so they also have a pseudosignature stipulating that this input and output is "*count-plural noun*" (taking that as a noun-based pseudotype).

Pseudosignatures also have applications outside of the macrotype "level". Consider nominals which are formed from propositions, e.g. via *that*. Semantically, these nouns profile facts or potential truths construed as objects of conception, and therefore as (abstract) "things". Syntactically, they are often formed by modifying a finite clause to turn it back into a noun (*I believe that Toronto will beat Detroit*; *I understand how Toronto beat Detroit*). In these cases, the modifier (*that*, say, or *how*) has a P:N signature, meaning that the outcome noun has the specific feature of *being* the result of a P:N transform; that is, of *being* the modification of a proposition. We can take this construction-history as a possible tenet on nouns: some nouns, in short, are outcomes of a P:N transform. A "pseudosignature" for *believe* would then indicate that the direct object to believe has to be an instance of that noun-pseudotype.

More accurately, this formation applies to one sense of *believe* (a different model appears in *I believe you* or *I believe everything you are saying*); these various senses may have their own pseudosignatures, and the lexical *believe* treated as the synthesis of the narrower senses. In each case the *subject* of *believe* has to be sentient, which (in my proposal) is mesotype-level; but this too can be constructed as a noun pseudotype for purposes of pseudosignatures. In *believe/understand/know that* (or *understand/know how/why* or *know when/where/whether*) the common requirement is sentience on the subject "column" and something proposition-like on the direct object (the more general case would allow this propositional sense to be indirect, as in *what you just said*, but I'll focus on explicit P:N examples). For *believe that*, say, the subject must have "mesotype" *sentient* (just for the moment label this N_S for "sentient noun"), and the direct object the *pseudotype* of a noun created via P:N (for the moment label this $N_p \dashrightarrow N$). We can then express *believe*'s preconditions via the pseudosignature $N_S{:}N_p \to P$ or (without compact notation) $N_S \dashrightarrow N_p \dashrightarrow N$. The pseudosignature combines pseudotypes originating at a mesotype level (N_S) and a macrotype level ($N_p \dashrightarrow N$), so it demonstrates how these levels can be convoluted in preconditions or postconditions. Given cases like these, I propose using pseudotypes as refinements orthogonal to the striation between *macrotype*, *mesotype*, and *microtype*, so as to sustain the idea that the latter three levels are cognitively distinct while also permitting them to be co-determinative when more than one such level is consequential for defining the propriety of a given word-usage or constructional pattern.

With this framework, macrotypes, mesotypes, microtypes, and pseudotypes are different scales of ideational breadth (or potentially cross-cutting scales for pseudotypes) where linguistic requirements may be asserted. I am not convinced that it is nessessary to define *a priori* what sorts of conditions should be recognized at what scale. When analyzing any one sentence we can retroactively decide to notate its patterns of conformance to standards — or more pertinently its strategic abnormalities — at one or another (or a combination

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of) scales, depending on what seems most explanatorily revealing about *that particular* sentence.

Having argued for this methodology at the macrotype (and then finer-grained) levels, I will now consider the extension of these ideas to "bilexical" categories or inter-word relations.

5.2 A Generative Theory of Bilexical Categories

I use the term "bilexical category" as a replacement for *relation kinds* or *link types* in Dependency or Link Grammar. My rationale for this nonstandard jargon is to highlight the parallels between bilexical categories and macrotypes (which in turn are akin to *lexical* categories). In particular, rather than a fixed inventory of lexical categories I advocate a system of macrotypes where some macrotypes are derived from others, in terms of the type associated with *modifiers* whose inputs and outcomes are other types. The space of macrotypes is therefore in some sense "generative" (although the proliferation of macrotypes should be seen as bounded by the relatively small size of linguistic constructions, once we treat clauses and nominals as singular components from a higher-level vantage point). Potentially we can usefully see the system of bilexical categories as comparably generative, but within reason.

Note that we can posit a close association between macrotypes and (at least some) bilexical categories. Many macrotypes — to begin with, modifiers which transform one target — can also usefully be seen as a bilexical category pairing the modifier and that which it modifies. The *adjective* macrotype, say, is closely associated with the Universal Dependencies "*amod*" relation: the adjective modifies a noun, which can be modeled as the adjective *transforming* a noun-concept, like a "function" in some conceptual space, and simultaneously as one inter-word connection in a parse-graph. The same general principle applies for verbs, though here we have to distinguish verbs' relations to subjects, direct objects, and indirect objects.

We can, in any case, begin to develop a system of bilexical categories directly from any system of macrotypes. For macrotypes which are simple (one-"input") modifiers, there is (we may stipulate) one corresponding bilexical category. Most non-simple modifiers involve verbs and clauses (the main exception here being conjunctions like *and*). Clauses take on diverse forms, which affects both macrotypes and bilexical categories.

The first differentiation among clauses is whether they produce actual propositions (finite clauses) or else nouns or adjectives. Compare:

- (212) She failed to hold the groceries.
- (213) She asked me to hold the groceries.
- (214) She asked that I hold the groceries.
- (215) Where is a bag to hold the groceries?

Here I read *(to/that I) hold the groceries* as a noun which is a direct object in (212) and indirect in (213); a proposition in (214); and an adjective in (215). If we define the *verb* macrotype as intrinsically a transform yielding a proposition, then we should categorize the verb component (*(to) hold*) in the non-finite cases as not exactly a verb — instead a transform *like* a verb but yielding a noun or adjective. For sake of discussion, I'll notate such a "substitution" by parenthesizing the non-proposition outcome after the "V": $V_{(\mathbf{N})}$ for a "noun-clause" verb, and $V_{(\mathbf{J})}$ for an "adjective-clause" verb. Separately, another feature of the above examples (apart from (214)) is that the *subject* is missing from the clause itself (so that it gets picked up from the surrounding linguistic material, e.g. the *direct* object in (213)). For each verb-alternative, then, we can identify which element is "missing": say, $V_{(\mathbf{J})^1}$ for a noun-clause verb "gapped" in the subject position (notated "1" for the "first column" in the verb's signature), and similarly $V_{(\mathbf{J})^1}$. It is possible for gaps to occur against objects also: consider *the person that I consulted* ($V_{(\mathbf{J})^2}$: direct object gap, adjectival clause) or *Tell me who to send the letter to* ($V_{(\mathbf{J})^3}$: indirect object gap).

On the premise that verb/subject and verb/object (direct and indirect) are bilexical categories, we can introduce variants for each of these where the verb becomes a verb-like clausal head for different kinds of clauses. Contrast the verb/object relations in *This poll favors Warren* and *the polls favoring Warren*; in the latter case *favors* relates to *Warren* as a direct object, but in a context where the two words form an incomplete clause that adjectivally modifies a nominal (*the polls*) which ultimately grounds the process ("favoring"). Concep-

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tually the two relations are subtlety different: *favoring Warren* connects the verb to the object as more of a generic, repeatable situation, whereas *favors Warren* creates the expectation that the verb will be grounded in one specific circumstance. (Not to mention the differences in grammatical behavior: one case calls for the morphological present participle and another for the third-person present). It is plausible, then, to distinguish verb/direct-object relations for actual macrotype verbs (V_2 , say, using "2" for "second column") from variations propagated off of verb-alternatives vis-à-vis clause-kinds: a macrotype $V_{(\mathbf{J})^1}$ for *following* yielding a bilexical $V_{(\mathbf{J})^{1,2}}$ for its connection with the direct object ("second" column).

In addition to deriving bilexical categories from macrotypes with no further specification, we can plausible introduce refinements (perhaps via "pseudotypes"). Consider prepositions. While most basically they have the same synonyms as adjectives ($N \dashrightarrow N$), they can also transform nouns *into* adjectives (*stereo with speakers*, *road by the river*, *hike up the mountain*) or adverbs (*cut with a knife*, *hike by the river*, *(It will/there is) snow up the mountain*). Strictly, then, prepositions span distinct macrotypes ($N \dashrightarrow N$, $N \dashrightarrow J$, $N \dashrightarrow A$). These signatures, however, do not capture the actual usage patterns of prepositions (not every $N \dashrightarrow N$ modifier is a preposition). In their "adjectival" guise, prepositions usually slot in as an indirect object; as adverbs, they tend to supply specific sorts of verb-detail (suitable to a "case-form" analysis). In their relation to verbs, then (whether within adverb or indirect object phrases) prepositions tend to identify verbs' relation to participants in the verb's profiled process which elucidate the *situational configuration* of the process — where, how, why, for whom, with what — rather than express qualities of the performing of that process (contrast non-prepositional adverbs like *cut effortlessly*, *hike quickly*, *thank profusely*, etc.).

Prepositions can therefore be classified in terms of what sort of detail they add. For instance, *toward* seems always to figure its target as some sort of location or point in space (even if an abstract space, as in *turning toward ...* to announce a shift in topic). Noun-concepts which profile a spatial location, or the end of a spatial path, are one genre of noun: I believe this is a level of generality appropriate for a mesotype, which (imperfectly) I'll label as *locations* (we need to be clear that in different contexts locations may be figured as points, regions, or as path-segments; see *highway into Philadelphia*). Then *toward* "converts" a grounded noun into location, which may or may not require some conceptual interpretation (e.g. *toward John* or *toward the TV* proxies the noun to the rough spatial area where he or it are situated). The fact that *toward*'s outcome is mesotypically a *location* can be modeled as a postcondition: if we read N_L as a pseudotype of nouns with the tenet of being construed locationwise, *toward* then has a pseudosignature $N \dashrightarrow N_L$. This postcondition accordingly carries over to the bilexical category we would recognize as categorizing *toward*'s relation to its target, extending to other spatial prepositions like "near", *around*, (often) *to*, and so forth.

In sum, mesotype and pseudotype specifications, among them pre- and postconditions, can adjoin to macrotype-level bilexical categories, yielding potential new bilexicals. We therefore have a "recipe" for identifying bilexical categories emerging from, but possibly narrowing, those induced directly from macrotypes (viz., modifier/target relations given the modifier's macrotype). Although bilexicals can conceivably in this system be formulated in a rather ad-hoc fashion, those which seem to represent patterns reappearing in numerous case-studies may emerge as a theoretically privileged collection, analogous to the arsenal of Universal Dependencies. Indeed, some bilexicals constructed via macrotypes and (potentially) pseudotypes are likely to match one of the 37 "Universal" relations (obvious candidates are adjective-to-noun, verb-to-subject, and verb-to-direct-object). Here, however, I am more concerned with the theoretical architecture for proposing bilexical categories as analytic utilities than in fixing any canonical listing.

5.3 Grounding and Syntagmatic Patterns

The terms *syntagmatic* and *paradigmatic* evince a mutual relationship arguably reciprocating *syntax* vs. *semantics*, but the former language is more endemic to "semiotics" and "Structural" linguistics, along with various "Continental" humanistic scholarship associated with linguistics (and with "structuralism" in general). I think it is a reasonable gloss to consider *syntagm/paradigm* as (compared to syntax/semantics) focused more on dynamic interpretive activity, from the response/reception

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point of view, than on formal or cognitively passive rules. The *syntagmatic* relations between word-units emerge from factors such as word-order which also determine syntax, but considering such givens in terms of "syntagms" focuses attention on dynamic processes whereby in understanding language we observe structures in word-order and positioning (and related facts of language sequence) to build a holistic picture of sentence-structure. In this spirit I will adopt the term *syntagmatic* (and in a specific sense *paradigmatic*) to model interpretive processes related to "grounding" and "accretion of detail" along the lines outlined above (particularly in Section Three here and the latter half of Section Three).

The account of "grounding" that I am working from here — which I derive from Langacker, not to say that this approach simply glosses and is maximally compatible with Langacker's, necessarily — assumes that the *essential core* of linguistic structure (if we had to condense language to a few word) is *profiling verbs*. The meaning of a sentence is, first and foremost, derived from its root verb (or its most salient verb, which may not be the *syntactic* root depending on one's parsing theory). Verbs profile processes, events, or states; the meaning of a sentence is thus whatever details complete the speaker's construal of the process, event, or state profiles by the sentence's core verb, accoring to what the speaker intends to convey. Such details vary in "centrality" according to whether a given detail is relatively intrinsic to the verb's meaning or is more supplemental or contextual (e.g., identifying *when* an event happened may or may not be intrinsic to the situation which the verb profiling that event encapsulates). Such modes or degrees of centrality are modeled by syntactic markers, such as the contrast between adverbs, adverbial clauses, and subject/object nouns, and between subject/objects and nouns or noun-phrases marked by case. Earlier (e.g. Section 2.2) I implied that "central" content is that which a verb needs to form a "complete idea", but that general picture leaves a lot of room to be clarified. How specifically is an "idea" complete as opposed to "not" complete? What is it about the mapping of expressions to situations which makes some of the former more or less "complete" construals of the latter?

Consider once more, for instance, the distinctions between intransitive, transitive, and ditransitive verbs. We might say *John married Katherine* which is a complete idea because *marry* needs (only) a subject and object to profile a complete event/state. Conversely, we might say *Lawrence introduced John to Katherine* wherein *introduce* profiles an event, or even a state — the event is constituted by the fact of John and Katherine now being in a state of knowing one another — with there different essential components. In general *introduce* profiles a *multi-part* relation (and the event of that relation coming into effect). Occasionally *married* is used in a similar multi-part mode to *introduce*. Consider:

- (216) A pastor we have known for years married John to Katherine.
- (217) His parents finally married John off to Katherine.

In these cases *marry* is (acting as) a ditransitive verb, and the roles of John and Katherine switch off from the simpler *John married Katherine*; John becomes the *object* and Katherine the *indirect* object (in (216)) (and vice-versa in (217)).

Of course, many details could be provided about the event of someone marrying someone; usually these would be marked not by refiguring the bride and groom (or bride and bride, etc.) as direct/indirect objects, but via supplemental clauses (John married Katherine *in 2017*, *during the pandemic*, *in Vermont*, *in a synagogue*, *at the urging of his parent*, *with a lavish wedding*, *with the Rabbi's blessing*, and so forth). Occasionally the same scenario painted via *marry* as a *three-part* relation can be similarly construed where the extra relational structure is relegated to a secondary role: the Rabbi or Pastor (etc.) who *marries* a couple (by officiating and giving the marriage legal force) could be seen as an essential participant in the relation *marriage* profiles or as a supplemental detail akin to where the marriage took place (say) in examples like *married with the Rabbi's blessing*. The choice of whether to make a verb transitive or ditransitive therefore signals whether the speaker's construal prioritizes the *multi-part* notion of the relation which is factually salient in the speaker's communications, or rather whether a two-part relation is conceptually isolated and then surrounding with whatever secondary context the speaker deems (sufficiently) relevant.

In Section Three I implied or postulated a kind of essential vs. "inessential" dimension of situational details, such that only those profiled components which are adequately "essential" become marked as subject/object (direct or indirect) with others relegated to auxiliary

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clauses. This may be a little question-begging, because *why* are some details "essential" more than others — especially when (consider the case of the Pastor or Rabbi officiating a wedding) such classification appears to depend on speakers' construals? The rootedness of subject/object vs. auxiliary clause as a feature of language appears to provide evidence that we have a *conceptual* tendency to construe concepts as one-part (involving states), two-part (involving binary relations), or multi-part (involving multi-part relations) and then to on such a basis mentally "slot in" satisfiers of those relata as situationally *internal* to the concept-instance — linguistically encoded as "columns" according to terms I suggested earlier — and then factor other details (no matter how empirically consequential) as *conceptually* secondary or non-foregrounded ("metadata", in a sense). If *I run*, or am running, I am in that state (and has a "one-part" *conceptual* form); if I *run the dog to the pet store* the *run* is now seen instead as a *relation*, or as bringing me into relation with another participant (the dog I "am running", which presumably means prompting the dog to run by running myself). Likewise in *I'll run the dog over there in a minute* the underlying relation is evidently *three*-part (me, the dog, and the place I am running to). Note that a location which is the *target* of running is (normally) not "intrinsic" to the running qua concept: in *I ran to the store* or, say, *I ran to the store along the side of the highway* the locational details feel more like "metadata" *about* my running. There is a conceptual split-level; in one register I am construing (and reporting) on a state/event (my running) and surrounding this with information about how/where/when/why the event happened. In *I visited the store along the highway* the "highway" detail is still more a matter of context and framing than "essential"; but *where* I went (the store) is now internalized *into* the profiled relation (*visit* implies a two-part relation connecting a person with a place visited).

These kinds of examples imply that an "essential" vs "inessential" contrast in verb-details can be motivated by the idea that some details are "inside the relation" backing whatever event/state/process a verb profiles. Any event/state/process occurs against a background; as typically spatially and temporally situated, one can always (or at least usually) entertain thoughts about *when* and *where* an event (e.g.) occurs. When events are deliberately induced by people (or "sentient beings") we can also ascribe rationales (*why* and *how*) and (both for deliberate and "natural" events) some notion of cause and affect (who/what was affected by the event, or change of state, etc.). All of this conceptual architecture appears to be built into any construal of events (and states/processes), i.e., of what verbs profile. So it seems reasonable that linguistically internalizing any event (etc.) also entails a kind of selective attention — no lexeme will capture the *entirety* of contextual detail (because situations are conveyed compositionally, not lexically). As soon as we endeavor to "encode" an event via a verb, in short, we assign to ourselves (and imply when speaking that we have thus taken on) the task of backgrounding some situational details, and profiling only a few dimensions (among the full spectrum of *when*/*where*/*why* and so forth) through the lexical affordances of the verb in itself. A certain sense of verb "details" being partitioned into "essential" and "inessential" therefore seems architecturally imposed, albeit this terminology may be misleading (inessential details may be *more* significant to overall communicative intentions, but they would be someone backgrounded in the specific profiling-construal captured by subject/object markings).

Using the terminology of "syntagm" and "paradigm", I would suggest that this "architectural" account of verb-profiling represents one "paradigm" dimension. Certain verb-details are syntactically marked as central (in some sense) whereas others are marked as supplemental (through the structural fact of their being attached to the verb via auxiliary clauses). This contrast embodies one "paradigmatic" dimension if we then say that the *syntagmatic* axis of language (centering on verb-profiling) represents how structures involving word-order and sequencing orchestrate the "accretion of detail". Some verb-details "accrete" through subject/object constructions, such that the morphological and word-order cues constituting such constructions manifest a central/supplemental distinction on the syntagmatic level, whereas the conceptual rationale for this distinction (how the marked details are profiled out against the overall event/state/process background) manifests this distinction paradigmatically. To the degree that this account furnishes a plausible theory of subject/object vs. auxiliary-clause constructions being manifest within a syntagm/paradigm distinction, we could then potentially add related dimensions (such as adverbs serving verb-modifying roles, and how verb-profiling gets packaged into subordinate clauses) at the

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paradigmatic level, with their corresponding syntagmatic dynamics/patterns marked morphosyntactically at the syntagmatic level.

As I have just implied, I would argue that verb-details can be roughly grouped into four orders: those which are *marked* as essential/central (i.e. subject, maybe object, maybe indirect object); those which are marked as supplemental "drawn from the background" information marked via auxiliary clasues; those which are lexical or descriptive modifications of the verb at some *conceptual* level (canonically via an adverb) rather than a situational report fleshing out details of the *context* where what the verb profiles plays out; and those which might package verb-profile construals into clauses for *other* construals. With sufficient detail a verb profiles a complete idea, which may or may not be *the* complete idea of the surrounding sentence. If "the idea" is somehow nested, the verb which forms the root (or most salient element) of a *clause* may be subsidiary to that of a larger sentence (or a larger clause). Thus we have constructions such as *I ran to the store which we visited yesterday* or *We need a bag big enough to hold all the groceries.* Earlier I discussed "gapping" and using type-signatures to analyze how clauses nest within other clauses by *slotting in* as nouns, adjectives, or adverbs, broadly understood.

I do not intend at this point to reiterate my previous analysis, since there is no reason to be repetitive. The further argumentation I wish to engage in here relates to my proposed classification of the "paradigmatic" pole (using this term "semiotically") in the specific context of verb-profiling, insofar as verb-details can be marked through subject/object registers, or auxiliary clauses, or adverbs, or via the transforming constructions (such as proposition-to-noun/adjective/adverb re-typing) governing how clauses are packaged when nested. Correspondingly, this four-part distinction, I would argue, figures as a crucial structure within the *syntagmatic* register. That is, we can see the syntagmatic dynamics of a sentence as organized around the tendency of sentence-elements (word-units, plus phrases and morphemes) to be organized around the accretion of verb-detail, and moreover that such accretion follows one of four patterns (in the linguistic units themselves, apart from how they conceptually resonate). Sentence elements (apart from verbs/verb-phrases themselves) are *either* (components of) verb subject/objects, *or* auxiliary clauses adding verb-details (largely details about the *context* where the verb's "action" plays out), *or* adverbs (conceptually) modifying the verbs directly, *or* subordinators, prepositions, morphological units evincing gapping-effects, and other elements which mark and package subordinate clauses into superordinates. Whereas we can speak generically about the *syntax* of language, I would argue that the *syntagmatics* of language is governed by how syntax *manifests* in these particular patterns.

5 .3.1 Syntagmatic Structure in Formal/Programming Languages

I would like to make a further claim that this specific sense of syntagmatic patterning may carry over to *formal* languages, such as programming languages, representing a point of contact between natural and "artificial" communications. The core structure of natural language, I am proposing, is how details are assembled pertaining to events/processes/states profiled by verbs; all langauge units or elements can be analyzed by how they line up in a chain of detail-providings leading to (first nested-clause verbs, potentially, then) a sentence's root or most salient verb. At the *cognitive* level we can consider the speaker *construing* an event/state/process, so we have as one structure the cognitive gestalt where such construing is lifted against a situational background. Details such as perceptual foreground/background, situational awareness (of the rationales and tendencies explaining what is currently happening and projecting how it will evolve), speaker epistemics (how speakers know/believe their appraisals of situations), and so forth, can be organized (when analyzed) around construals of events/states/processes in particular, which then become profiled via verb and carry over into language. These cognitive organizations then influence and are (indirectly) encoded by linguistic organization, structured around (I propose) a four-part distinction within (morhpo) syntactic patterns related to (accretion of) verb-details (subject/object, auxiliary clause, adverb, and clause-packaging).

This theory of language's semiotic organization, I think, may have interesting analog in *formal* languages. Whereas the crux of *natural* sentences is a verb (profiling an event/state/process), it is plausible to suggest that the core of a *programming* language statement (taking this as the most credible analog to a natural-language sentence) is a procedure which the statement invokes to

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derived a result (and/or engender a side effect). "Nested" clauses are then analogous to nested expressions which yield values passed as parameters to enclosing procedures (viz., procedures indicated by enclosing expressions). The analogy between sentences and code-statements would be rather facile and uninformative if we consider procedures only in terms of inputs and outputs (it's true that any code-expression identifies a procedure and then supplies it with arguments so as, in general, to yield a value, but that is little more than a tautological statement of what *expressions* are). However, comparisons between programming *statements* and linguistic *sentences* become more interesting if we consider a larger spectrum of coding constructions which can be part of modern computer languages (exceptions, object-method calls, continuation closure, and so forth).

To push the analogy somewhat further, natural-language *clauses* are organized around verbs, whereas programming-language *expressions* are organized around (symbols or expressions which resolve to) *procedures*. All components of a coding expression (or a statement, which would be the outermost layers of expressions in the sense that their evaluated values are not immediately used in other expressions) contribute either to providing values for a procedure to act on, or processing values returned (or somehow produced) by a procedure; or both. These alternatives however cover a spectrum of possible cases; for example the values "produced" by procedures may be ordinary return values, or exceptions (which are handled in specific ways by the calling procedure and have their own syntax and semantics); alternatively a "closure" (a sequence of statements effectively defining an anonymous procedure) can be defined to operate on a procedure's return value(s) (which is a common arrangement when calling a procedure via a new execution thread, or a network request, or some other branching in program flow where they may be a delay in the called procedure terminating, such that the calling procedure should not wait indefinitely; in that case the calling procedure may simply return itself, using a closure — called a "continuation" in this context — to resume the desired computations once the called procedure does in fact return). A further detail is that, although we tend to think of procedures as directly returning *values*, in some contexts — particularly procedures exected in some sense remotely, using networking or threads along lines I just alluded to — the values returned by a called procedure may be some sort of encoded or serialized structure which has to be deserialized to extract an actual value.

I am not aware of terminology which adopts the "semiotic", or structural-linguistic, concept of "syntagmatics" in the context of formal (e.g. programming) languages, but it seems to me that these just-outlined program-flow and procedure-related considerations are a credible analog for natural-language syntagmatic formations. We could reasonably say, then, that computer code has "syntagmatic structure" which reflects the patterns wherein coding elements relate to procedures where elements' values are implicated in some manner — as procedure inputs or (handlers for) outputs, in some sense, or some sort of intermediary logic (such as a deserialization routine) which works on inputs/outputs. Although adopting this language may not yield major technical variation on how computer code is typically understood and modeled (for purpose of static code analysis, for example), potentially such ideas can provide a useful shift in perspective. I will be writing about this possibility in greater detail in a forthcoming book related to Conceptual Space Theory and bioinformatics (Elsevier, 2022), but I'll present a brief case in this context drawn from the specific domain of Aspect-Oriented Programming.

5 .3.2 Syntagmatics and Aspect-Oriented Programming

In computer science, "Aspect-Orientation" refers to a technique where written code can be extended with supplemental actions which provide greater flexibility (compared to large-scale refactoring of a code base; for example, programmers may want to modify the behavior of an application whenever values of one specific type are initialized, or whenever procedures of a specific kind are called). Aspect-based methods are designed especially for cases where program-behavior should be modified in several different locations which share some property that can be unambiguously identified (for example, logging a warning whenever a "deprecated" procedure is called, or whenever a certain type of exception is thrown or caught). The supplemental code introduced at these program-locations (called "joinpoints") is (according to aspect-oriented principles) generally "concerned with" some specific *aspect* or programming requirements (such as logging, verifying program behavior, code-compliance, etc.) which would be "orthogonal" to the main concerns

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of the primary code. Aspect-oriented programming is "oriented" to "aspects" in the sense that it permits code to be composed according to a certain methodology, or theory of coding efficiency, which assumes that source code should focus on its main concerns (what the relevant application needs to accomplish) and *secondary* concerns such as security, verification, version maintenance, and related "management" requirements can be factored into spearate parts of the code base (and then "woven into" the primary code by associating supplemental "advice" code with specific join-points).

Assessing the value of such Aspect-Oriented methods (instead of alternative programming paradigms, which address similar goals through different techniques) is not relevant to my current discussions, but Aspect-Orientation is a good example of a paradigm which grants central importance to models of program flow and the sequential ordering of code-elements (which are analogous I suggest to natural-language "syntagmatics"). Aspect-Oriented notions of joinpoints and "pointcuts" (definitions of criteria for selecting joinpoints) are relevant to code design and analysis even if one does not diretly employ aspect-based techniques to actually dynamically *modify* program-behavior by weaving advice. In this context, arguably one *limitation* of the aspect paradigm is that the programmatic rationale for defining advice (and corresponding pointcuts) is often only approximately modeled by the "pointcut expressions" through which pointcuts are defined. For example, pointcuts often rely on naming conventions — which are artifacts of program designed enforced relatively informally by programming teams, not structural invariants in code itself — to designate conditions which theoretically could be made more rigorous.

For sake of discussion, I will motivate these comments through the example of "accessor" methods, which are procedures in an Object-Oriented context (hence they are *methods*, or procedures with a "this" object given special status vis-à-vis other input parameters) that "encapsulate access to" some piece of information which is a property of the corresponding object. For instance, a class representing books/publications might have a "title" field, which could be exposed via the methods **getTitle()** and **setTitle()** (in other words, those methods are the procedures which may be called by other procedures to learn or change the title). The **getTitle()** and **setTitle()** in this case are examples of *accessors* (classified as "getters" and "setters" respectively) which are, conceptually, a distinct class of precedures. In most programming environments, naming accessors in terms of *get* and *set* is purely a matter of convention, and there is no requirements that procedures with these sorts of names actually act like accessors to some underlying data field. In other words, the use of accessors is an (only semi-formal) "design pattern", constituted by the general idea that "getter" and "setter" methods act in tandem to manage specific pieces of data.

The informal criteria on accessors can be made a little more rigorous by modeling what are reasonable expectations for the behavior of getters and setters; for instance, if a value is set via *set...* (for some field-name after "set") — say, **setTitle()** — we should expect (barring a futher set-action in between) the same value to be retrieved by a matching getter (like **getTitle()**). Moreover, we expect accessors to function conceptually as exposing a value which we would tend to regard as a *data field*, something delineated and integral, like the title of a book; accessors should not perform background computations, or manage complex data structures. Ordinarily a "getter" should take no parameters, because the data field thus exposed would generally be context-independent (a normal book always has one title, say). These are programming conventions which are obeyed both in how accessors are named (via *get...* and *set...* patterns) and their implementation. In most environments there is no way to *stipulate* that methods are in fact accessors (adhering to these articulated requirements), although such documentation could be achieved via method-attributes (for languages which support them) or some other code-reflection mechanism.

In Aspect-Oriented systems, pointcuts intended to advise *accessors* in particular would not necessarily have formal designations of methods which *are in fact* accessors, relying instead on (informal) naming conventions, such as the idea of matching any method with a name that starts with "set" (as a way of identifying likely setter-methods). However, potentially a more rigorous code-reflection model can be employed which can make these designations precise: one could state explicitly that a given method is a "getter" or "setter", in which case the event of an accessor being called (or a getter's return-value being used) would be a joinpoint rigorous matched to accessor-related pointcuts. In such a scenario, code-analysis could rigorously identify values implicated in

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accessor-calls, either passed to setters or returned from getters: for instance, it would theoretically be possible to annotate a scoped variable which hold the result of a getter-call (flagging the corresponding symbol as holding a getter-resulting value as opposed to a value deriving from some other source, such as a code literal or the return from some other sort of procedure which does not explicitly encapsulate a data-field). The key point in this context is that code details, such as a value being obtained from a **getter**-return, can propagate away from the individual method-call point and be traced or flagged through the chain of symbols and subsequent method-calls as values are stored and reused.[10]

This sort of "propagation" of metadata "across" computer code, I would argue, represents a sort of "syntagmatic" ordering of the "horizontal" relations between code elements (borrowing the picture from natural language, where horizontal relations involve things like word-order; *vertical* relations would then involve procedure-calls, insofar as each such call transfers control from one source-code location to another). Of course, these "horizontal" relations are also dimensions of program-flow, and it would be superfluous to propose a novel term like "syntagm" just for ordinary program-flow concerns. I would note, however, that the specific *metadata* associated with details (such as a value deriving from a getter-method) that can be specifically tied to procedure calls and returns, and treated as flags or attributes specifically if input/output values or other wise preparatory to calling and/or processing procedure returns. These specific program-flow dimensions could perhaps then be usefully identified as "syntagmatic" in the same way that *syntagma* in *natural* language involve syntactic and word-order/sequence relations, but (as I have used the term) emphasize specifically *rootedness* of semantic and syntactic detailing in the accretion of detail appertaining to *verbs*.

In the programming context, the fact that a procedure is marked as (and fulfills requirements for) an *accessor* can be considered metadata *about* the procedure, and accordingly about any code-point where the procedure is called; by extension it is meta-data about its return value, about the symbol where the return-value is carried, and so forth. "Syntagmatic" relations, in sort, as I am exploring this use of the term, propagate metadata about procedures away from call-points to any other code-locations interacting with or affected by call-points. The analogous idea in *natural* language would be that "metadata" about (verb-profiled) events/states/processes would be further details that get registered in discourse by auxiliary clauses (any other constructions apart from subject/object). The distinction between "essential" and "supplemental" details, which I have argued lies behind subject/object constructions contrasted with auxiliary clauses, can then be figured via the contrast between "data" and "metadata". Any detail not *directly* pertinent to the relational structures embodied in verbs' profiled events/states/processes — enough to be marked as subjects or objects — details such as *when/why/how/where* and so forth, is analogous then to "metadata". On this analogy such metadata stands in relation to the "primary" verb information roughly as metadata such as flags on procedure calls and (potentially) their inputs/outputs — say a procedure being a "getter" — relates to inputs/outputs which are a procedure's "primary" data.

5.4 *Composition Revisited*

At the most theoretically noncommittal level, we should accept that syntactic and conceptual composition are interrelated: smaller-scale linguistic elements have distinct conceptual implications, and the purpose of syntax is to define for addressees how such concepts or conceptualizations should be combined, to reproduce the speaker's own intentions. Moreover, we often have a clear sense that a given sentence has one specific construction pattern — that only one decomposition of the sentence into its component parts is realistic in light of its meaning.

However, our appraisal of sentence composition is holistic and retroactive: *after* grasping its overall meaning we can reconstruct how a sentence is put together. The problem is that such ex-post-facto analysis seems to leave something out, because compositional patterns obviously have some bearing on how we process the linguistic givens *before* we ascertain sentences' full meaning. At the very least, these issues complicate theories according to which smaller-scale linguistic elements have conceptual auton-

[10] One possibility for "flagging" getter-returns, in line with my earlier discussion about "channels", would be to associate a special kind of return-channel specifically with getters, though there are various other ways of achieving the same annotative effects.

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omy (even if their conceptualizations are incomplete or underdetermined), and are pieced together like building blocks in a complete sentence.

The extent to which a certain inter-operation between syntax and semantics is a *problem of compositionality* is determined in part by the linguistic scale on which the interdependence arises. Consider, first, syntactic "context-dependence" on a lexical level, as in the contrast between *I expected him to come* and *I persuaded him to come* (see also Langacker's sample sentences (39), page 435). The compositional contrast is based on *him to come* grouping into a clause in the former, whereas in the latter only *him* is the direct object of *persuade*. These also have conflicting grammatical behaviors: we can rearrange the first sentence to *I expected that he would come*, but not the second to *I persuaded that he would come*. The superficial similarity in the sentences' construction does not preclude their having disparate parse structures.

In this specific comparison, the divergent parse routes is relatively routinely rooted in *persuade*, but not *expect*, being ditransitive. This still illustrates that we have to be sensitive to word's lexical properties and the structural expectations that they raise, when identifying the correct parsing strategy: the parse of *him to come* is context-dependent on the transitivity or ditransitivity, along with the lexical meaning, of the preceding verb. We can nevertheless potentially see this as a straightforward check against a lexicon. A more complex circumstance arises when the verb's lexical profile permits both transitive and ditransitive forms, or different genres of objects (*ask a question* vs. *ask him to come*). With these more multi-faceted verbs, reading a potential subordinate clause as a phrase — or conversely as two different objects, direct and indirect — can be ambiguous.

One response to that problem is to simply tolerate the acceptability of divergent parses. If two superficially different compositions yield the same meaning, perhaps we should just relegate their differences to a theoretical artifact, a kind of formalistic "noise". The problem however is that additional context may reveal *semantic* divergence which is nonconsequential at a simpler level (I made a similar point earlier vis-à-vis *heading out*). Consider, for example, that *authorize* (or *encourage*, etc.) seems to accept a reading like *expect* (where we may hear a noun or a proposition direct object as equally plausible) or alternatively like *persuade* (where the direct object is more pointedly a noun rather than a propositional phrase where it appears):

- (218) I authorized him to attend the conference, and I'm expecting him to give a lecture.
- (219) I authorized him to attend the conference, and I'm persuading him to give a lecture.

If *him to come* is not decidedly *either* a single direct object clause *or* a direct object pronoun with a nonfinite indirect object clause, we might argue that the proper model simply should allow a sentence to be intermediate between disparate parses if they produce equivalent meanings. But surrounding context may intervene and push one structure as the more likely reading, as in:

- (220) I authorized him to attend the conference, but I was overruled.
- (221) I authorized him to attend the conference, but he refused.
- (222) I authorized him to attend the conference, but our school said he is just too controversial.
- (223) I authorized him to attend the conference, but his school said he is just too busy.

The first and third examples imply that an invitation was extended but then revoked, so that the cause of his non-attendance was unrelated to *his* actions. Conversely, the other two make *him* the agent of a decision not to come (explicitly in (221), and by implication in (223)). The latter scenario is more in keeping with reading *authorize*'s direct object as just *him*, which then becomes (or at least whose referent becomes) subject of the next clause, as in *I invited him, but he declined.* Conversely, making *him to come* as a whole phrase the object of *authorize* focuses attention not on *him* personally but on the overall circumstance (or possibility) of his coming, which can then be discussed as a potential state of affairs in its entirety, without specific focus on *him* as subject — cf. *I authorized that he be/him to be allowed to attend, but that prospect proved wildly unpopular.*

We can still allow a sentence to have two different, equally viable parses. However, instead of considering the choice between them to be arbitrary, a more exact appraisal is that we (as addressees) can be aware of multiple parse options, and are prepared to deem them equally plausible if they produce essentially the same

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meanings. At the same time, we can simultaneously recognize that two inconsequentially different parses may be more significantly contrasting in a more detailed context (or in light of further discourse). The point is not then to theoretically ignore parse differences, but neither to posit one "correct" parse. Instead, alternate parses point to *potential* semantic differences which may (but may not) arise.

It is appropriate in this sense to reconstruct parses holistically and retroactively, because a sentence may have two or more *plausible* parses such that only emerges as most accurate *after* the sentences' holistic meaning is resolved. This is, then, a general paradigm which addresses the apparent problem of holistic meaning being a precondition for parsing sentences to begin with. We might address this paradox as follows: sentences do have compositional patterns, which allow holistic meaning to be built up from provisional elements. However, sometimes these patterns are not exact: we can be aware of several different candidate models for how, precisely, the overall meaning should be synthesized. We entertain a certain superposition of such possibilities, enough to derive the most plausible overall meaning; at that point, one or another finer-grained parse may appear retroactively to be the most salient, while other structures are marginalized. So there *is* something retroactive about recognizing parses *in full detail*, but this does not preclude coarser, more noncommittal sketches of sentence structure from serving a compositional role when piecing together sentences' meaning in the first place.

This perspective may possibly reconcile Cognitive Grammar with other, more formalistic paradigms. To consider one example, the "Hypergraph"/Conceptual-Space-oriented model I discussed earlier construes syntax — speaking at a very general level — as dictating the order and parameters of how multiple conceptual spaces (associated with different linguistic elements) are fused together. What exactly the "fusing" of conceptual spaces entails is a more complex question — a full analysis of conceptual synthesis may need to extend underlying Conceptual Space theory in many ways. But leaving such detailed theory aside, the idea of retroactive convergence on one (of several) parses translates, in this "Hypergraph/Conceptual-Space" model, to an overarching metatheory wherein sentences' surface form often permits several different schema of conceptual space synthesis. Considering each such synthesis as candidates, we grasp a holistic meaning which is most appropriate given the ambient extra-linguistic situation as well as the specific connotations and lexical profiles of the sentences' words. With that overall meaning we can then retroactively identify one parse as correctly modeling the synthesis pattern yielding the composite conceptual space which corresponds to the meaning, intention, and propositional content of the sentence itself.

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