Ordering Conceptual Synthesis: The Implications of Cognitive Phenomenology for Syntactic Theory

Abstract

This paper examines methodological foundations for linguistics in terms of phenomenology and the philosophy of science. I argue for explanatory paradigms that model the interdependence of linguistic and extra-linguistic knowledge/faculties for understanding typical sentences. In lieu of set theory or predicate logic formalization, I point out some similarities between natural and computer languages, so that formal structures related to compilers and programming-language implementation may offer useful simplified models for human communication. In particular, I emphasize how surface discourse may be transformed to sequences of operations toward conceptual aggregation/synthesis, while maintaining that most details concerning how concepts are pairwise combined depend on extralinguistic cognitive activity.

1 Introduction

It is clearly true that an important part of human language is governed by rules or structures, ones that can be (at least to a useful extent) formalized and computationally simulated. And yet, language was not designed by committee: claiming that a particular semantic or syntactic pattern has become entrenched is not a complete argument, as if language were intrinsically a collection of formal rules, and we need merely infer them (like reverse-engineering compiled computer code). The question is *why* patterns become entrenched and stay so.

Plus, we should not overestimate rules' rigidity. That a bachelor is an unmarried man, for example, is a canonical example of logic underlying semantics; but sentences like these are quite meaningful:[1]

(1) My brother has been married for 10 years, but in many ways he's still a bachelor.

(2) All of the eligible bachelors in this town are married.

Moral of the story: just as, in a fair legal system, it should be assumed that almost all laws have instances where reasonable people would break them, so in language, for every set of "rules" there are contexts where competent speakers will ignore them.

To motivate further discussion about the limits of linguistic formalization, consider these pairs of sentences:

(3) Everyone sang along to three songs.

(4) All appeals are heard by a panel of three judges.

(5) All New Yorkers live in one of five boroughs.

(6) All New Yorkers complain about how long it takes to commute to New York City.

(7) In Ariel's picture of Beatrice, she looks sick.

(8) In Ariel's picture of Beatrice, she snapped the lens just as two cardinals flew by.

(9) We operated near the bank.

(10) On the mantle was a wooden bat.

Each pair shows interpretive reliance on extra-linguistic reasoning. The situation in (3) and (4) is quantifier scope: assuming (3) discusses some musical performance, it would be abnormal for everyone in the audience to individually choose exactly three songs to sing along with. Hence, we can assume that, among all songs played that evening, there were specifically three with the property that (all) the audience joined in. The numeral-quantifier "three" is thus outside the scope of "everyone". By contrast, one is free to hear (4) as nesting the scope of "three" inside "all" (by protocol three judges hear an appeal, but the set of individuals can vary from one case to another).

In (5) and (6), reading a quantifier's intent requires distinguishing levels of exactitude. Rhetorically, "all" often actually means "most". The (6) speaker is not heard to report on 10+ million residents as if they were personally interviewed (nor would (6) be falsified by scattered counter-examples). On the other hand, geopolitically New York is indeed divided into five boroughs, so (5) is *literally* correct — but only via a rigid reading of the referential intent behind "New Yorker". In numerous contexts this term extends to many inhabitants beyond the city proper.

Uncertainties in (7) and (8) are of a different sort: anaphora resolution rather than quantifier scope. These also have two competing interpretations, depending on whether "she" is read as Ariel or Beatrice. The former option is more likely in (7) because one can tell from a photograph what the depicted subject "looks like". But we can't *a priori* exclude a continuation like "I'm worried, it seems as if Ariel's hands were shaking". Nor can we entirely disregard a scenario for (8) where Ariel takes a picture of Beatrice photographing colorful birds.

The issue in (9) and (10), by contrast, is ordinary polysemy: (9) might reflect an accountant with offices facing a financial institution, or otherwise a field clinic estab-

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[1] This paper's examples are embedded in its Journal Article Tag Suite (JATS) sources according to a standardized encoding. See the JATS (XML) files for more information.

lished near a river.⇒And (10) could describe a baseball collectible or an animal sculpture.⇒I include these for point of comparison.⇒The ambiguity in the former three pairs, I believe, is *holistic* and *compositional* whereas the latter's underdeterminism is more localized (even though selecting one or another reading of *bank*, and *bat*, frames lexical choices for the overall sentence; my point is that the locus of sense-divergence can be reduced to a single word).

I chose the first three sentence-pairs because the variable factor in each case flip-flops from first to second, at least in the most *likely* reading.⇒But subtle variation can point to the opposite, as in these alternatives for (3):

(11) Every band performed three songs.

(12) Everyone sang along to one song or another.

Changing the context to a *band* playing, versus an audience member, imposes a different interpretive framework: usually bands perform a "set" with their own material/covers.⇒Meanwhile, switching from the exact "three" to the more flexible "one [song] or another" gives enough construal slack that putting the later scope in the former makes interpretive sense.

Despite the competing readings, each option for each sentence I have discussed so far, I believe, has a fairly obvious logical form.⇒But there are other examples where a logical gloss would not fully capture the communicated content of a given statement.⇒Consider:

(13) This election is slipping away from the Democrats.

(14) Student after student came by to complain about the reading assignments.

Notice how (13) and (14) subtly explicate warrants as well as assert beliefs.⇒The metaphor of "slipping away" connotes a gradual process that the speaker has observed over an extended period of time.⇒Similarly, (14) suggests multiple similar episodes that collectively motivate the enunciated, presented in phrasing that intimates an extended, enduring process.⇒These examples reveal a kind of "narrative account" of the speaker's evidential rationale.⇒The details in (14) are different than if all objections were made during one single heated class session, say.

With no further qualification, of course, we hear an implicit "I believe that" attached to any utterance.⇒Since a claim of **P** is almost always a claim of "I believe **P**" this kind of meta-discursive attitude can be subsumed into ordinary logic.⇒Often, it should be obvious, we present one claim to justify another (imagine a variant of (11) that explicitly mentions polling numbers)⇒So the pattern of propositions justifying other propositions does not in itself challenge the validity of semantic theories premised on treating sentences as encodings for propositions.

However, the resources a speaker has for expressing the backstory of their propositional attitudes span a wide spectrum of connotations and experiences, and I'd argue that there is no logical system that could precisely model all ways that language-users characterize how one belief compels or reinforces another.⇒Most usage embeds propositions not in chains of deductive reasoning but rather in narrative presentations that reflect perspectives, the interlocking of situations, and in general the somewhat informal manner by which we formulate beliefs and opinions⇒To the degree that one expresses beliefs via narrativizing constructions or metaphors like "slipping away" and "student after student" — or so I claim — this aspect of discourse cannot be adequately captured via formulaic logic.

Cumulatively, then, I believe that sentences (1)-(14) offer examples of two issues for formal semantics:

1. While assertion (or implicature) of some proposition **P** features in most sentences, there may be details contained in the meaning of the sentence that are not contained in **P** itself (or in logically related propositions, such as *belief that **P***).

2. Even if the meaning of sentence **S** is indeed to a large extent included in some **P**, background knowledge may be needed to infer **P** as the intended meaning.⇒There might be no deterministic process to extract **P** from **S** via syntactic, semantic, or pragmatic rules alone.

If these points are valid, then the project of formulating semantics as the search for rules governing how sentences **S** encode propositions **P** is notably limited.

I don't want to make too much out of ambiguity in and of itself.⇒A "dresser" can be someone donning clothes or a piece of furniture.⇒So people must discern which word-sense applies, usually with the aid of background knowledge.⇒Anyone who believes that such facts problematize a particular semantic theory need not progress to *sentence-level* ambiguity.

However, the *lexical* underdeterminacy of "dresser" or "bat" is a purely local phenomenon that can't be equated with more holistic examples such as (1)-(9)⇒To put it differently, it's credible to imagine homonyms like "dresser" as surface-level accidents, artifacts of random drift in usage, borrowings, or accent, masking a lexical "deep structure" by analogy to the syntactic.⇒Perhaps lurking behind English lies an idealized language where senses could be marked, so "person" and "furniture" dresser become just different words.⇒The problem on a larger scale is that sentences are supposed to function via composition: as words signify concepts, so sentences convey propositional content because they merge concepts according to specific recipes (syntax matters because multi-concept complexes are not just unstructured "bags": the king loves the queen versus vice-versa)⇒I argue from cases like (1)-(14) that even after fully digesting compositional intent, predicate signification remains underdetermined.

To borrow the apologia from the lexical realm, we'd have to argue that lurking behind any spoken dialect is an

...14 idealized language which "marks" all logically salient elements — quantifiers, anaphora, deictics (imagine differentiating a proximate versus distal "there", or abstract versus concrete "here"), conjunctions (cf. "and" as temporal as in "John quit his job and moved out of town", wherein we hear "and *then*") — with enough granularity to forestall all compositional ambiguities.⇨Imagine inflectional variations on words like "all" to distinguish crisp from fuzzy domains, or nested from independent quantification; or morphological features on pronouns to distinguish verb subjects from objects in anaphoric reference.⌐

15 Imagine, that is — or so we might be tempted — a formal semantics whose basic premises are roughly these:⌐

1.⌐Canonically, sentences signify propositions — by analogy to how words signify concepts.⌐

2.⌐Behind any actual language is an idealized language wherein sentences denote structured propositions via compositional maxims, themselves encoded through syntactic conventions and the semantic properties of specific word-classes (quantifiers, pronouns, case-markers, determiners, etc.).⌐

a ⌐Occasions where speakers employ extralinguistic reasoning would then be treated as mentally refining the actual lexicon to an approximated ideal.⇨It is true, say, that *Trump* should be interpreted differently when playing bridge versus talking politics, but this just means that ambient situations nudge speakers contextually when "projecting" their actual language to its systematic ideal.⇨Context disposes us to "label" *Trump* as either person or card suit.⇨But such concerns are antecedent to semantics proper: for theoretical purposes we can take the lexicon as enriched with such labels *a priori*.⇨From this perspective, the cognitive gap between actual and ideal dialects is orthogonal to linguists' project, which is to describe the rules of the latter.⌐

16 ⌐I contend that paradigms authorizing linguists and philosophers to imagine such ideal languages lead us to underestimate the theoretical dependence of linguistics on other disciplines.⇨By way of example, sentences (1)-(14) imply that the specific **P** derived from an **S** depends (in part) on addressees' rational acts that aren't linguistic in nature.⇨The reason why quantifier scope is nested in (4) but not (3) is that the predicates signified by that reading make more sense than their alternatives, but such judgment relies on knowledge of socio-cultural, not linguistic, facts.⇨In short, whatever a sentence means, it does so — in the general case — not via linguistic structures alone, but instead via the interplay of such structures with more general cognitive and social-semiotic processes.⇨Consequently, linguistic explanation alone is incomplete.⌐

17 ⌐Moreover, these issues are sufficiently holistic and entrenched that we cannot dismiss them as cognition merely bridging a gap between real and ideal language, by analogy to real and ideal dictionaries (where each distinct word-sense might be marked in some disambiguating manner).

17 ⇨This isn't only an issue of pragmatic context guiding inference of one word-sense or another.⇨Cognition plays a more holistic role, such that any *compositional* determination depends, in general, on a case-by-case admixture of linguistic and extralinguistic reasoning.⇨Even when "the meaning of a proposition is given by its truth conditions" we thus have to ask *why* sentences encode propositions (or are optimized to do so).⇨People don't talk out of abstract desires to assert fragments of symbolic logic, but rather to coordinate their joint activity.⇨Logically transparent statements are certainly an important part of that, but still, conveying beliefs is an *emergent property* of human verbal communication.⇨The existence of (relatively) deterministic **S**-to-**P** mappings is not an axiom to deploy in linguistic explanations, but a cognitive faculty to be explained.⌐

18 ⌐A plausible rejoinder is that language has a cognitively-important truth-conditional essence that can be analyzed in isolation from pragmatic and contextual complexifiers.⇨The problem then is that extremely simplified languages, such as those for programming computers, should thereby be much closer to a sort of truth-conditional ideal.⇨But the machinery of how programming languages are implemented does not really befit or accommodate a logico-mathematical description either.⇨The germinal structures of computer code are calls to "system" functions and the use of local symbols, bound to memory addresses, to store temporary values.⇨If we take compilers and runtimes as primitive models for human discourse processing, the analogy matches a notion of extralinguistic cognitive "kernels" more than a "closed world" formal-system semantics.⌐

19 ⌐To be clear, I do believe the value of signifying propositions is self-evident.⇨My point is that any instance of **S** conveying **P** is not just a linguistic phenomenon, but rather a detail of two (or more) persons' lifeworld interactions.⇨If I slip, fall, clutch my ankle, and grimace, you may conclude that I am injured; but groaning "ouch" does not express this through linguistic means.⇨Similarly, if I see a car veering dangerously close to my friend John from behind him, shouting "John" to get his attention does not make that word signify "watch out!"⇨In most communication, true, linguistic structure plays a more prominent role — only rarely do we share ideas through crude vocalization alone — yet just because propositions get conveyed in a linguistic context does not ensure that *why* or *how* this happens is fully explicable in linguistic terms.⌐

20 ⌐Lexical plurality is one domain where linguistics is obviously incomplete, because background knowledge is needed to adjudicate competing word-senses.⇨But I believe the *compositional* indeterminacy of whole sentences is qualitatively different, and reveals a more substantial surface area where linguistic and extralinguistic phenomena intermingle.⇨Hence, linguistics must actively connect its paradigms and presuppositions to a larger intellectual environment, one where overarching theories of cognition and communication are formulated and disputed.⌐

For these reasons, I believe *cognitive phenomenology* is relevant to linguistics because it potentially provides this overarching theoretical framework. Here, I will outline why I think Husserlian phenomenology and its modern refinements can play this role, and then what implications for syntactic theory might follow therefrom.

2 Phenomenology and the Philosophy of Science

I argue in this section that (Husserlian) phenomenology and the philosophy of science jointly offer a framework for justifying linguistic methodology. On (overly superficial, I believe) interpretations, phenomenology is often seen as hostile toward science. I propose, however, that phenomenology's analytic role relative to other humanistic disciplines can be usefully discussed in terms of the mutual support between interrelated scientific theories.

An intrinsic aspect of any science is establishing a collection of entities (or kinds thereof) that comprise its focus. Apart from elementary particle physics (perhaps) such entities will almost always be reducible to smaller parts. Hydrology depends on properties of water molecules, and botany on plant cells. However, the discourse of the higher-scale disciplines should not parrot that of chemistry or cellular biology. It is the responsibility of each higher-scale theory to develop a vocabulary and classification that describes dispositions and attributes of their higher-scale objects. Explanations can then address why posited dispositions and attributes generate observed behaviors.

By analogy, there is a distinct set of terms relevant to high-level computer source code (procedures, contracts, side-effects, lexical variables, lifetimes, types, pointers, execution branches). Separately, there are terms related to machine code (registers, prefixes, opcodes/operands, instruction sets, memory pages). Although source files compile to machine code, analyses of programming languages' rules and implementations cannot in general "quantify" over machine-level concepts. Moreover, it would be impossible to explain the rational structure behind machine-code sequences without employing terms or concepts derived from the original high-level sources. While engineered rather than natural phenomena, compiler pipelines are a good case-study in downward-reductive causation versus emergent/token-supervening describability [4].

More generally, examining progressively smaller physical scales may suffice for purely mechanical explanations of physical processes, but remains explanatorily incomplete insofar as macro-scale phenomena structure and mold the micro-scale aggregates.[2] Complex systems may not introduce new forms of matter or energy (existents

with spacetime extension and causative influence), or new forces beyond those physicists recognize — e.g., vis-à-vis Philosophy of Mind, first-person consciousness is not a redoubt of dualism or magic — but they still deserve specialized descriptive and theory-semantic regimens.

In short, causative explanation is incomplete on any one scale in particular; it is only by bridging multiple theories that one can simultaneously analyze both purely physical properties (dependent on micro-scale realities) and aggregate, complex behavior (caused by interactions between higher-scale objects) [31], [35], [56]. Individual theories contribute to cross-scale explanations by formalizing their own terminological and epistemological frameworks, ones that focus on some class of entities but also explicate how peer theories (e.g., those of smaller constituents) describe causal grounds for the object-propensities/qualities studied by the original theory. This is intrinsic to any science: hydrology and botany (reusing those examples) exist as such because it is possible to negotiate discursive practices and investigatory paradigms for macro-scale complexes of water (rivers, oceans, lakes, dams) and *Plantae* organisms (tree growth, forests, foliage ecosystems, etc.) respectively, all the while connecting such paradigms to theories of smaller constituents (water molecules and plant cells).

The situation is similar with respect to humanities and social sciences. A political theorist might note the waxing and waning of parties' popularity, but such phenomena ultimately rest on individual voters' decisions. The mindset of a single person acts as a societal "reductive base" (likewise for economics: individual workers/consumers). Such brings one naturally to cognition, which is an inevitable explanatory setting for any talk of decision-making, social commons, selfhood, identity, or ideology [36]; [58, p. 3].

Inter-theory reduction depends on filling macro-to-microscale gaps with mid-level analyses. Source files, for example, become transformed to several intermediate representations during a compiler build. Vis-à-vis the human mind, neurologists have studied how clusters of neurons form "nuclei", "ganglia", or "modules" with distinct functional roles; and, on a higher scale, brain scientists identify many distinct (and functionally unique) anatomic regions [5], [49], [50]. Working from "the ground up", however, one is still far from connecting neurophysical substrata to vivid *Lebenswelt* consciousness (and vice-versa). Telically, theories' connecting arrows will more deftly point both up and down the ranks of physical constituency.[3]

There is an almost universally recognized explanatory gap with respect to consciousness itself: we still have little understanding of how purely biological phenomena can give rise to subjective "first-personal" states and awareness [6], [12], [63], [68]. Some philosophers apparently minimize this gap by construing consciousness as epiphenom-

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[2] For instance, a purely molecular account of the dynamics of a spinning baseball does not take into consideration the thought processes of the pitcher who decided to throw a curveball. A complete account of the universe in that moment needs to recognize such work of mind as part of the causal background for the ball's trajectory.

[3] Science is *guided* by a more "top-down" metaphysic: lifeworld experience seeds our recognition of phenomena needing microphysical explanation. But we might still take it on faith that no aspect of reality is *fundamentally* incommensurate with basic scientific methods.

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enal, ontologically separated from the primary functional structures of cognition [26, p. 7], [44], [47].⇒However, the nature of consciousness *per se* clearly plays a critical role in the mental careers of conscious animals. Consciousness evolved at some point in natural history, and presumably it conferred adaptive benefits.⇒Instead of reacting to stimuli merely via instinct, forming conscious mental representations — with a certain distance between observer and observed[4] — evidently permits a wider and more malleable response repertoire.Animal behavior and intelligence has evolved in consort with consciousness: we exist in a world of conscious representations that allow us to observe surrounding environments without immediately committing to a course of action.⇒We benefit from opportunities to formulate reactions thoughtfully, informed by values, personal identity, and past experience.[5]

⊢Suppose I stand by a platform waiting for the subway to arrive. I need to board my correct train.⇒To do so, I may well follow a well-rehearsed protocol: hearing the train cues me to look down the platform; upon seeing its outline I then focus attention on the letter- and color-coded symbol painted on the front.⇒If it indicates my preferred train, I pace back as passengers start to disembark.⇒Now, notice how each step in this process is consciously mediated.⇒I deliberately shift perceptual orientation multiple times, and could break off the "protocol" given some external stimuli. ⇒Perhaps I hear my cell phone pinging.⇒Or announcements that the current train is out of service, so it's a moot point. ⇒The key detail is that such protocols don't just occur by force of instinct.⇒They continue, or not, because of subjectively controllable choices of cognitive orientation.⊣

⊢Not that we have first-person awareness of all cognitive processes.⇒Conscious reality has many constituents that we experience as perceptual givens despite being the product of complex (subconscious) reasoning.⇒We see a world of discrete objects, whose contours and boundaries are inferred via visual processing. Sight employs color variation to partition visual scenes, but it is not as simple as isolating distinct color patches.⇒Given a red rose in a blue vase, we cannot segment the image merely by treating red as the flower and blue as the ceramic.⇒Color-perception has added complexity first because some chromatic variation is expected in an extended region resulting from texture and lighting; and second because visible substances have optical qualities beyond just red/green/blue quantities — albedo, specularity, glossiness, metallicity, opaqueness, etc.[6]Object boundaries (and meaningful detected edges) are suggested by discontinuities in visual properties of varying kinds, not just pure color; moreover, segmentation algorithms must be wary of spurious boundaries due to light/shadow effects and the vagaries of pigmentation.⊣

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[4] Apart from rare occasions for "fight or flight" reflexes, anyhow.

[5] We benefit *both* from such distancing — bracketing consciousness's affective dimensions — and yet also from the greater detail in representations carved via sense-data affectively impinging on awareness.

[6] For instance, [19], [21], [23], [34], [38], [40], [42], [64], [70].

⊢Humans subconsciously perform complex image-analysis tasks, many of which can be simulated by computer-vision algorithms [16], [28], [59], [60], [66]: texture segmentation, line/pattern detection, 3D reconstruction, occlusion compensation/interpolation (e.g., perceiving the shape of a vase's back side by projecting around from its visible rim-circle), classifying subregions (in computational parlance, "object proposals" [17, for instance]).⇒Via color alone we infer textural and optical details, yielding a significantly enlarged color space, and thereby perceive objects' external geometry (e.g., their gradient vectors at each point — the degree to which their shape departs from a flat plane).⇒We do not consciously *direct* these processes, by contrast to my example of ascertaining which train is arriving.⇒Nevertheless, conscious experience is intrinsically structured by faculties of visual (and, to some extent, haptic/tactile) perception so that we can trust our senses as a usually reliable source of information about objects' movement, position, shape, and contours.⇒We *do* exercise deliberate control over such data by conscious choices of where to direct attention [54].⊣

⊢Presumably this balance between conscious and subconscious cognition is a fine equipoise, evolved to optimize the efficacy of conscious control. ⇒But even if perceptual processes such as textural segmentation, occlusion compensation, and gradient recognition are not guided by conscious intervention, it is only *through* consciousness that these factor into larger-scale human actions.⇒Our minds work in such a manner that pre-conscious operations become consequential as they are woven into conscious experience, against which we orient as perceiver to perceived, whilst also superimposing planning and executive control, situational awareness, personal identity, and our overall commitment to engage the world in rational, purposeful ways.⇒Consciousness is a medium through which the "outputs" of cognitive processes acquire the status of perceptual givens, that we deem to disclose states of affairs, relative to which we coordinate actions.⊣

⊢Any comprehensive theory of human cognition, then, is necessarily a theory of how subjective experience serves as a unifying field for preconscious faculties, connecting momentary perceptions to larger-scale goal-directed action and situational reasoning.⇒Consequently, investigations that abstract away an encompassing first-personal context are only provisional — the causal efficacy of a single nerve cell, neuronal cluster, brain region, or functional algorithm replicated via AI, depends on how such entities or processes become manifest in consciousness. ⇒Biologists notice a similar contrast between *in vitro* and *in vivo*: molecular interactions in a test tube or device bench versus in living organisms (e.g., [39]).⇒Lab experiments are simplifying abstractions.⇒I propose the analogy: consciousness is human reality's *in vivo*, in that any biological or sociological/economic principles invoked to explain human actions are not explanatorily complete until we consider their presence in first-person consciousness.⊣

Subjective awareness affords a "geometric" model of surroundings more granular than facts or concepts alone; we can spotlight its functional benefit to living organisms. ⇒Still, the *in vivo* raises metascientific questions: we cannot dissect, nor neuroimage, animals in nature (the *in vitro* is artificially staged for data acquisition)⇒For consciousness as the humanities' *in vivo*, analogously one cannot observe another's mental states as objective givens. This is a well-known philosophical controversy⇒Phenomenology offers techniques to adjudicate claims about cognition *in consciousness*, compensating for the private existence of any one person's experience⇒In particular, while introspective consideration of mental states *as they occur* is imperfect (analysis alters the analyzed), we do have capabilities to reflect on subjective episodes retroactively⇒Our minds are primed to learn from experience, and to make inferences about others' mental reality.⇒Usually this would occur without explicit systematization, perhaps to some extent subconsciously, but it is not a great leap to reflect on past experience with a more analytic/expository intent.⌣

⌣Suppose I examine a colorful glass paperweight⇒I will most likely shift my visual focus from place to place once or twice, even when holding the weight still, to discern the coloration on its visible side⇒Then I might turn it over. ⇒Perhaps, from touch, I infer that the bottom side has a flattened base, which I now confirm visually while rotating the object manually⇒As I just begin that action I have some anticipation of the obverse side's appearance, which (let's say) is borne out by what I see next.⇒So a proto-image of that hidden side is *protained* while the top is visible, and when the bottom is seen instead my perception of the top is *retained*⇒The interplay of protention and retention creates a perceptual synthesis.⇒Validation of protentive expectations plays a logical role in such syntheses, as would sense-data that instead deviate from anticipated — say, the paperweight had a plastic or cloth covering on its base, while I presumed it were all glass.⇒Our ability to both formulate perceptual expectations and adjust to subsequent sense-data gives a rational structure to the minimal exploratory course of sense-perception.⌣

⌣Via discussions like these we can collectively analyze phenomena such as retention, protention, and perceptual synthesis.⇒Empirical actuality is not required, nor even particularly relevant, for the analysis.⇒I am not literally holding a paperweight while writing these paragraphs, and a paperweight does not ship with this paper for experimentation⇒I assume that both myself and any reader can engage in such hypothetical considerations, and two people may either agree or question each other's use of terms and concepts like "protention" and "retention"⇒This gives the analysis a public-discursive face, even without empirical science as normally understood⇒We aren't using EKG machines to measure neuron activity whilst a test-subject looks at a paperweight⇒There may or may not be identifiable neurobiological correlates to the concepts of (e.g.) *protention* and *retention*.⇒Searching for such correlates

would be a valid investigation bridging the (metaphorical) "in vivo" and "in vitro" facets of human minds⇒But as a high-level science, cognitive phenomenology does not need to develop a complete theory about how the parameters in its explanatory arsenal emerge from and/or supervene upon physical substrata (the mind/matter gap is a profound limit to our understanding of the universe, but no more consequential here than elsewhere)⇒Its goal, rather, should be to work toward consensus about which theoretical ideas and posits have analytic value and, thereupon, strive for consistency in theory-semantics and in how structural parameters are employed for analysis.⌣

⌣Phenomenologists from Husserl onward have built a literature of analyses and nomenclature toward such theoretical ends⇒Phenomenology explores how minimal sensate givens are contextualized in situations and subjective tableaux⇒Apperceptive synthesis occurs on multiple time scales, with any momentary perception connected to immediate past and future instants via retention and protention [15], plus memory and planning⇒We cannot posit consciousness within single instants — the minimal atoms of experience, evidently, are brief but extended perceptual episodes (one or several seconds' duration, say). ⇒Such episodes then aggregate into larger units whose inner boundaries, we might propose, are defined by deliberate acts of perceptual reorientation (as in the example of switching from watching for an arriving train to focusing toward its window decal)⇒And compound episodes chain together into purposeful, situational action, together with the observations and conceptualizations that sustain it.⌣

⌣We therefore have a provisional network of theoretical concepts — qualia, proprioception, protention, retention, synthesis, patent/latent, horizon, episodicity, situationality, purposefulness, intentionality — to help organize exchanges about conscious states and attitudes⇒Phenomenology does not restrict itself to sensory introspections [69, pp. 5, 9, 22] like "this shade of red looks identical to that one"; instead, we can reflect on our own experiences to consider how concepts such as intentionality and episodicity form building blocks of rigorous cognitive models.⌣

⌣By systematizing a process for analyzing cognition "in-consciousness" — by analogy to "in vivo" versus "in vitro" — phenomenology establishes methodological prototypes for humanistic and social sciences in general, at least for that part of their domains where issues of human thought and decision-making are relevant⇒Phenomenological terminology is central to such goals; its mode of analysis is not open-ended, but grounded on the deployment of specific ideas with relatively fixed technical meanings⇒Via this sense of discursive *praxis* I will argue for connections between phenomenology and cognitive linguistics.⌣

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⌣Similar to the controversial status of first-person reports vis-à-vis theoretical confirmability/falsifiability, the

...41 linguistics community is divided over the value of analyses based on subjective assessments of acceptability [3, pp. 52–55], [9, pp. 2–6].⇒It is, of course, common for linguists of multiple persuasions to construct ad-hoc sentences/utterances in service of theoretical claims.⇒Such methods raise two questions: whether samples not taken from real-life corpora are empirically valid, and whether language-users — in testing that sentences are meaningful, or grammatical — can rely on just their own judgment (rather than conducting some survey) as conclusive.�

42 ⌐There are interesting analogies between the epistemic relevance of subjective accounts in linguistics and in phenomenology.⇒Both disciplines have well-rehearsed protocols even while normal empirical disputation relative to publicly-accessible data does not apply.⇒The possibility of one writer assenting or objecting to another's formulation implies that claims largely endorsed by a research community serves witness to their theoretical value — no less than claims warranted by more empirical measures.⌐

43 ⌐In one discussion that elucidates metascientific background for syntactic theory, Hubert Kowalewski presents the work of Ronald Langacker, and by extension Cognitive Grammar overall, in terms of "Structural Empiricism":⌐

i ⌐Viewed through the lens of structural empiricism, Cognitive Grammar is therefore a family of models of a linguistic system.⇒Like any other scientific theory, it features theoretical entities and processes (cognitive domains, constructional schemas, compositional paths, subjectification, etc.) and empirical substructures isomorphic (in a weaker version: similar) to appearances of observable phenomena.[27, p. 18]

a ⌐He immediately avows "It is somewhat unclear what should count as observable phenomena in linguistics", but situates such uncertainty in a larger philosophical context.⇒In particular, *most* scientific theories entertain taxonomies and analyses of a domain of entities encompassing both public observables and "hypothesized" posits that — for one of several possible reasons — cannot be "seen".⇒Empiricism is *structural* insofar as such "unobservables" are taken seriously because they contribute to persuasive explanations of *observables'* behavior, with structured models unifying the seen and the hidden into a rational package.⇒Sometimes unseen posits are deemed just as real as everything else, merely beyond our capabilities of (instrument-enhanced) observation, at least for now. ⇒Other phenomena (like "dark energy") are left more open-ended, possibly subsumed under such ontological realism or possibly artifacts of some more complex process (e.g., "phonons", which behave like "particles" of sound, but that's largely a metaphor [33]).⇒Natural selection or "design" is not an object, but rather an encompassing system wherein adaptation drives evolution.⇒Potentially "dark" matter and energy will ultimately be given a similarly indirect and holistic cosmological interpretation, rather than deemed to refer to a specific kind of field or particle.⌐

⌐The status of mental attitudes and subjectivity vis-à-vis physics and material science is more circuitous than these other more-physical "unobservables", but Kowalewski implies that we should treat the cognitive as adjunct to the physical in a similar structural vein.⇒If explanations quantifying over subjective states provide convincing accounts of observed behavior (in this case, linguistic performance), then the first-personal realm should be judged scientifically legitimate as a kind of "hidden variables" dimension. ⇒Specifically in regard to ad-hoc sentence examples, he argues as follows:⌐

44

i ⌐The linguistic material analyzed in many ... texts [is] constructed ... to illustrate points under analysis.⇒For this reason, the analyses can be easily attacked on the grounds that they are somehow unreliable due to the inauthenticity of data. ..⇒Many linguists seem to embrace the conviction that linguistics should study only actual, real-life events of language use, which do not belong anywhere on the above counterfactuality scale [viz., logical impossibility is much stronger than the contingent fact of something not having yet occurred, with various intermediates].⇒However, this conviction overlooks the fact that many useful scientific models involve clearly counterfactual scenarios [whose] role is not merely heuristic or pedagogical.[27, p. 32]

a ⌐He then analyzes how⌐

ii ⌐fictional models in natural sciences can be accounted for in philosophical terms.⇒In ... structural empiricism, isolated systems, frictionless pendulums, and perfect liquids are treated just like any other theoretical objects, except their theoreticity does not follow from unobservability, as is the case with electrons and electromagnetic fields, but from their fictional character.⇒[A] structural empiricist is not committed to believing in the actual existence of real-world objects corresponding to theoretical concepts, but only to the empirical adequacy of the theory featuring these concepts.[27, p. 33]

b ⌐A reasonable paraphrase vis-à-vis constructed sentences is that, for purposes of exposing semantic or syntactic claims, the universe of linguistic objects is broader than merely the totality of sentences humans have in fact created.⇒Ad-hoc hypotheticals also belong to that domain if they serve and fit within model-building regimes.⌐

45 ⌐I would put it thus: what makes a sentence an object in the domain of entities spotlighted by linguistics is not the fact of its being empirically an example of real language-use, but rather how upon that sentence we can apply observations, analyses, annotations, etc., whose ordinary ground is real-world speech-events.⇒We can, for instance, note syntactic, morphological, or lexical patterns, and point out where pragmatic interpretation is needed.⇒Constructed sentences may or may not conform to English grammar, but at least the question of whether they do so

...45 is well-posed.⇒Even *imagined* speech is grammatical (or not).⇒We can label syntactic categories; track pronoun-antecedent pairings and singular or plural alignment; observe how inflections indicate verb-tense; and etc.: minimal operations in the syntactic and semantic realms that apply equally whether samples are real or hypothetical.⤸

46 ⤷My earlier subway-platform speculation was similarly about hypothetical circumstances.⇒I have caught New York subways in real life, but that's beside the point: we are primed to learn from experience, but in a manner that abstracts nonsalient details; it is not a great stretch to substitute hypotheticals for memories, in this sense. ⇒Husserl and his commentators, too, build many analyses around constructed situations, like seeing a mannequin in a shop window, hitting a tennis ball, or admiring a sculpture [22, p. 2], [65, p. 6], [53, p. 208]⇒Following such examples, my presentation was not free-associative: via posits like attention, episodicity, and situationality, I bore a matrix of concepts via which to, in effect, "annotate" elements of consciousness.⇒Instead of focusing on the contrast between real and hypothetical experiences, methodology should consider whether some target of analysis is amenable to the notions and structures comprising an analytic protocol.⇒Similarly, Cognitive Grammar advances a series of interrelated analytic notions (landmark, projector, profiling, domain of instantiation, attentional system, grounding predication, subjectification, subjective and objective construal) whose theoretical merits may be tested against constructed (and also real) sentences.⤸

47 ⤷Methodologically speaking, reasonably, a hypothetical object, space, or situation becomes an instance of a theoretical model via the applicability of that model's simulative and descriptive maxims.⇒The proper explanatory domain of a theory is any structure that can be analyzed according to the terms of that theory — including artifacts conjured ad-hoc precisely to test, clarify, or refine it.⇒By analogy, complex numbers (and other dreamed-up number systems: hyperreals, quaternions, affine arithmetic), despite lacking physical interpretations (such as spatial distance) are objects of mathematical reasoning because they are amenable to many quantitative methods (add/multiply, path-integration, infinite summation, and so forth).⤸

48 ⤷Constructed examples are prominent in both linguistics and phenomenology.⇒Relatedly, the "demarcation problem" — defending them as legitimate inquiry, not pseudoscience — plays similarly in both contexts.⇒Suppose I examine a pair of hypothetical utterances:⌐

(15) John poured water onto the stove.

(16) John spilled water onto the stove.

a ⌐The most obvious point would be how "poured" versus "spilled" frames the action in different ways (deliberate or accidental).⇒By selecting one or the other, the speaker implicitly expresses beliefs about John's mental state; such choice-effects are cued by the lexical contrast between the two verbs.⇒The sentence is not merely notating observable details: choice of words can encode information about the speaker's epistemic starting-point.⇒This phenomenon is nicely illustrated in (15) and (16), constructed or not.⤸

48a

49 ⤷But let's step back.⇒For sake of discussion, I will assume (15) and (16) occur in contexts where listeners know the speaker saw John firsthand (the evidence is direct observation, not hearsay).⇒Implicit in a communicative claim to *describe* something witnessed is having been in a perceptual orientation to *see* it.⇒The sentences then encode salient features of this orientation: presumably the speaker was standing/sitting in a position where both John and the stove were in their visual frame, and they could focus attention on one or the other as called for.⇒Likewise, probably they were talking to John or in some other way clued in to the ambient situation, so as to rationally infer John's intentions.⇒Much of the *configuration* of this cognitive-perceptual orientation, thereby summarized, reflects my sketched "structural model" for phenomenological description — the intentional relations toward objects insofar as we deliberately orient toward them as a focus of attention; the coexistence of multiple attentional sites (e.g., John and the stove) with focus shifting back and forth in larger synthesizing episodes; the role of larger-scale situational awareness guiding our granular decisions to direct attention hither and thither [24].⤸

50 ⤷And yet, such configurations are also implicit in the sentences' meanings.⇒Foci of attention tend to become signified as nouns; so in both cases we have "John" and "the stove".⇒It is the former who initiates actions that affect the stove's state, so he becomes encoded as subject/actant with the latter as "patient".⇒Since speakers implicitly expresses the evidence for propositions stated (or implied) in their discourse, understanding a sentence is partly a matter of inferring mental states, which includes perceptual comportment toward its noun-topics.⇒Anyone hearing (15) and (16) will, at least in some schematic manner, reconstruct a configuration of attentional focus and situational construal like that I tried to explicate phenomenologically. ⇒Syntactic categories such as nouns and verbs are rooted in listeners' need to infer speaker's cognitive attitudes.⤸

51 ⤷As a feature of our reason and lifeworld, mental states exist in a vivid way in our own momentary consciousness, but they also exist in an approximative manner vis-à-vis people (and often animals) around us.⇒Others' cognitions being, modulo such imprecision, a natural feature of our own rationality undergirds (I claim) the feasibility of both phenomenological and linguistic analysis.⇒We have a structural model for how people comport themselves to situations so as to observe and act rationally; therewith we seamlessly transition from nonverbal orientation toward surrounding environments to framings of states of affairs in communicable ways, then actual speech-production.⇒Basic organizational principles migrate from one to the other, such that cognitive-perceptual structures

...51 (attentional foci, say) become manifest, within communicative intent and staging, as linguistic phenomena (e.g., that to which I can perceptually attend becomes a noun; attributes noticed so to do this become adjectives, etc.).

52 If this is correct, then posits of linguistic argumentation have origins in cognitive faculties that can be phenomenologically investigated (and should be if we want an encompassing, "in vivo" theory).⇒At the same time, language elucidates how models of other minds are inherent to our rational agency; they aren't esoteric superstitions of a phenomenological sect.⇒Language is the best case-study for how phenomenology simply codifies "folk theories" of mind and cognition.

53 Phenomenology and cognitive linguistics, then, to my mind reinforce each other; and each can be said to depend on the other, from an expository and justificatory point of view.⇒More to the current point, hypothetical situations are methodologically valid because both disciplines curate a toolkit of terms and concepts whose applicability transfers over from constructed to empirical examples.⇒And, in particular, the menagerie of theoretical posits in phenomenology and in linguistics are interrelated, as (15) and (16) hopefully illustrate.

3   Concepts and Compositionality

54 "The meaning of a sentence is a function of its words and how they are composed" (cf. [45, p. 2])⇒In itself, that seems uncontroversial, except that *words* are not combined *per se*; rather, the concepts to which they "point"⇒There are two key questions: how this "pointing" works; and how *concepts* are combined.

55 A good example of formal answers to the second question is Bolt *et al.* [7], based on Peter Gärdenfors's Conceptual Space theory, alongside a syntactic approach related to Categorial Grammar and mathematical Category Theory.⇒Consider "red box", and (for sake of argument, although this deviates from the specifics of Gärdenfors-inspired work on conceptualization) define the concepts set-theoretically: *red* means the set of red things; *box* means the set of boxes (or box-like things)⇒Combining the concepts yields an intersection between the two sets. ⇒Meanwhile, syntactically, that compositional motif is cued by the left-adjacency of *red* before *box*, which in English binds adjectives to nominal targets⇒Thus we have a syntactic operation/relation (left-adjacency) and a semantic operation (set-intersection)⇒The gist of [7] is that mapping the *phrase* to its signification depends not just on mapping the two *words* but also mapping the intra-Category *morphisms* to each other (adjacency projects to set-intersection).

56 Bolt *et al.* generalize this kind of insight by proposing Categories (in the mathematical sense) for syntax and semantics, with *lexical* word-meanings serving as maps (technically *functors*) from one to the other⇒Because func-

46 tors project "morphisms" (transforms *in* Categories) from one Category to another, assemblies of syntactic operations project onto semantic/conceptual structures systematically, extending the lexicon-to-concept functor to aggregate phrases.⇒In other words, we can give a mathematical gloss to "combining concepts", and specifically the role of syntax in defining compositional patterns that get transferred to the semantic plane.

57 For Bolt *et al.*, then, syntax and semantics develop in consort.⇒On the one hand, we have theories for how to properly model syntactic structure (e.g., Categorial Grammar [29], [67]).⇒On the other, semantic theory should define operations that are referenced by syntactic operations by analogy to how lexicons define single words⇒In [7], Conceptual Spaces supply the requisite semantic architecture, analyzing how two concepts' respective "spaces" can interact (similar results can be based on alternative "amalgram" models; *cf.* [52])⇒I am not convinced of the explanatory value of quasi-mathematical treatments for concepts, such as advanced by Gärdenfors (such criteria as "convexity" feel forced to me, outside special contexts like color terms)⇒Nonetheless, Bolt *et al.* codify what a formal engagement between semantics and syntax should look for: having determined a pattern of synthesis among components by virtue of syntax, we seek a translation of that synthesis into the conceptual register.

58 If we abstract away word-order (the left/right adjacency distinction), Categorial Grammar resembles a kind of type-theoretic syntax where parts of speech may be likened to a system of types, such as nouns and propositions.⇒Because mappings from a tuple of types to some result type are themselves a type, we can build an arbitrarily large system out of a small basis (e.g., n/P)⇒Propositions are an overarching sentential type, whereas phrases may have intermediate types between "P" and "n"⇒A sentence is properly formed if those intermediates resolve to propositionality, via type-inference rules like reading (intransitive) finite-verb/noun pairs as producing a grounded clause.

59 All of these paradigms assume that phrases compose meanings by synthesizing concepts in order-dependent ways, so it is important to examine how pairs of concepts can transform into something more specific then either one in particular.⇒I will outline a cognitive-phenomenological reading of this phenomenon.

3.1

60 It is circular just to say that "red box" means something possessing both redness and boxness, so we need to look a little deeper⇒Consider a full sentence:

(17) I put Mom's chocolate brownies in this red tin box, take some!

a It's easy to destructure this into a union of concepts where each word makes a distinct contribution⇒Here are a few:

◎ ⌐tin box → provides insight into how the box will look, and feel to the touch, and how to open it⌐

◎ ⌐red tin box → the color helps one find it amidst other objects⌐

◎ ⌐this red tin box → invites the hearer to focus on something proximate to the speaker; deictic augments descriptive reference⌐

◎ ⌐in this red tin box → draws attention to the interior, with its functional affordance of holding and storing contents⌐

◎ ⌐chocolate brownies → "chocolate" adds detail relevant to whether the hearer will want to eat them⌐

◎ ⌐Mom's chocolate brownies → helps anchor the referent in situations known to the listener (insofar as the brownies are not otherwise identified); viz., Mom made them, and this fact is known to the listener. ⇨On an alternative interpretation, the brownies are *for* Mom, but this is less likely in context.⌐

⌐We should examine both syntactic and semantic factors⇨Semantically, clearly each word adds its own details to an emerging picture of the speaker's intent.⇨How to properly model the intermediate stages of the overall conceptual bundling remains an open question⇨Syntactically, it should be obvious that there is a fixed order to when each word "enters the stage", as it were.⇨This is presumably enforced by, or an effect of, grammatical form, though again a theory would have to describe how this happens.⌐

⌐Addressing the semantic plane first, considering words with explicit sensation-related meaning is a good place to start.⇨It's simple to note that "red box" designates a box which appears as red⇨But we should investigate how this meaning actually factors into cognitive processing⇨I would question an analysis whereby understanding (17) entails forming a mental image of a "red tin box", at least with any vividness.⇨But nor do we make sense of that phrase in complete isolation from sense-content⇨This is a good place to invoke the maxim that meanings are usually precursors to concrete actions⇨Should (17)'s hearer decide to partake in brownies, the meaning-content helps prep for finding and grasping them. "Red tin box" thereby equips said hearer with information relevant to locating, opening, and reaching inside the stash⇨Hearer does not require an explicit mental image at the moment (of enunciation), but *does* need to later isolate the box from fields of sense-data. ⇨Of course, while imagining that future scenario, hearer might potentially form a certain mental picture of a red tin box, but it can adequately be imprecise.⌐

⌐Taking this case as an example, it seems as if phrases with concrete, sense-related meanings occupy some intermediate cognitive realm, neither abstract concept-clusters nor photorealistic imaginary pictures.⇨This presumably reflects cognitive anticipation of future behavior more generally: mentally rehearsing planned actions involves

pictorial imagination to some degree, but we focus on enactive schema more than sensory details (maybe a temporal mirror-image of how perceptual specifics likewise fade from memories)⇨If we can accept this as a feature of cognition as such, it yields a natural framework for semantics.⇨Such semi-perceptual content serves as a "staging area" for intermediate-level concept-aggregates.⌐

⌐Syntactically, meanwhile, the word order seems fairly rigid⇨This is hardly self-evident, because each contribution (e.g., *red* and *tin*) feels unrelated⇨Still, evidently there are cognitive trends in the mental "staging area" that yield a preference for building conceptual bundles via canonical, ordered formulae⇨Among adjectives, those naming attributes that are more intrinsic to the nature of their substrata appear closer to the noun than qualities which are more incidental⇨A metal box can be painted over, but will never become wooden.⇨Hence "red" slots outside "tin" (*tin red box* sounds wrong)⇨Adjectives of compositional substance bind more tightly than color, which is ontologically "accidental".⇨Such conventions evidently reflect how adjectives play different roles in different contexts — affixing *black* inseparably to "belt" clarifies that the color, here, is not primarily a sensate quale, but part an enumeration (*black baseball cap*, but *karate black belt*).⌐

⌐Phrases built around material objects thereby evidently pan outward from their minimal physical substantiation to the ambient situational context, with word-order marking a parallel trajectory.⇨This is a syntactic principle in the sense that "tin red box" is ill-formed by virtue of word order, but also since we need to mark phrasal boundaries: adjective-to-noun distance depends on *which* noun.⌐

⌐Parts of speech, moreover, reflect how words play specific roles relative to aggregating concepts in (what I would call) a "semi-perceptual" staging area⇨Noun phrases are de-facto landmarks in the synthesizing process, forming a conceptual nexus with some level of completeness and unity⇨This surely reflects how sentences reconstruct perceptual orientation: in (15)/(16), say, John and "the stove" represent two object-concepts inferred to stand as attentional foci for the speaker.⇨They serve as attractional zones, or foregrounds, absorbing awareness of other details and backgrounds⇨Since linguistic structure intuitively reconstructs perceptual organization, it makes sense that noun-phrases are cognitive-staging milestones, because their significands are cognitive-perceptual attractors.⌐

⌐Type-theoretically, modeling some parts of speech as "functions" captures the interplay of stasis and dynamics that typifies cognitive "staging".⇨Noun-like conceptual aggregates have a kind of holistic unity that becomes destabilized by added modifiers⇨"Tin box", say, has a certain stasis as idea, semi-image, or precursor to action; a stasis disrupted by "red", but then via further processing the staged image settles back into a stable unity. ⇨The formal construct of adjectives mapping nouns to nouns captures the surface-level manifestation of a churning cog-

nitive underground, where intellectual labor is expended in forming, altering (by assimilating new detail), and re-establishing static precursor-images�llarly, propositions have a kind of situational stasis — representations of states of affairs more than discrete objects, but still fixpoints within our construal of facts and affordances surrounding us — which gets destabilized when subordinate clauses become nested into superordinates.

(Syntactic-) Categorial type theories are, of course, just a few among many protocols deployed to model sentence structure⇒Phrase-structure grammars emphasize nested hierarchies⇒Dependency grammars focus more on inter-word relations (often among adjacent words, but crucial connections can exist between distant ones, such as pronoun/antecedent, or subject to verb when a clause intervenes) [25], [43], [48]⇒If our framework is instead (or in addition) more cognitive, we can emphasize the transformative effects of any single word on a conceptual synthesis established via preceding words, in a *logical* ordering that deviates from the sequence of enunciation, though grammar determines how the latter maps to the former.

To examine further, imagine a simple programming language with just a few components: function symbols, string (character-sequence) and numeric literals, and "variable" symbols that must be assigned a value before they are used⇒The most common structure in such a language would be expressions consisting of a function symbol and one or more "arguments"⇒The *interpreter* that would execute programs written in the language is essentially a state machine, reading a sequence of symbols in turn⇒Assume the following basic operations:

1. If the current symbol is a numeric literal, convert it to an actual number (e.g., "16" becomes hexadecimal **0xF0**)⇒Convert string literals to arrays of glyph codes (e.g., in the Unicode **UTF-16** format)⇒Place the current value on a program stack.

2. If the current symbol is a variable, retrieve its value from a global index⇒Because every variable is initialized before use, we can assume that any value is ultimately obtained from source code as in item **1**, or read from an external source (like a local file)⇒Again, place the current value on a program stack.

3. If the current symbol is a function-symbol, identify which procedure is named by the symbol⇒If we allow polymorphism — one name may reference multiple code-blocks, distinguished by their signatures — then this process requires examining the types of values further down the program stack⇒Once the correct procedure is identified, transfer control to that function body (if compiled correctly, the new callee will take its inputs off the stack and push its own return values, which in turn may serve as inputs to later subroutines).

a For sake of discussion, I will call this a "push/transfer" execution model, given the two main operations (pushing

a value, or transferring control)⇒While this account is too simplistic for practical computer languages, it serves as a useful case-study for real-world compilers.

Among the added complications relevant to a real-world push/transfer implementation are — first — resolving polymorphically "overloaded" function symbols⇒By stipulation, the interpreter or compiler has access to a list mapping procedure names to signatures⇒Selecting a correct overload is straightforward if there is one exact signature-match given the current stack types⇒However, most modern programming environments allow implicit type-casts (e.g., any integer is also a decimal, with fractional part zero).⇒Moreover, modern languages commonly adopt template-metaprogramming and/or class-inheritance systems wherein a given variable-symbol could have different types in different contexts⇒In these systems, to compute which overload matches a given sequence of parameter-values is considerably more complicated.

A second difficulty for push/transfer mechanics is deriving the correct sequence for presenting symbols to the "interpreter" (in real life, said interpreter is more like an abstract representation guiding the compilation of high-level code, but we can still reason about source code as if it were interpreted on-the-fly)⇒Usually this sequence is different from the order in which tokens appear in source code, so symbols have to be reordered for push/transfer. ⇒Compilers must also deduce which tokens are associated with which function-symbols, a process that involves both syntax (e.g., nested parentheses) and semantics (e.g., order of operands, like multiplication preempting addition). ⇒Parsing high-level code is therefore a matter of reducing source files (which have extra structures such as nested expressions) to a simpler representation based on token-sequences (details like nesting become "flattened" to a single lineup, which works because subroutines enforce a contract about how the program stack should be used).

Despite its simplistic provenance, the "push/transfer" execution model has some interesting resonance with natural language⇒For one thing, the syntactic process just described — parsing more-complex code down to symbols arranged in a sequence ordered for push and transfer actions — has some schematic resemblance to the role of syntax in human language⇒Moreover, semantic complexities such as function polymorphism recall phenomena like multiple word-senses, where lexical units are, in effect, "overloaded" with divergent meanings by context.

Both computer code and natural language are, by many lights, better represented in terms of parse-graphs than trees (particularly in so far as some relations, like anaphora in the latter context and side-effect propagation in the former, cut across tree-like directed branches)⇒With proper edge-filtering, tree "visiting" algorithms (e.g., push/transfer) can be adopted to parse graphs. Type-checking may be described as a graph-traversal strategy where the "program stack" holds types rather than concrete values⇒Assuming

...73 polymorphism, a type-checker must confirm that, given any stack-state with a procedure symbol on top, there is a unique implementation whose parameter-types match those symbolized lower on the stack (if so, its output type is then placed on the stack instead)⇉Both type-checking and push/transfer may thereby be modeled as versions of a generic graph-traversal pattern, whose central operations are crossing to unvisited child nodes; pushing leaf-nodes' values (or types, etc.) onto an external stack; and performing some external operation on non-leaf nodes once all descendent branches have been explored (in effect, navigating graphs with a state machine holding stack-memory and a trace of previously-seen nodes).⌞

74 ⌐In short, whenever a directed graph models a computational process, we can extract a postordering of nodes representing the proper sequence for a push/transfer traversal; and we can type-check relationships between child nodes and parent nodes, the latter being interpreted as procedures with specific signatures⇉I believe both of these operations — postordering and type-checking — have approximate correlates in natural language⇉The mapping of a general parse-graph onto a postorder traversal sequence recalls underlying machineries for conceptual synthesis, conformant to a word-by-word "staging" order⇉Intuitively, nouns are akin to "values" pushed onto a *conceptual* stack, whereas verbs, adjectives, and other modifiers embody cognitive transforms applied to concepts currently residing on this "stack" (albeit which, in the present context, is mostly metaphorical)⇉Given this conceptual background, I will adopt the phrase "staging order" as a linguistic counterpart to computational "push/transfer" order.⌞

75 ⌐Type-checking and postordering are "functionalizable" similarities between natural and programming languages — whatever the metaphysical differences between how they are realized, the two domains have some functional structures in common⇉By analogy, human and computer vision share capabilities whose functional roles in larger processing "modules" can be analyzed⇉Image-analysis tactics such as texture segmentation, occlusion compensation, and gradient-vector inference have detailed mathematical formulae that could offer functional insights into visual perception (even if computer implementations may be very different from brains')⇉Postordering and type-checking are not at the same level of quantitative sophistication, so we don't necessarily move a theoretical needle very far by detecting structural analogies between graph-postorder and cognitive "staging"⇉Still, I believe these analogies imply a precis of the syntax/semantics interface that is more cognitively realistic than Bolt *et al.*'s appeal to commutative diagrams⇉Compilers are *stateful* processing/workflow platforms, more than mechanistic term-reduce artefacts.⌞

76 ⌐More substantially, postordering is not just a heuristic for revisiting parse graphs⇉Type reduction and conceptual-synthesis conventions act as constraints *on* parse-graphs to begin with⇉Most sentences give rise to many minimally plausible graphs⇉Even when excluding unrelated contexts like the family name, for instance, the word "trump" in a playing-card context can serve as noun, verb, adjective, and even adverb⇉The distribution of a single word-sense over multiple syntactic categories is more a norm than an exception.⇉This fact in itself suggests a proliferation of plausible parse-graphs, even before addressing polysemy and phrase-boundary ambiguities⇉From many *plausible* candidates, the set of *correct* parse graphs are those that meet case-by-case criteria of coherence, some of which can be modeled in terms of graph-traversal protocols.⌞

77 ⌐Such processes are apparently interdependent, in that (for example) part-of-speech assignment influences phrase nesting and vice-versa⇉Language would be more computationally tractable if processing algorithms had a logical order, with earlier ones' results available to those later⇉In reality, it seems as if our minds subconsciously test out many initial-condition sets for traversals (e.g., multiple ways of construing syntactic categories) and converge on best solutions (e.g., parts of speech and phrase boundaries being mutually consistent, without deriving the former first, or vice-versa)⇉Conceptual synthesis and "staging" are surely part of this process insofar as assessments of meaningfulness, on the one hand, and well-formedness (on syntactic, semantic, and pragmatic criteria) on the other, coexist in a kind of feedback loop, converging on the most plausible construals in all domains (syntax, semantics, pragmatics, and conceptualization).⌞

78 ⌐This interpretation of parse-graphs — as "intermediate representation" for sentence content, endowed with post-order and type-checking traversals — works by analogy to (but also in place of) set-theoretic or (say) modal-logic approaches, where languages are treated as a surface-level manifestation of logico-mathematical rule sets⇉A key difference, however — apropos computer-code as metaphor for human language — is that within "transfer of control" the space of available functions is not restricted to those explicitly implemented in high-level code. ⇉Operating-system functions, language runtimes, standard libraries, and other pre-compiled procedures would be analogous to extralinguistic cognitive competence that may be solicited by constructions in discourse: conceptual transformations' staging-order position might be established by syntactic and semantic means, but their cognitive effects need not be modeled solely in semantic or pragmatic terms.⌞

79 ⌐I intend to propose these ideas as a foundation for grounding syntactic theory on cognitive optimization — and, by extension, situating the theory's overall series of disciplinary warrants against the paradigms of phenomenology⇉However, I feel there are two issues to address that could complicate the picture I've outlined.⌞

3.2

80 ⌐First, my discussion has implied that word-order and associated sentence properties, such as phrase-structure,

...80 are logically fixed⇒That may be true in some sentences, but one might find counter-examples⇒I will examine:⌐

(18) I'm heading out to the store.

a ⌐As I see it, there are two ways to read this sentence, and they imply phrasal and staging-order differences⇒We can read "heading out" as a compound verb, or we can treat "out", instead, as part of an expression describing direction of movement⇒That both are feasible may be demonstrated by question-and-answer forms:⌐

(19) Where are you going? Out to the store.

(20) What are you doing? Heading out.

b ⌐Movement verbs reference spatial trajectories, but these are defined by more than just start and end points.⇒A path "to the store" has a functionally distinct early part in leaving the building, to which (18) alludes via "out". ⇒At the same time, the process has dimensions beyond just spatial movement; going *out* typically involves grabbing keys, wallet, phone⇒In short, the presence of *out* results in (18) referring to the speaker's planned actions with extra detail both vis-à-vis the path trajectory and the operative components⇒Either of these semantic effects are triggered by attaching "out" to a word or phrase — but a given parse will draw the phrasal boundaries one place or another, and thereby model only one part of the word's role.⌐

81 ⌐I would address this issue by arguing that parse-graphs are provisional: diagramming one version that is appropriate for a sentence does not preclude others working as well. ⇒The actual syntactic forms that influence sentences' reception may serve as a superposition of multiple different phrase-nesting schemes⇒Since "out" in (18) is stated both immediately after "heading" and before "to the store" we can, while hearing (18), process "out" simultaneously as influencing our interpretation of both the prior word and the following phrase. A parse-graph represents how we experience certain words as implying a modification of some intermediate complex (what I've called "staging"), particularly if we allow edge-annotations to notate where words have that "restaging" effect.⇒In this sense parse-graphs are cognitively motivated, but such does not preclude a sentence from yielding several distinct motivated graphs. ⇒If we believe syntax should provide one definitive construction representing sentences' "deep structure", then we can take the unit of exposition as a superposition of multiple graphs rather than one single structure.⌐

82 ⌐So, in short, two different parse-graphs — one wherein "out" attaches to "heading" to yield a verb-phrase, and another where the same word connects to "to the store" to provide a direct object — are both correct, but neither is complete.⇒The "definitive" parsing structure for (18) would be a superposition of the two provisional graphs.⌐

83 ⌐The second issue I'd like to address is the extent of complete phrase- (and sentence-) level scale in contrast to word-pairs.⇒My preliminary proposal is that individ-

ual words contribute cognitive "restaging" of aggregates formed from logically (not necessarily temporally) prior words.⇒From a given conceptual bundle, we interpret a particular succedent word as adding detail or variation, wherein the synthesis re-stabilizes into an updated unity by assimilating the new content⇒In broad outline, the process is not unlike how scientific theories adapt to accommodate new empirical data, though on a smaller scale.⌐ 83

Such an analysis might work fine on mostly local levels, e.g., adjectives, adverbs, relative pronouns, determiners, and so forth, but require further clarification for verbs (and perhaps conjunctions, subordinators, etc.)⇒In the case of verbs, a "local" analysis could accommodate intransitives, but not subject/object (and possibly indirect object) tuples. ⇒Categorially, (di)transitive verbs require multiple nominal constructs to yield proposition-like syntheses⇒Moreover, verbs may command multiple clauses governed by various case-forms: locative constructions, (ab)lative, benefactive, instrumental, etc., each marking that an associated phrase presents some detail (the where, why, how) for the central verb in the immediate surrounding phrase/sentence.⌐ 84

⌐In the realm of conceptual synthesis, that is, verbs function uniquely: they don't alter a single aggregate so much as collate a collection of distinct nouns (or noun-phrases), using a roster of thematic relations, in particular, to organize the significatory role of different constituents⇒A sentence, in general, accrues various kinds of detail related to its central verb⇒Some of these would appear to be intrinsic to the verb's meaning; some, less so.⇒Given *donate*, for example, it seems necessary to indicate (perhaps by implicit context) a giver, a gift, and a recipient:⌐ 85

(21) Last weekend we donated a hundred dollars to the animal shelter.

a ⌐Here, the indicator of *when* (viz., "last weekend") is subsidiary, adding merely a tangential factoid to the overall sentence, but the other components are mandatory given the relevant sense of "donate"⇒A verb's "theta grid" models elements that are sufficiently intrinsic that special grammatic forms embed them concisely, as in⌐

(22) We gave the animal shelter a hundred dollars.

b ⌐However, indirect objects may be ineliminable for a completed idea while also resistant to the transform whereby a phrase headed by *to* moves before the direct object, dropping the preposition⇒It is not clear why the abridged "double object" form is acceptable with some English verbs and not others ([10], for example)⇒Be that as it may, verb "details" exist on multiple levels of essentiality, from a core subject/object nexus (spanned by theta grids) to essential and then eliminable thematic relations, plus potential marginal emendations (like when something happened, or further elaboration on motives or context)⇒Verbs have implicit "slots" for such variegated thematic roles, and by observing the particular slot slated for a given word (via theta formations) or phrases (via case-marking; par-

ticularly, in English, leading prepositions) we identify the intended role for the constituent [14]⇒(Philosophically, the concept of a phrase itself may be emergent/derivative.)

⊱In presenting conceptual syntheses, then, verbs operate via structures of roles rather than one-word-at-a-time reworking of conceptual syntheses⇒Cognitive staging is still intrinsic to inferred meaning; the point here is that verbs effectuate such processes on a larger scale, spanning the breadth of a phrase or sentence, whereas other syntactic categories (e.g., adjectives) operate more locally. ⇒A theory of cognitive staging can cover both cases if it accounts for thematic roles/relations⇒We can still study verb-constructions as sets of word-pairs that trigger mutual cognitive reinterpretation, but the difference here is that we need to describe *which* thematic role governs how the verb is oriented to any conceptual aggregate that it transforms and/or vice-versa⇒The conceptual pairing of verbs to a locative phrase, for example, would be different than the same phrase (perhaps swapping out the preposition) figured as indirect object, or genitive, or so on.

⊱Systems of thematic relations establish a kind of two-tiered dimension of sentence structure: the set of words and phrases that add detail for a central verb provides sentences' inner skeleton, whereas adjectives and other "localized" modifiers form a peripheral epitope (so to speak). ⇒Conceptually, the central firmament's multi-part nature means that cognitive integration must synthesize multiple components, in contrast to a single re-staging such as *diamond* in "her diamond wedding ring"⇒To put it differently, the underlying intellectual phenomenon is less about a single concept acting on a provisional image-aggregate (as *diamond* acts upon *wedding ring*, *red* upon *tin box*, or *karate* upon *black belt*) so much as a verb, in conjunction with multiple thematically related details, setting forth the principal data of situations or states of affairs⇒Whereas semantics on the localizable "periphery" appears to tap into a cognitive faculty of schematic planning and proto-images, the meaningfulness of the "central" structure reflects a more holistic, situational cognitive repertoire.

⊱We can also say that the veins of a sentence's thematic scaffolding provide multiple sites for speaker-relative grounding (subjectification): for each person's discourse to encode their particular epistemic orientation and perspectival vantage [30, pp. 263–265, 296–309, 422, 441, 449, 485]⇒Such details may be manifest temporally (e.g., via choice of verb tense/aspect), spatially (via locative constructions and deictics), perceptually (through, say, figure/ground, single/plural, mass/count, and landmark/trajector pairings), or in terms of "narrative construal" from an evidential standpoint (I argued earlier how rhetorical patterns imply evidential narratives even if these are not marked directly on a morphological scale) or local qualities, such as verb-aspect⇒Not to imply that this list is exhaustive; modeling all modes of subjectification requires a detailed theory in its own right⇒Here I simply

want to observe that such grounding is holistic in the sense that it encompasses a central verb (profiling some event, state, or process) as well as the set of noun-concepts or -foci that participate therein⇒The central spine that pulls together multiple thematic relata likewise consolidates multiple sites for speaker grounding/epistemics, allowing listeners to piece together speakers' belief-provenance.

⊱From a formal perspective, thematic relations suggest a form of typed lambda calculus wherein functions act upon input-tuples indexed not by sequence, but instead by assigning distinct roles to each argument⇒Consider lambda-expressions taking (in lieu of value-tuples) parameter-packs indexed via distinct role-attributions for each argument.[7] In spoken language, the particular thematic relation that connects a subsidiary phrase to the central verb determines how we infer its meaning (or, more precisely, its contribution to the larger meaning overall).

⊱Such "roles" may be outside the normal scope of lambda calculi (or other computation-models), but there are related ideas in hypergraph databases, or similar knowledge-representation techniques⇒A multi-part relation (schematically a hyperedge) can assign distinct roles to each participant; e.g., *divorce* implies two individuals, a prior situation of marriage, and some legal entity or context which recognizes the divorce as binding⇒A binary relation such that one party is *divorced from* another thereby implies the presence of further participants (so treating this relation as merely arity-two excludes constitutive details).

⊱Unlike a "Semantic Web" style hyperedge, calling a procedure does not assert a presumed fact but rather obtains a computed result, perhaps then used in some larger or future expression⇒However, there are various commonalities between sets of interrelated software procedures (e.g., code libraries, coalescing "procedural" rather than "declarative" knowledge [20]) and graph databases, that could potentially serve as approximative inspiration for theories of human cognition⇒Procedural "memoization" (caching results to avoid repeating prior calculations) combines evaluation and data-persistence⇒More substantially, pre- and post-conditions embody *contracts* [41] (or *proofs* [57, p. 47]), partially mimicking shape/range constraints on hypergraph neighborhoods [8]⇒For such contexts, database and software-language concerns interpenetrate.

⊱In cognition, meanwhile, the line between predicative belief and practical know-how is more radically blurred. ⇒For one thing, facts are not isolated data-points; they are inextricably contextualized by conceptual and pragmatic networks⇒For another, facts and enactive maxims share agent and theme/role structures, on a vaguely "Neo-Davidsonian" event semantics [11]⇒Conceptual integra-

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[7] This kind of calling convention — adopted as "labeled" or "keyword" parameters in some computer languages — is arguably more natural than the alternative ("positional" arguments) anyhow, because each value passed in to a procedure typically has a distinct role, possibly suggested by its name in the function's implementation block.

...92 tion is in some sense an intellectual procedure — "computing" in the domain of conceptual staging and proto-images, if we don't take the mind/machine metaphor too literally — and language-users deploy background knowledge to "execute" such scripts in comunally-sanctioned ways.

93 The "interface theory of meaning" developed by Orlin Vakarelov is another route to articulate similar intuitions [61], [62]⇒By analogy to how lexicons codify a space of linguistic knowledge — speakers are acquainted with the concepts associated to thousands of words in their native tongue — we likewise have (and acquire) a dictionary of mental "scripts" guiding how concepts are to be merged; e.g., pair an object with its constitutive material (like "tin box"), or its manner of appearance ("red box")⇒In many cases these semanticized scripts derive from analogous skillfulness in social, collective life: "menu", "waiter", and "restaurant" belong to a semantic frame that regulates one form of social activity⇒Knowledge of what to do when visiting a sit-down eatery is coiled together with knowing what words like "menu" mean.

94 Such examples motivate theories wherein language-users are also, on a broader scale, competent members of a society, who have learned certain norms and rituals. ⇒Enculturated knowledge acts by analogy to precompiled code libraries supplied by a computer operating system, for example, from which source code may "solicit" a particular function as needed (e.g., opening a file)⇒Language, by analogy, defers to a social repertoire of enactive scripts, and words often acquire their context-specific meaning by triggering associations — or hypothetical situations — grounded in social-pragmatic schemas⇒The meaning of sentences are their consequence for further (context-specific) action⇒Rather than trying to define e.g. *menu* via logical or set-theoretic machinery, we should simply recognize that anyone familiar with the restaurant domain — as a nexus of social practice — understands such actions as selecting items off a menu⇒Presumably speakers rarely talk about menus anyhow outside that dining/ordering context; so proper use of the word merely reflects normative behavior in the preeminent contexts where it's used.

95 More than anything, after all, this is what the word means: not so much its contribution to signification of some statement's truthmakers, but rather what makes it correct to token this word in a particular social setting. ⇒Metaphorical uses also exist (the idiom "not on the menu" extends beyond food), but that is merely one of innumerable examples of metaphoric word-sense that abstracts from concrete "socialized" usage properly modeled via something like an "interface theory" of meaning.

3.3

96 The premise that individual words conceptually modify logically precedent aggregates may seem obvious⇒But I want to extend that maybe-underwhelming starting point with three further arguments.

97 First, I claim that this overall phenomenon can be taken as a groundwork for syntactic theory to begin with⇒When interpreting a sentence, we need to queue up words in a well-determined order, each acting as a kind of conceptual transform applied to syntheses borne from precedent words⇒To sequence which word comes on the stage, when, demands a rigorous set of phrase-bounding and morphosyntactic conventions, which gestate within language under the guise of syntactic proscriptions⇒Conventions in grammar acquire rule-like status in light of processing demands for aligning "staging" word-order to optimal cognitive construal of conceptual aggregates. ⇒So such word-order is not just a feature *of* syntax; it is a causative foundation *for* syntax (see likewise [18, pp. 4–9, 12-13], if one accepts a cognitive reading of "fragmentation").

98 Second, verbs are distinct in that "their" conceptual syntheses demand contributions via numerous thematic relations⇒This formulation generalizes the typically "local" phenomenon of one concept modifying another, to a more holistic realm where syntheses are molded against enactive and situational (agent/role) templates⇒Meanwhile, the expansion of conceptual synthesis into a multi-themed complex expands the plurality of sites where speakers express epistemically-inflected content⇒Any locative construction, for example, because it will assert a spatial path and/or place (or set of places), is invested with speaker's orientation to the spatial framework of the discourse⇒How does the speaker see, imagine, know about these spaces?

99 Listeners instinctively reconstruct details of the speaker's belief-forming perspective because they have to recreate for themselves the pattern of subjectivization expressed in a sentence⇒For example, in "John spilled water" the person is grounded as focus of perceptual orientation and as an active agent. ⇒Meanwhile, rhetorically, *John* is grounded as a noun, and (specifically) a verb-subject. ⇒Processing the latter, listeners inevitably reconstruct the former (cognitive) orientation⇒Because discursive structure has parameters that replicate perceptual comportment, we constantly receive other's communications as saturated with their particular epistemic attitudes⇒(Speaker-relative epistemics is not some adjunct that we only entertain explicitly when a speaker's authority is in question, say, or when there is disagreement⇒Instead, synchronizing cognitive disposition is woven tightly with minimal facts of language constituents, such as parts of speech).

100 Third, given the accretionary nature of conceptual synthesis, any theory of meaning must address the intermediate aggregates: those in between lexical word-meanings and sentence-level propositions. ⇒To the degree that we use formal models, they should be explanatory rather than circular. ⇒The idea "red box" obviously intersects the concepts *box* and *red*. ⇒If we then analyze this signification as, say, the set of things that are both red and boxes, then such a construction might be theoretical progress if we had some literal engineering whereby words reference

...100 sets⇒However, if we accept set-theoretic language in just a metaphoric way, describing "red box" as the intersection **red** ∩ **box** merely restates what should be analyzed.⋌

101 ⋋Bolt *et al.*, mentioned earlier, propose Conceptual Space theory as an alternative to symbolic logic, for modeling aggregates like **red** + **box**.⇒To the extent that our overall conceptual worlds may be represented via quasi-mathematical operations, then aggregative meanings can be seen as functors between Categories of grammatic formations and of multi-part conceptual units, respectively (composition operators on a purely syntactic level, and conceptual syntheses on a significatory plane, being mutually commutative in the sense of commutative diagrams)⇒Unfortunately, I am not convinced that there is any logico-mathematical formulation that models/captures conceptual synthesis in any general case⇒The meaningfulness of intermediate conceptual complexes, from my perspective, depends on some sort of "cognitive staging" and the use of partially-formed perceptual images as precursors to purposeful action.⇒I suggest that, almost always, such intermediaries depend on extralinguistic cognitive engagement.⋌

102 ⋋There is certainly a role for semantic theories: many patterns of meaning have recurring structures that doubtless guide cognitive schemata, such as the mass/count distinction within modes of plurality/multiplicity (and others listed earlier: singular/plural, figure/ground, landmark/trajector)⇒For another example, alongside type-theoretic grammar, there is a branch of type-theoretic *semantics* which highlights the partition of our discursive domains into, in effect, distinct "ontological regions", such as physical objects, living things, sentient beings, and rational agents [1], [37], [46], [51], [55].⇒The superposition of multiple such regions gives conceptual structure to sentences about referents that exist in multiple strata:⌐

(23) That newspaper [pointing to a table] just moved to 10th street and laid off half its staff.

(24) At home you can print out this book from a PDF link.

(25) The borough of Queens voted heavily for Mamdani.

a ⌐Also, apparent region violations drive many functional metaphors:⌐

(26) These flowers really want some sunshine.

(27) This drought has left the soil parched.

(28) Our car stubbornly refused to move.

(29) The spell-checker thinks "hooman" isn't a word.

b ⌐Examples such as (23) through (27) have been analyzed in terms of type coercions, monads, dependent types, "continuations", and other structures recognized within mathematical type theory (and formalized within the semantics of computer programming languages) [2], [13], [32].⋌

103 ⋋These are options for formal semantics that have, I contend, explanatory merit vis-à-vis natural language, but they describe constraints on cognitive processing more than

end-to-end algorithms for constructing signified meanings. ⌐103 ⇒They do not, in my opinion, substitute for cognitive accounts of intermediate staging, necessary to bridge lexical word-sense with full-phrase propositional content.⋌

104 ⋋To be sure, I have offered rather inchoate characterization of this "staging"⇒The space of mid-level conceptual aggregates belongs neither to a realm of abstract reasoning nor in-the-moment sensate perception, so it may be difficult to analyze without special-purpose vocabulary and paradigms⇒Whatever their details, I believe such theories' central concerns will be *extra*-linguistic⇒This is not a kind of *limited* contextual detour, where resolving ambiguities such as which sense of "bat" (animal or wooden instrument) depends on background knowledge⇒Since conceptual syntheses are reshuffled with almost every word, we are invoking "staging" faculties at almost every step, such that sentence-understanding is intrinsically a process that swings back and forth between extralinguistic and syntactic/semantic/pragmatic inference.⋌

4   Conclusion

105 ⋋Against this backdrop, I think I can more rigorously defend my earlier-stated objection to the idea (explicit or not) that sentences signify propositions.⇒Discourse may indeed *communicate* beliefs, but that phenomenon emerges from a multifaceted process integrating both linguistic and extralinguistic ideations⇒We cannot account for proposition-like meanings *within the affordances* of syntax, semantics, or pragmatics alone, at least without widening the scope of one or more of these to an extent that is not explanatorily productive.⋌

106 ⋋Holding, in our minds, semi-complete precursor images of future or hypothetical objects, surroundings, and situations is an intrinsic part of rational agenthood⇒During talk, we exploit these capabilities to synchronize behavior among two or more people, leveraging future-oriented cognitive routines even when the focus of our discourse exists in the immediate present.⇒Cooperation between multiple individuals engenders abstracting demands, refactoring perceptual experience into propositional/enactive schemata (perhaps we can find this analogous to the sensate indeterminacy of an imagined/planned future).⋌

107 ⋋Certainly, purposeful action coordinated among several people requires everyone to know (and mostly share) each other's beliefs, so communicating what we deem factual is an important part of discourse⇒Expressing not just *what* we believe, but *why*, is relevant because we want others to hear our rationales⇒Given these requirements, it is inevitable that human language evolved structures within almost every sentence to express one or more beliefs — either as assertions that are the sentence's point or preambles to some further comment, suggestion or request — and moreover encode speaker-relative perspectives and foreknowledge that clarify their origins⇒This epistemics-

...107 oriented disclosure emerges from the overall regimes of subjectification and cognitive linguistic processing.

108 But we should not conclude from such hypotheses that sentences *signify* propositions — i.e., that we can list a series of formal rules governing a determinative signifying process, existing on a minimal level in the mapping of lexemes to word-sense, that propagates outward to predicate structure in a logical or mechanical fashion. Paraphrases such as *red box* as the set-theoretic intersection of *redness* and *boxness* may create an illusion that the transformative effects of one word on a priorly-processed aggregate can be modeled via formal systems. Yet such formalization, I contend, will be either circular (explaining not much, in the end) or oversimplistic (explaining only cherry-picked linguistic artifacts, not typical usages and utterances). To the degree that cognitive transforms and "staging" are amenable to rigorous analysis, such analysis would have to be grounded in an overarching cognitive science.

109 Formal syntax has a notion of sentences being "grammatically well formed" (depending on which grammar applies, of course) because we can give mechanical algorithms for testing when a string of words may, or may not, be derived via production rules. Whatever actual philosophy is in play, formal semantics often seems to *want* semantics to follow a similar mechanizable protocol; e.g., we can imagine testing whether a particular conceptual assemblage is "well formed" by consulting an enumeration of concept-formation rules. "Married bachelor", say, would be ill-formed. By contrast, I believe "married bachelor" names a reasonable concept, in that most people would infer its intension (in the sense of an intensionality/extensionality contrast) — hence (1) and (2).

110 More broadly, building models of algorithmic conceptual synthesis would allow the comparably algorithmic notion of grammatic production to map onto the semantic plane, as anticipated by Bolt *et al.*: syntactic and semantic syntheses commuting like Categorical diagrams, with both atomic and complex functors between syntax and semantics (the "atomic" being lexical word-sense). My arguments in this paper are that such an overly-tidy picture is untenable. Concepts simply don't synthesize according to "production rules" akin to BNF grammars.

111 I think the story Bolt *et al.* and many similar analyses have in mind — once expressed informally — is roughly like this: semantics tells us how to combine concepts; syntax tells us which concepts to combine, in which order. I mostly dispute the first part; although semantics establishes parameters on concept-admixture, our intellect molds multi-part conceptual formations against dictates of social norms and purposeful action, rather than by manipulating concepts as formalizable abstractions.

112 To draw once again from coding analogies, programming language *semantics* is concerned with the binding of values to symbols — when those "markings" start and cease to be appropriate — as well as polymorphic definition of multiple procedures with the same symbol but different parameter types, and other type-related concerns. Code *syntax* addresses such issues as expression boundaries, storage-duration scope, and "sequence points", indicating which values are parameters for which function-calls as well as, potentially, the order of procedures' side-effects (particularly when a prior effect could be "visible" to a future subroutine). Syntactic and semantic systems are necessary to ensure that high-level code maps (properly) to a "push/transfer"-like stack representation, ensuring that all procedures' type and precondition contracts are guaranteed. Note that the algorithmetized syntax and semantics here serve as *preparation* for function-calls, many of which may be to precompiled routines whose implementations are opaque to the high-level compiler and runtime. I find this roughly comparable to the role of syntax and semantics in natural language, which bridge discourse to cognitive operations even if the cognitive processing itself is opaque to linguistic analysis *per se*.

113 This exposition might be a little straw-man-like in that Bolt *et al.*, for example, do not specifically work from a system of grammatical productions. Their syntactic theory is more about, starting from any given sentence, retracing the compositional principles that build up a complex network from isolated word-pairs. We aren't "producing" (or, for that matter, "testing") sentences so much as retracing their unifying formulae. But still, any analysis wherein conceptual syntheses reciprocate composition-patterns implicitly invokes a principle of conceptual production. Either we view such production as inherently cognitive and extralinguistic, which is my approach, or we must articulate rules for how concepts in their totality form a logical system, wherein all concepts are built up (almost syntactically!) from primitive roots by operations such as those of set theory (union, intersection, disjoint union ...) or other formalizations (modal logic, quantifiers, etc.).

114 Referring back to my reading of the successive syntheses connoted by "in this red tin box", I don't believe *any* of those transforms can be glossed in such logical terms. Put aphoristically, linguistic formalization should model — perhaps with the aid of computational analogs — processes through which surface-level discourse is mapped to a sequence of cognitive transforms *presented to* extralinguistic rational faculties. This is different from attempting to model concept-synthesis, as a kind of "algorithmetizable" cognitive process, directly. As a useful analogy, programmers are not obligated to study how system-kernel procedures are implemented; they merely need to know the type-signatures and preconditions for calling them.

115 I have also argued that any cognitive science, to be comprehensive, has to work with cognition as lived by flesh-and-blood people in social, embodied, personalistic life-worlds. Such an approach would be only tangentially a *natural* science — the physicalistic intuitions that lend

...115 systematicity and disputative structure to studies of nature would, in this context, dilute rather than guarantee explanatory rigor.⇾Endorsing phenomenology as an alternative foundation, theories of cognitive-semantic "staging" would — on this architecture — rest on phenomenological grounds.⇾Thus semantics has a kind of nomological dependence on cognitive phenomenology, and syntax on semantics in the sense that phrase-structure rules become entrenched by virtue of conceptual demands on word-order.⇾So phenomenology can stand as a foundation supporting multiple facets of the linguistics project, even if it lies outside the normal scope of that discipline's.⇾This is consistent with a philosophy wherein phenomenology provides an explanatory scaffold for *all* humanities.⇽

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Sentence Examples ★

★ Numbers on the left-hand column represent the order of examples as they appear in the text. Those on the right specify the page number and paragraph id, respectively. Similar styling is used for page and paragraph numbers within the index entries. Note that all number characters may be clicked, redirecting the viewer to the top of the page, near the start of the paragraph, or near the point where a given sentence/example is first presented (depending on which column the number belongs to). JATS/XML code for the index is included in the accompanying JATS files (see those files for deserialization info).

Index †

† While it is unusual to prepare an index for a journal article, I believe this practice should be more widely adopted, partly because journals can then construct "master" indices merging content from many articles. Here, both page and paragraph numbers are clickable, except when a locator refers to a paragraph split between two pages, and specifically the portion of the paragraph that follows the page break; in such cases the paragraph code is presented in the "continuation" marginal style also used within the main text.