

## Lexicalizing and Combining Paul M. Pietroski

Often, theorists mean different things by ‘meaning’, and understandably so. Even restricting attention to language, one might want to talk about what *speakers* mean when they communicate, or what *expressions* of a language mean. Regarding the latter, one might focus on languages that human children can naturally acquire, various systems of animal communication, possible languages of thought, formal languages invented for purposes of computation or modeling “ideal” thought/communication, etc. Like many words, ‘mean’ is polysemous. So if the task is to study whatever natural phenomena we are gesturing at, it is hard to know where to begin.

On the other hand, it can seem obvious that whatever *verb meanings* are, they vary along a dimension that can be described in terms of valence, adicity, or Frege’s (189x) metaphor of *saturation*. This is a tempting starting point, with implications for semantic composition that have become standard. But I’ll urge a different view, according to which verbs—along with nouns, common and proper—are instructions to fetch *monadic* concepts that can be *conjoined* with others; cp. Parsons (1990), Schein (1993). As we’ll see, adopting this perspective leads to an attractive though nonstandard conception of how words and the process of lexicalization are related to human thought and communication. It also helps make sense of some otherwise puzzling phenomena which suggest that lexical items do not themselves have fixed adicities.

Section one reviews some facts that motivate the view I want to challenge, and then some others that motivate the search for an alternative of the sort discussed in section two. I’ll conclude by locating my specific proposal in the context of Chomsky’s (1986, 1995) conception of distinctively human languages as biologically instantiated procedures, I-languages, whose expressions make contact with other cognitive systems.

### 1. Fregean Verbs: Idealization and Myth

We humans can express endlessly many thoughts by linguistic means. This suggests that expressible thoughts are composed of concepts that are linked to atomic expressions that combine in ways that mirror the ways in which the concepts combine. Frege offered a model language whose expressions reflect, in this way, thoughts of a certain kind (*Gedanken*). But as Frege stressed, even if humans can have such thoughts, his *Begriffsschrift* may not provide a good model of the languages we naturally use to express the thoughts we typically entertain. Still, one can hypothesize that a verb is like a predicate of Frege’s invented language in expressing a concept whose adicity determines the number of arguments the verb can/must combine with in a sentence. In this section, I note some well known difficulties for this idea. My suspicion is that its familiarity, easily mistaken for inevitability, leads us to underestimate both these difficulties and the attractions of an available alternative.

#### 1.1 A Pretty Picture

In a sentence like (1) or (2), consisting of a verb and one or more referential expressions,

- (1) Brutus arrived                      (2) Brutus saw Caesar

each referential expression is an argument of the verb. The relation a verb bears to its argument(s), in a sentence or sentential clause, is somehow asymmetric.<sup>1</sup> Verbs *take* arguments. By contrast, the names in (1) and (2) do not take verbs: ‘saw Caesar’ is a verb phrase, akin to ‘arrived’, not a name phrase akin to ‘Brutus’; the names appear, in some sense, as satellites of the verbs. Let’s take this as given, for now, and precisify later.

One might hope to explain this grammatical asymmetry in terms of a more fundamental asymmetry exhibited by constituents of thoughts. For present purposes, let’s assume that at least

many thoughts can be described as the result of combining an *unsaturated* concept with one or more *saturating* concepts. Saturating concepts, like BRUTUS and CAESAR, can be used to think about things like Brutus and Caesar. Unsaturated concepts, like ARRIVED(X) and SAW(X, Y), can be saturated to form thoughts like ARRIVED(BRUTUS) and SAW(BRUTUS, CAESAR). Correlatively, an unsaturated concept can be viewed as the result of abstracting away from the specific contents of one or more saturating concepts in a thought.<sup>2</sup>

Given some such conception of articulable thoughts—thoughts with parts that can be systematically combined and expressed—one might suppose that verbs are argument-taking words *because* they express unsaturated concepts, while names appear in sentences as arguments *because* they express saturating concepts.<sup>3</sup> If verbs have “unsaturated meanings” in this sense, then perhaps the *number* of arguments a verb combines with in a sentence is determined by the adicity of (i.e., the number of variable positions in) the concept expressed with the verb.

One can go on to hypothesize that the determination is transparent: ‘arrived’ takes a single argument because it indicates the monadic concept ARRIVED(X); ‘saw’ takes two arguments because it indicates the dyadic concept SAW(X, Y). From this perspective, semantic composition is equally transparent for sentences like (1) and (2). Combining words to form a phrase indicates saturation of one concept by another. In particular, ‘saw Caesar’ indicates the complex monadic concept SAW(X, CAESAR), which is like ARRIVED(X) in being saturatable by BRUTUS. Likewise, one might say that ‘gave’ indicates the triadic concept GAVE(X, Y, Z) and so takes three arguments, as in (3);

(3) Brutus gave Caesar a sandwich

where ‘a sandwich’ reflects existential quantification on (as opposed to saturation of) the conceptual “slot” for the thing given to the recipient by the giver, as shown in (3a).

(3a)  $\exists Z:\text{SANDWICH}(Z)[\text{GAVE}(\text{BRUTUS}, \text{CAESAR}, Z)]$

In this thought, the complex monadic concept GAVE(BRUTUS, CAESAR, Z) saturates the “second-order” concept  $\exists Z:\text{SANDWICH}(Z)[\Phi(Z)]$ , which is itself the result of saturating a dyadic concept,  $\exists Z:\Psi(Z)[\Phi(Z)]$ , with the monadic concept SANDWICH(Z). While singular concepts like BRUTUS and CAESAR are inherently saturaters, on this view, unsaturated concepts can saturate other unsaturated concepts of a higher order. The “surface syntax” may not reflect the order of saturation. In (3), ‘a sandwich’ is a grammatical constituent of a verb phrase headed by ‘gave’. But one can, in various ways, posit “movement” that is not reflected in audible word order.<sup>4</sup>

One can also retain the Fregean idea of composition by saturation, yet allow for verbal valences that *exceed* the number of overt arguments. For example, one might say that ‘ate’ is fundamentally transitive/dyadic, as suggested by sentences like (4). In which case, (5) involves some kind of covert argument.

(4) Caesar ate a sandwich

(5) Caesar ate

I’ll return to some complications for this suggestion. But first, let me stress that “saturationists” can and should posit event variables, following Davidson (196x) and much subsequent work. For example, the untensed verb ‘arrive’ can be treated as an indicator of the formally dyadic concept ARRIVE(E, X), which applies to an ordered pair of things just in case the first is an arrival of the second. Correspondingly, theorists can represent the thought expressed with (1) as in (1a).<sup>5</sup>

(1a)  $\exists E[\text{PAST}(E) \ \& \ \text{ARRIVE}(E, \text{BRUTUS})]$

Eventish analyses of this sort account for the pattern of entailments and nonentailments exhibited by sentences like (6) and (7).

(6) Brutus poked Caesar with a red stick sharply

(7) Brutus poked Caesar with a blue stick softly

Note that while (6) implies each of (8-10), and (7) implies each of (10-12),

(8) Brutus poked Caesar with a red stick

(9) Brutus poked Caesar sharply

(10) Brutus poked Caesar

(11) Brutus poked Caesar softly

(12) Brutus poked Caesar with a blue stick

the conjunction of (6) and (7) implies neither (13) or (14).

(13) Brutus poked Caesar with a red stick softly

(14) Brutus poked Caesar with a blue stick sharply

This pattern is expected if the thoughts expressed with (6) and (7) have the forms displayed in (6a) and (7a).<sup>6</sup>

(6a)  $\exists E \{ \text{PAST}(E) \ \& \ \text{POKE}(E, \text{BRUTUS}, \text{CAESAR}) \ \& \ \exists X [ \text{RED}(X) \ \& \ \text{STICK}(X) \ \& \ \text{INSTRUMENT}(E, X) ] \ \& \ \text{SHARP}(E) \}$

(7a)  $\exists E \{ \text{PAST}(E) \ \& \ \text{POKE}(E, \text{BRUTUS}, \text{CAESAR}) \ \& \ \exists X [ \text{BLUE}(X) \ \& \ \text{STICK}(X) \ \& \ \text{INSTRUMENT}(E, X) ] \ \& \ \text{SOFT}(E) \}$

Moreover, a tenseless version of (10) can appear as the direct object of certain verbs, as in (15)—suggesting that the perceptual verb ‘saw’ does *not* express the dyadic  $\text{SAW}(X, Y)$ .

(15) Antony saw Brutus poke Caesar

For ‘Brutus poke Caesar’ does not name or describe any particular seeable thing. Brutus may have poked Caesar many times, in many ways, with sticks of varied colors; cp. Ramsey (192x). Instead, one can say that ‘saw’ expresses  $\text{SAW}(E, X, Y)$ , where values of the last variable include events as well as people; see Higginbotham (1983). On this view, the thought expressed with (15) has the form shown in (15a).

(15a)  $\exists E \{ \text{PAST}(E) \ \& \ \exists F [ \text{SEE}(E, \text{ANTONY}, F) \ \& \ \text{POKE}(F, \text{BRUTUS}, \text{CAESAR}) ] \}$

And if the adverbial phrase in (16) is understood as a conjunct of a complex event description.

(16) Antony saw Brutus poke Caesar with a telescope

the *ambiguity* of (16) can be represented as in (16a) and (16b).

(16a)  $\exists E \{ \text{PAST}(E) \ \& \ \exists F [ \text{SEE}(E, \text{ANTONY}, F) \ \& \ \text{POKE}(F, \text{BRUTUS}, \text{CAESAR}) ] \ \& \ \exists X [ \text{TELESCOPE}(X) \ \& \ \text{INSTRUMENT}(E, X) ] \}$

(16b)  $\exists E \{ \text{PAST}(E) \ \& \ \exists F [ \text{SEE}(E, \text{ANTONY}, F) \ \& \ \text{POKE}(F, \text{BRUTUS}, \text{CAESAR}) ] \ \& \ \exists X [ \text{TELESCOPE}(X) \ \& \ \text{INSTRUMENT}(F, X) ] \}$

On one reading, Antony’s does his seeing (of a poke) with a telescope; on the other, Brutus does his poking (of Caesar) with a telescope.

I don’t know of any systematic account of these facts that eschews event variables.<sup>7</sup> So I assume that neo-Fregeans allow for such variables, thereby granting that a verb can express a concept whose adicity is *greater than* the number of arguments the verb combines with in a sentence. (And of course, the strategy of hypothesizing *higher* conceptual adicities and implicit binders is not limited to event variables.) But let me note one more reason for positing event variables in the concepts expressed with verbs.

If tensed verbs like ‘poked’ express dyadic concepts like  $\text{POKED}(X, Y)$ , which applies to pocker-pokee pairs, it becomes hard to even describe (much less explain) the much discussed thematic asymmetry that such verbs exhibit; see, e.g., Dowty (198x), Baker (199x). Consider the possible concept  $\text{KOPED}(X, Y)$ : when saturated by CAESAR and then BRUTUS, the result— $\text{KOPED}(\text{BRUTUS}, \text{CAESAR})$ —is true just in case Caesar poked Brutus;  $\text{KOPED}(X, Y)$  applies to pokie-pocker pairs. Human children do not naturally acquire verbs that express such

“thematically inverted” concepts; if they did, there would be sentences with verbs whose direct objects indicate agents and whose subjects indicate patients of the relevant events. This suggests that ‘poke’ not only expresses a concept with an event variable, like POKE(E, X, Y), ‘poke’ is associated with a thematic decomposition of this concept along the lines shown in (17).<sup>8</sup>

(17) POKE(E, X, Y)  $\equiv$  POKE(E) & AGENT(E, X) & PATIENT(E, Y)

This does not preclude the neo-Fregean idea that intransitive, transitive, and ditransitive verbs exhibit distinct semantic adicities. For one can maintain that monadic concepts like POKE(E), concepts of events that may be expressed with nominals, are abstracted from the polyadic concepts expressed with verbs. Nonetheless, appeal to event variables can feed various doubts about the neo-Fregean picture.

## 1.2 Messy Facts

Some of these doubts are specific to the introduction of such variables. Others are often set aside as puzzles for any account. Though as we’ll see, the relevant facts are not so puzzling if all verbs express monadic concepts like POKE(E).

If ‘arrive’ and ‘poke’ express ARRIVE(E, X) and POKE(E, X, Y), respectively, one needs some explanation for why (18) and (19) cannot have meanings that might be glossed as follows:

(18) This Brutus arrived

(19) The witnessed event Brutus poked Caesar

the demonstrated thing was an event of Brutus arriving; the witnessed event was one of Brutus poking Caesar. I readily grant that each sentence is associated with existential closure of a variable, and hence that some variable is always left open. But one wants to know why. If a sentence *cannot* be formed by combining a verb with a saturating argument for each variable the verb introduces, perhaps verbs do not take arguments *because* they express unsaturated concepts.

I’ll return to the actual meaning of (18), which casts doubt on the idea that names appear in sentences as arguments *because* they express saturating concepts. For now, recall (5) and consider its relation to (20-22).

(5) Caesar ate

(20) Caesar ate something

(21) Caesar dined

(22) Caesar dined on tacks

As Chomsky (19xx) observed, (5) does not follow from—and hence is not synonymous with—(20): if Caesar ate a tack, and Caesar is a normal human for whom tacks are not nutritious, an utterance of (20) will be true while an utterance of (25) is false. In this respect, (5) is more like (21). My own judgments are that the implications go, unidirectionally, from (22) to (21) to (5) to (20). But even assuming that (5) has a covert argument, if ‘eat’ always expresses the polyadic concept EAT(E, X, Y), one needs to say why the covert argument licences an inference to the effect that the unspecified thing is food for the eater.<sup>9</sup> And more importantly here, the concept expressed with ‘dine’ presumably does not have a *lower* adicity.

On the contrary, one might think this concept *adds* something about the manner of the eating and/or the food eaten. Yet ‘Caesar dined something’ is not a sentence of English—as if the concept expressed with ‘dine’ does *not* have a variable for the food eaten, and so describing this (essential) event participant requires a grammatically optional prepositional phrase. But then perhaps the concept expressed with ‘eat’, which does take a direct object, also lacks a variable for the food eaten. Perhaps ‘eat’ and ‘dine’ express EAT(E) and DINE(E), respectively.

As discussed in section two, this is full compatible with speakers *having* the polyadic concepts EAT(E, X, Y) and DINE(E, X, Y). Indeed, these concepts may be related to the verbs in a way that helps captures the intuition events of eating/dining require eaters and things eaten. From this perspective, ‘eat’ and ‘dine’ still differ: the former can take an overt direct object that

specifies whatever was eaten; the latter requires use of a prepositional phrase to specify what was dined on. But this difference has to be encoded somehow, whatever concepts the verbs express. And as we'll see, it is easily encoded if the concepts expressed are monadic. So the question is what *kinds* of concepts do verbs indicate/fetch for purposes of semantic composition. Do the thoughts expressed with (20-21) have the saturational form shown in (20a-21a),

(20a)  $\exists E \{ \text{PAST}(E) \ \& \ \exists X [\text{EAT}(E, \text{CAESAR}, X)] \}$

(21a)  $\exists E \{ \text{PAST}(E) \ \& \ \text{DINE}(E, \text{CAESAR}) \}$

with thematic information represented elsewhere, or the form shown in (20b-21b)?

(20b)  $\exists E \{ \text{PAST}(E) \ \& \ \text{AGENT}(E, \text{CAESAR}) \ \& \ \text{EAT}(E) \ \& \ \exists X [\text{PATIENT}(E, X)] \}$

(21b)  $\exists E \{ \text{PAST}(E) \ \& \ \text{AGENT}(E, \text{CAESAR}) \ \& \ \text{DINE}(E) \}$

Similar questions arise in the context of much discussed examples like (23-25).

(23) Brutus gave a museum a painting

(24) Brutus donated a painting

(25) Brutus donated a painting to a museum

If 'give' takes three arguments because it expresses  $\text{GIVE}(E, X, Y, Z)$ , one wants to know why 'donate' does *not* express  $\text{DONATE}(E, X, Y, Z)$  and also take three arguments. Of course, it may be that 'give' expresses a concept of *lower* adicity. The synonymy of (23) with (26)

(26) Brutus gave a painting to a museum

invites the hypothesis that 'give' expresses  $\text{GIVE}(E, X, Y)$ , and that (23) is used to express thoughts of the form shown in (23b), as opposed to (23a); cp. Larson (198x).

(23a)  $\exists E \{ \text{PAST}(E) \ \& \ \exists Y [\text{PAINTING}(Y) \ \& \ \exists Z [\text{MUSEUM}(Z) \ \& \ \text{GIVE}(E, \text{BRUTUS}, Y, Z)]] \}$

(23b)  $\exists E \{ \text{PAST}(E) \ \& \ \exists Y [\text{PAINTING}(Y) \ \& \ \text{GIVE}(E, \text{BRUTUS}, Y)] \ \&$

$\exists Z [\text{MUSEUM}(Z) \ \& \ \text{RECIPIENT}(E, Z)] \}$

And upon reflection, the mere availability of ditransitive *constructions* like (23) does not tell against "two argument" analyses of the constituent verbs.

Examples like (27) do not lead us to say that 'kick' expresses  $\text{KICK}(E, X, Y, Z)$ .

(27) Brutus kicked Caesar a bottle

For plausibly, (27) and (28) are both used to express thoughts of the form shown in (28a).

(28) Brutus kicked a bottle to Caesar

(28a)  $\exists E \{ \text{PAST}(E) \ \& \ \exists Y : \text{BOTTLE}(Y) [\text{KICK}(E, \text{BRUTUS}, Y) \ \& \ \text{RECIPIENT}(E, \text{CAESAR})] \}$

But if 'give' and 'donate' are like 'kick' in expressing concepts with no variable for recipients, we must consider the possibility that these verbs express concepts with no variables for Agents, as in (23c); cp. Kratzer (199x), Chomsky (199x).

(23c)  $\exists E \{ \text{PAST}(E) \ \& \ \text{AGENT}(E, \text{BRUTUS}) \ \& \ \exists Y [\text{PAINTING}(Y) \ \& \ \text{GIVE}(E, Y)] \ \&$

$\exists Z [\text{MUSEUM}(Z) \ \& \ \text{RECIPIENT}(E, Z)] \}$

The existence of passive constructions like (29)

(29) Caesar was kicked

is puzzling if 'kick' expresses  $\text{KICK}(E, X, Y)$ . One can posit a process of introducing a related concept— $\text{KICK}(E, Y)$ —with no variable for kickers, yet still retaining a saturatable variable for kickees:  $\forall E \forall Y \{ \text{KICK}(E, Y) \equiv \exists X [\text{KICK}(E, X, Y)] \}$ . This goes some way toward the view urged here. But why should "passivization" be available at all? Why not understand 'kicked Caesar' with a covert subject, or always require an overt quantificational subject as in (30)?

(30) Someone kicked Caesar

Such considerations can help motivate the idea that 'kick' expresses  $\text{KICK}(E, Y)$ . But then we must also consider "objectless" examples like (31) and nominal constructions like (32).

(31) The baby kicked

(32) I get no kick from champagne

Especially in light of the pressure to say that ‘dine’ can express a concept with no variable for the food eaten, perhaps we should say that ‘kick’ expresses KICK(E), with no variable for kickees.<sup>10</sup>

Likewise, given passive uses of ‘give’ and the possibility of giving at the office, perhaps we should say that ‘give’ expresses GIVE(E), with no variables for event participants. Moreover, if ‘give’ expresses GIVE(E, X, Y, Z), one might expect ‘sell’ to express a concept with an *additional* argument, SELL(E, X, Y, Z, W). For selling differs from giving, in that the seller gets something from the buyer: x sells y to z for w. Likewise, one might expect ‘buy’ to express BUY(E, X, Y, Z, W). And if combining a verb V with an argument A signifies saturation/binding of the concept expressed with V by the concept expressed with A, one might expect ‘sell’ and ‘buy’ to combine with *four* arguments in sentences (modulo any event variable). But in fact, the verbs cannot take four arguments, as indicated by the unacceptability of (33).

(33) \*Brutus sold/bought Caesar the car a dollar

So if SELL(E, X, Y, Z, W) and BUY(E, X, Y, Z, W) are expressible concepts, we face the question of why they aren’t expressed with ‘sell’ and ‘buy’.

One can say that syntax somehow forbids tri-transitive constructions. But this is to grant that linguistic constraints may require a process of lexicalization that results in verbs with adicities that are *lower* than those of the concepts expressed. Examples like (34) and (35)

(34) Brutus sold the car

(35) Caesar bought the car

suggest that ‘buy’ and ‘sell’ express concepts with no more than two variables for participants—buyers/sellers and things bought/sold—in the relevant events. Especially given the facts concerning ‘give’/‘donate’/‘kick’, noted above, the synonymy of (36) with (37)

(36) Brutus sold Caesar the car

(37) Brutus sold the car to Caesar

suggests that ‘sell’ expresses a concept no variable for recipients. And note that while (35) follows from (38), just as (34) follows from (36), (38) is not synonymous with (39).

(38) Caesar bought Antony the car

(39) Caesar bought the car from Antony

Rather, (38) has a benefactive meaning like (40),

(40) Caesar bought the car for Antony

which differs from (41), which follows from (42), which employs two prepositional phrases.

(41) Caesar bought the car for a dollar

(42) Brutus sold the car to Caesar for a dollar

But if ‘Antony’ does not indicate a saturator of the concept expressed by the verb in (38), then *prima facie*, ‘Caesar’ does not indicate a saturator of the concept expressed by the verb in (36).

If ‘sell’ does not require more arguments than ‘give’ or ‘donate’, and ‘buy’ does not require more arguments than ‘take’, perhaps that is because no verb expresses a concept with more than two variables for the relevant event participants. If so, we want to know the source of this constraint. Does it follow, for example, from the stronger constraint that all verbs express monadic concepts of things that can have participants? But in any case, if neo-Fregeans posit such a constraint, this reduces the interest of the hypothesis that verbs inherit adicities from the concepts they express. And if neo-Fregeans end up positing processes that *introduce* concepts like GIVE(E, X, Y) in terms of concepts with *higher* adicities—e.g.,  $\forall E \forall X \forall Y \{ \text{GIVE}(E, X, Y) \equiv \exists Z [\text{GIVE}(E, X, Y, Z)] \}$ —they can hardly complain if other theorists do the same, and then extend the strategy in light of examples like (43) and (44).

- (43) Brutus gave/donated at the office
- (44) Caesar wants to buy low and sell high

One can call these cases of “coercion,” hypothesizing that they should be set aside for special treatment. But we shouldn’t mislead ourselves into thinking that we have any conception of how a concept can be coerced into changing its adicity. Our already tenuous grip on concepts is lost, in my view, if we take adicities to be “default but inessential” properties of concepts. We can, however, posit processes of using polyadic concepts to introduce concepts of lower adicity—even if this leads us in surprising directions.

## 2. A Conjunctivist Picture

Let’s assume that lexicalizers have many polyadic concepts like GIVE(X, Y, Z) or GIVE(E, X, Y, Z). We can describe lexicalization as a process that uses available mental representations, over time and given experience, to make atomic linguistic expressions that can be combined in certain ways that correspond to ways in which concepts can be combined. If constraints on the available modes of combination create pressure for lexical items that fetch monadic concepts, and lexicalization can use polyadic concepts to introduce fetchable monadic concepts, then one expects to find lexical items that fetch monadic analogs of (prelexical) polyadic concepts. And if the methods of introduction often make use of event variables, which can appear in both monadic concepts like GIVE(E) and thematic concepts like RECIPIENT(E, X), one might expect to find lexical items that fetch monadic concepts *and* invoke thematic concepts—via functional elements (prepositions), or certain grammatical relations created when these lexical items combine with certain other expressions (arguments). So if the available modes of combination create pressure to treat phrasal composition as an instruction to *conjoin monadic concepts*, as opposed to an instruction to *saturate one concept with another*, the facts illustrated with (1-44) are unsurprising if lexicalization can use nonmonadic concepts to make monadic concepts.

### 2.1 Possible Minds

One can imagine minds that simply pair combinable concepts with perceptible signals, and still manage to communicate tolerably well by producing the signals in a linear order. Producing a string of word-signals  $S_1 \dots S_n$  could be interpreted as the expression of a thought whose atomic components are the corresponding concepts  $C_1 \dots C_n$ , at least one of which must be unsaturated. Given a few conventions to reduce ambiguity—e.g., put the signal for a dyadic concept between the signals for its saturaters, and associate the first signal with a particular argument position—short sentences, pronouns, occasional parataxis, and lists can go a long way. (Hemingway wrote novels. He liked newspapers. People understood him. He won a prize.)

Of course, humans are not limited to this kind of understanding.<sup>11</sup> For us, lexicalization results in a stock of atomic expressions that exhibit a syntactic typology, which imposes significant restrictions on how these atoms can be combined. But if our lexical items still signal concepts that are independently combinable because of their valences, and the semantic effect of syntax is basically just to determine order of saturation, one might wonder why we have the syntax we do? So perhaps lexicalization and syntax conspire in a less transparent way.

I have pursued the technical details—especially concerning the composition principles governing verb/determiner/prepositional phrases with various kinds of nominal constituents—in other places; see Pietroski (2005, 2006, 2008, forthcoming). So here, let me simply present the basic idea in the context of an example that initially seems unfriendly.<sup>12</sup> Suppose the sound of ‘gave’ is initially paired with a triadic concept GAVE(X, Y, Z) with no event variable.

One can envision a process of first introducing an event variable along the following lines:  $\forall X \forall Y \forall Z \{ \exists E [ \text{GAVE}(E, X, Y, Z) \equiv \text{GAVE}(X, Y, Z) ] \}$ . This assumes the apparatus required for

such introduction. But one can at least imagine a mind that can use  $n$ -place concepts to define and  $n+1$ -place concepts in this way; cp. Davidson (1967). The added variable can then be used like a variable for times:  $\forall E \forall X \forall Y \forall Z [\text{GIVE}(E, X, Y, Z) \ \& \ \text{PAST}(E) \equiv \text{GAVE}(E, X, Y, Z)]$ .

And given  $n$  thematic concepts, a monadic concept can be introduced:  $\forall E \forall X \forall Y \forall Z [\text{GIVE}(E) \ \& \ \text{AGENT}(E, X) \ \& \ \text{PATIENT}(E, Y) \ \& \ \text{RECIPIENT}(E, X) \equiv \text{GIVE}(E, X, Y, Z)]$ ; cp. Castañeda (1967).

As one would expect, this is a “contextual” introduction of  $\text{GIVE}(E)$ , which applies to certain events that occur when three individuals exhibit the relation that  $\text{GIVE}(X, Y, Z)$  is a concept of. And the biconditionals in question need not be logical truths. The hypothesis is that in lexicalizing  $\text{GIVE}(X, Y, Z)$ , we effectively assume the following equivalence:  $\text{GAVE}(X, Y, Z) \equiv \exists E [\text{PAST}(E) \ \& \ \text{GIVE}(E) \ \& \ \text{AGENT}(E, X) \ \& \ \text{PATIENT}(E, Y) \ \& \ \text{RECIPIENT}(E, X)]$ ; where the right hand side implies each of its conjunction-reducing variants. But this generalization need not hold—like  $\forall X \forall Y \forall Z \sim [\text{GAVE}(X, Y, Z) \ \& \ \sim \text{GAVE}(X, Y, Z)]$ , an instance of noncontradiction—as a matter of logic. At this point, there is much more to be said about the relations among logic, meaning, and psychology. But I propose to set these issues aside for present purposes.

## 2.2 Recapturing Distinctions

Let’s assume that for any given speaker, finitely many concepts are fetchable with lexical items, even if they can be used to build endlessly many others. Since these lexically fetchable concepts are linguistically combinable via operations corresponding phrasal syntax, call them *L-concepts*. And for any given lexicalizer, let’s say that her *P-concepts* are those available independent of lexicalization, with ‘P’ connoting ‘prior’ and ‘pre-lexical’. This leaves room for the hypothesis that all or most L-concepts are P-concepts, and it does not require that L-concepts be atomic. It also leaves room for the hypothesis that at least many of our L-concepts are not P-concepts, but rather, concepts introduced in the course of lexicalization: a P-concept like  $\text{GIVE}(X, Y, Z)$  might be used to introduce an L-concept like  $\text{GIVE}(E)$  that would otherwise be unavailable for fetching with a lexical item.<sup>13</sup>

If all L-concepts fetched with open class lexical items are monadic, this has implications for names as well as verbs. But before turning to this point, let me stress that concepts can differ formally while expressing concepts of the same adicity. In particular, traditional ideas about subcategorization/selection can be recast in terms of hypotheses about which thematic concepts a verb invokes along with the monadic concept it expresses.

We can grant that ‘put’ requires both an object and a prepositional phrase as in (45),

(45) Brutus put a book on a table

without saying that ‘put’ expresses  $\text{PUT}(E, X, Y, L)$ , with a variable for locations—or  $\text{PUT}(E, Y, L)$ , without a variable for agents. We can say instead that ‘put’ expresses  $\text{PUT}(E)$ , or perhaps  $\text{PLACE}(E)$ , but that ‘put’ *also* imposes a lexical requirement on the verb phrases it heads: they must invoke the thematic concepts corresponding to a thing placed and its location when placed. If the grammatical relation between ‘put’ and its direct object invokes the concept  $\text{PATIENT}(E, X)$ , and the preposition invokes  $\text{LOCATION}(E, X)$ , then ‘put a book on a table’ meets this requirement by expressing concepts like the following:  $\text{PUT}(E) \ \& \ \exists X [\text{BOOK}(X) \ \& \ \text{PATIENT}(E, X)] \ \& \ \exists X [\text{TABLE}(X) \ \& \ \text{LOCATION}(E, X)]$ .

If ‘put’ lexicalized a polyadic concept of making something be in a place, locations might well be “conceptually tied” to puttings in a way they are not tied to eatings, even if it is necessary (and in some sense *a priori*) that every eating occurs in a place. For the concept lexicalized with ‘put’ might have a variable for locations, while the concept lexicalized with ‘eat’ does not. And this can be so, even if ‘put’ and ‘eat’ are on a semantic par in the sense that both verbs fetch monadic concepts of events.

Let the Semantic Composition Adicity Number (SCAN) of a verb be the adicity of the concept it expresses: the SCAN of a verb *V* reveals how many saturaters/binders are required to convert the concept expressed with *V* into a complete thought. Let a verb's Property of Smallest Sentential Entourage (POSSE) be the number of "satellite" expressions—arguments or adjuncts, be they noun, determiner, prepositional, or complementizer phrases—that must accompany the verb in a sentential clause: the POSSE of a verb *V* reveals how many additional expressions are required to convert *V* into a complete sentence. A verb's SCAN need not determine its POSSE, and its POSSE need not determine its SCAN. One can say, for example, that 'put' has a SCAN of 1 and a POSSE of 3. One can also define a verb's Lexicalized Adicity Number (LAN) as the adicity of the concept initially lexicalized with the verb. And one can speculate that a verb's POSSE is determined by, or at least interestingly related to, its LAN. This speculation seems plausible; but is hard to evaluate, absent independent and reliable ways of discerning LANs.

In one sense, this simply recodes the facts. But that is no objection, absent good reasons for coding the facts in terms of *diverse* SCANS, as opposed to POSSEs and/or LANs. Of course, if one posits diverse SCANS *in addition to* diverse POSSEs, one might be accused of needlessly introducing an unwanted degree of freedom into our theories. But the hypothesis here is that SCANS are uniform: all verbs express monadic concepts, even if the concepts lexicalized vary in adicity. And this at least avoids the need to explain particular SCAN/POSSE mismatches. For example, if the verb 'jimmy' (as in 'jimmy the lock with a knife') has a SCAN greater than 2, one needs some explanation for why it (unlike 'put') has POSSE of 2; see Williams (200x). Otherwise, one *is* positing both various SCANS and various POSSEs.

If SCANS greater than 1 are possible, one also needs some explanation for why apparently simple concepts like BETWEEN(*X*, *Y*, *Z*), TALLER(*X*, *Y*), and FROM(*X*, *Y*) are not lexicalized with monomorphemic verbs—allowing for constructions like 'Brutus betweened Antony Caesar', 'Caesar taller Antony', and 'Brutus froms Rome'. The intended thoughts are expressible, with circumlocution, by using functional expressions: Brutus *is* between Antony *and* Caesar; Caesar *is* taller *than* Antony; Brutus hails *from* Rome. This suggests some kind of block on directly fetching the relevant nonmonadic concepts. And it invites the hypothesis that functional vocabulary lets us find circumlocutory ways to express essentially relational thoughts, despite our massively monadic lexicons, when the thematic concepts invoked by grammatical relations (like being the subject or object of a verb) are inadequate.

### 2.3 Weather Reports and Names

Verbs that can apparently take *no* arguments, as in (46) and (47),

(46) It is snowing in Rome

(47) Brutus saw it rain today

are often set aside for special treatment. From a neo-Fregean perspective, such examples are puzzling. Given the need for event variables, the verbs in 'It rained/snowed/poured/drizzled' cannot be treated as devices for expressing thoughts with no unsaturated elements, even if there are such thoughts; cp. Montague (197x). But if 'rain' expresses RAIN(*E*), and the argumentless verb corresponds to an argumentless concept modulo the event variable, we some explanation for why (48) is acceptable and why it implies (49).

(48) Rocks rained down on the village

(49) Rocks fell on the village

An obvious suggestion is that RAIN(*E*) is an essentially plural variant of FALL(*E*), which is introduced via FALL(*E*, *X*), a concept that relates falls to fallen. To a first approximation, some events together count as rain if in addition to being suitably related, each of them is a fall; cp.

Boolos (1998). So if some events satisfy RAIN(E), they are falls; and if their patients were rocks that ended up on the village, they were falls of rocks that ended up on the village. And if we often use ‘rain’ to think/talk about waterdrops, we might well add a nominal use as in (50)

(50) Brutus watched the rain fall

for thinking/talking about the falling waterdrops.<sup>14</sup>

My aim is not, however, to provide a theory of weather reports. It is rather to highlight two points. First, if verbs express monadic concepts of things that can have participants, “argument optionality” is not surprising. If ‘rain’ expresses RAIN(E), then absent lexical restrictions of the sort imposed by ‘put’, (46-50) do not pose mysteries. Likewise, if ‘kick’ expresses KICK(E), its appearance in the range of constructions repeated below is unsurprising.

(27) Brutus kicked Caesar a bottle

(29) Caesar was kicked

(31) The baby kicked

(32) I get no kick from champagne

In short, a verb can take arguments without expressing a polyadic concept; and a verb can have mandatory satellites, of whatever kind, without expressing a polyadic concept. Second, support for alternatives to the neo-Fregean picture can come from considering words that do not take arguments. And this leads to the last set of reminders I want to offer.

For purposes of this paper, I have focused on verbs. But the saturationist conception of semantic composition is motivated in part by the idea that names like ‘Brutus’ and ‘Caesar’ express singular concepts like BRUTUS and  $\gamma$ . As Russell and Montague showed, this hypothesis is not required: one can analyze names as quantificational expressions of the same higher-order type as ‘every logician’; cp. note 4. But if names don’t express saturating concepts, yet children have many such concepts (*pace* Russell), that would be surprising—absent some reason for thinking that concepts like BRUTUS and CAESAR can be P-concepts but not L-concepts. On the other hand, if all (open class) L-concepts are monadic, it follows that names do not express singular concepts: lexicalizers would have to use a concept like CAESAR to introduce a monadic concept—perhaps CALLED(X, PF: CAESAR), where PF: CAESAR is a concept of the phonological form associated with the singular concept—that can be combined with others.

This predicts that examples like (51) are not as simple as they appear.

(51) Caesar left

If the lexical item ‘Caesar’ fetches a monadic concept like CALLED(X, PF:CAESAR), the subject of (51) is presumably a complex expression consisting of the lexical item and a covert functional item of some kind.<sup>15</sup> For present purposes, the details are not important. The idea is simply that one way or another, (51) used to express a thought like the following:  $\exists E\{\text{PAST}(E) \ \& \ \exists X[\text{D}(X) \ \& \ \text{CALLED}(X, \text{PF: CAESAR}) \ \& \ \text{AGENT}(E, X)] \ \& \ \text{LEAVE}(E)\}$ ; where D(X) is a monadic concept, perhaps demonstrative in character, expressed by the posited covert element. As noted by Burge (197x) and many others, there is abundant evidence that lexical proper nouns are like common nouns with respect to distribution and the kind of concept expressed. Consider (52-55).

(52) Every Caesar I saw was a politician

(53) Every politician I saw was a Caesar

(54) There were three Caesars at the party

(55) That Caesar stayed late, and so did this one, but the other Caesar left early

As shown in (52) and (53), ‘Caesar’ can appear where nouns can. Like common nouns, ‘Caesar’ can take a plural form, as in (54). Examples like (55) show that ‘Caesar’ can combine with ‘That’ to form complex demonstratives; and ‘one’, modifiable with ‘other’, is ordinarily a

pro-form for nouns that are *not* singular terms. It would be very puzzling if a lexical item with this distribution expressed a singular concept like CAESAR. By contrast, if ‘Caesar’ expresses a monadic concept (52-55) are expected. Even if such constructions are special (or “coerced”) in English, they remain grammatically possible. And in other languages, including Greek and many dialects of Romance, such constructions are quite normal.

Note that proper nouns are not only pluralizable, they can be used generically as in (56).

(56) Politicians lie, and Caesars steal

They can also be used to make claims about some people who share a surname.

(57) The Smiths are coming to dinner

And as surnames remind us, names can be overtly complex, as in (58).

(58) At noon, I saw Caesar Smith

Prima facie, ‘Caesar Smith’ is *semantically* related to ‘Caesar’ and ‘Smith’, roughly as ‘red stick’ is to ‘red’ and ‘stick’: a Caesar Smith is both a Caesar and a Smith. A random Smith need not be a Caesar Smith. But in a context where the only Caesar is also the only Smith, one can use (59) or (60) to say what one says with (58), suggesting that ‘Caesar’ fetches a monadic concept.

(59) I saw Caesar at noon

(60) I saw Smith at noon

Titles, as in (61), raise similar issues.

(61) Professor Caesar Smith and Doctor Caesar Smith are both republicans.

One might insist that a speaker who uses ‘Caesar’ to talk about two people, who we might call ‘Sid’ and ‘Romero’, has two homophonous lexical names. On this view, the sound of ‘Caesar’ is associated with potentially many singular meanings *in addition to* its monadic meaning. (Positing the latter seems unavoidable.) I find it hard to believe that a speaker who knows and distinguishes  $n$  Caesars has  $n+1$  meanings for ‘Caesar’. But it is hard to establish that an ambiguity hypothesis is false: that is why such hypotheses are, methodologically, not options of first resort; see Kripke (1979). Still, this particular hypothesis faces serious difficulties.

Given that many languages allow for grammatically complex names, with predicative nouns as constituents, it is a substantive assumption that English *forbids* such an analysis of (51).

(51) Caesar left

But if such an analysis is possible, positing even one singular meaning for ‘Caesar’ makes (51) ambiguous; and any posited singular meanings seem theoretically otiose. Lexical nouns with such meanings would also be theoretically unattractive, since they would not head any noun phrases. There are, to be sure, subclasses of nouns. Indeed, as (52) shows,

(52) \*Politician left

common nouns do not combine with a covert name maker. But one can distinguish common nouns from proper nouns, especially if the latter do not correspond to language independent concepts, without positing unmodifiable nouns. Accounting for any grammatical categories is hard enough, without positing subcategories needlessly; see Baker (2003).<sup>16</sup>

My aim is not, however, to provide a theory of names. It is to highlight a potential source of support for the idea that open class lexical items (and hence verbs) express monadic concepts, in contrast to the neo-Fregean picture of verbs often expressing polyadic concepts saturated by the singular concepts expressed with names.

### 3. Meaning and the Language Faculty

At the outset, I noted that the neo-Fregean picture of verb meanings can seem to offer an attractive starting point for theorizing about meaning more generally. If verbs express unsaturated concepts of varying adicities, then presumably, combining verbs with arguments

signifies saturation of one concept by another. And this conception of verbs coheres with the idealization that lexical items express prior concepts, which were available for lexicalization. One might hope to develop detailed accounts of meaning, and its relation to human psychology, within these framework assumptions. But in so far as the neo-Fregean picture is inadequate, even as a description of how verbs do and don't combine with arguments, we need a different point of departure. So let me suggest that Chomsky's (1986, 1995) focus on I-languages and their core operations provides a congenial setting for the idea that lexical meanings are instructions to fetch monadic concepts. We can view I-languages as cognitive tools that let humans use prior concepts to make distinctive recursively combinable concepts. But the distinctiveness may lie more with the monadic building blocks than with the modes of recursive combination.

### 3.1 I-Languages

Starting with the ancient conception of languages as pairing signals with interpretations, we can distinguish *sets* of signal-interpretation pairs from *procedures* that pair signals of some sort with interpretations of some sort. Since we can describe the former as extensions of functions, and the latter as intensions, Chomsky speaks of E-languages and I-languages.<sup>17</sup> While 'I-' also connotes the internalistic and idiolectic character of the procedures that interest Chomsky, the basic distinction is simpler and less tendentious. We can distinguish the set of input-output pairs determined by 'x - 1' from the indicated procedure, which differs from the procedure indicated with  ${}^{+}\sqrt{(x^2 - 2x + 1)}$ , which determines the same set of input-output pairs. Likewise, even if a speaker's linguistic competence can be partly characterized by a set of signal-interpretation pairs, we can distinguish any such set from the procedure the speaker *implements* in pairing signals with interpretations as she does; cp. Marr (1982) on the distinction between functions computed and implementable algorithms for computing them.

Using this terminology, let's say that Human I-languages are naturally acquirable procedures that pair distinctively human linguistic signals—like the sounds of spoken English or signs of ASL—with the corresponding interpretations, whatever they are.<sup>18</sup> Human I-languages are biologically implemented procedures that normal children can acquire, given an ordinary course of experience. But depending on what we mean by 'signal' and 'interpretation', the procedures in question may be indirect. For example, my "I-English" need not be a procedure that directly links acoustic vibrations to interpretations of any kind. Human I-languages may be procedures that pair instructions to generate signals/percepts of a certain sort with instructions to generate interpretations/concepts of a certain sort. From this perspective, the Human Faculty of Language consists of whatever aspects of human cognition are responsible for generating such instructions, via the acquisition of Human I-languages. And following Chomsky (1995), we can think of the linguist's PFs and LFs—or more neutrally, PHONs and SEMs—as instructions at two "interfaces" between the Human Faculty of Language and other cognitive systems: the articulatory/perceptual systems germane to the production/perception of signals, and the conceptual/intentional systems germane to the construction/expression of concepts.

Let's assume that in acquiring a Human I-language, a child lexicalizes available concepts, which are symbols of one or more mental languages that children may share with nonhuman animals. Once acquired, Human I-languages can be used (via the expressions they generate) in thought as well as communication. Indeed, we may use "Human I-expressions" primarily in thought, at least statistically. But the significance of such expressions is presumably *inherited* from the significance of lexicalizable concepts; see, e.g., Fodor (200x). Nonetheless, this inheritance may be indirect, since lexical expressions of a Human I-language may do more than merely label lexicalizable concepts.

If the phonological form of ‘poked’ is initially paired with a polyadic concept, this may initiate a process that results in a lexical item that connects the phonological form of ‘poke’ with a monadic concept  $POKE(E)$ ; where the monadic concept is henceforth the one fetched with ‘poke’, and ‘poked’ is treated as complex instruction to fetch the concept  $PAST(E)$  and conjoin it with a concept fetched via ‘poke’. Likewise, if the phonological form of ‘Brutus’ is paired with a singular concept like  $BRUTUS$ , this may initiate a process that results in a lexical item that connects the sound with a monadic concept like  $CALLED(X, PF:BRUTUS)$ ; where the monadic concept is henceforth the one fetched with the lexical item ‘Brutus’, which might be combined with an overt or covert determiner. Given a polysemous word, there is presumably more than one fetchable concept. But a lexical item that is, early on, linked to at least two concepts—one lexicalized and one fetchable—might become linked to four or six.

Of course, lexicalization and composition must dovetail. If lexical items can be combined to form a phrase, the concepts fetched with those lexical items must be combinable via the operations (conjunction, saturation, or whatever) invoked by the relevant syntax. Correlatively, these operations of semantic composition must be such that they can be applied to the concepts fetched by lexical items that can be combined to form expressions of a Human I-language. This raises chicken/egg issues. Are certain operations of conceptual combination invoked, as correlates of phrasal syntax, because lexically fetchable concepts have the formal character they do? Or do the fetchable concepts have the formal character they do because of constraints on which operations of conceptual combination are available as correlates of phrasal syntax?

I suspect that in the end, the answer to both questions is affirmative, but that the second is especially important. In my view, there are independent empirical and theoretical reasons for thinking that in Human I-languages, the core operation for combining expressions recursively yields expressions that are instructions to conjoin monadic concepts that may have thematic constituents in which one variable has been closed; see Hornstein and Pietroski (forthcoming). But even restricting attention to the facts noted above, we have seen reasons for taking some such conception of semantic composition seriously. And if one were to begin anew, without adopting a neo-Fregean/saturationist conception by default, one might well explore the idea that combining Human I-expressions signifies a *reversible* operation that is in some sense *additive*. If one focuses on considerations of computability, and not mere compositionality, one might well see patterns of conjunction reduction as manifestations of the core operation invoked by the Human Faculty of Language to combine lexically fetchable concepts recursively.

From this perspective, the distinctively human aspect of this faculty may well lie with lexicalization and the concepts it delivers, as opposed to (i) the composition operations applied to these concepts, or (ii) the concepts lexicalized; cp. Hauser, Chomsky, and Fitch (200x), Chomsky (2009). Indeed, lexically fetchable concepts may be special in various respects; see note 13. But we know that human children are distinctive primates who lexicalize with a vengeance. So one might well explore the hypothesis that lexicalization was the new trick that somehow let humans exploit extant operations of conceptual combination to new effect. If our ancestors were already saturating polyadic concepts with singular concepts, at least within various local domains, lexicalization may not have added much. But perhaps monadicizing, massively, lets us do a lot—with simple operations of conjunction and existential closure—that we couldn’t otherwise do; see Pietroski (200x, 200x) for further discussion.

### **3.2 Reprise**

If a mind is stocked with unsaturated concepts of various adicities and singular concepts that can saturate them, and this mind can express thoughts by means of intransitive, transitive, and

ditransitive constructions in which verbs combine with one, two, or three referential expressions, one might well expect this mind to express its concepts in accord with the neo-Fregean picture: intransitive verbs express concepts like ARRIVED(X) or eventish analogs like ARRIVE(E, X); transitive verbs express concepts like KICKED(X, Y)/KICK(E, X, Y); ditransitive verbs express concepts like GAVE(X, Y, Z)/GIVE(E, X, Y, Z); and names express singular concepts like BRUTUS.

One can imagine such a mind having a transitive verb ‘poke’ expressing POKE(E, X, Y), with no variable for instruments, or a ditransitive verb expressing POKE(E, X, Y, Z). But one wouldn’t expect both. Likewise, given transitive ‘kick’, one wouldn’t expect an intransitive or ditransitive version. Other things equal, one wouldn’t expect passives or nominalizations. Nor would one expect names to figure in sentences like (53)

(53) Every Antony saw a Brutus poke a Caesar while it rained.

But given ditransitive constructions and some concepts like SELL(E, X, Y, Z, W), one might expect “tritransitive” constructions like (54), with the meaning that Brutus sold a car for a dollar.

(54) Brutus sold a car dollar

Given concepts like JIMMY(E, X, Y, Z) and BETWEEN(X, Y, Z), one would expect ditransitive constructions like ‘Brutus jimmied the lock a knife’ and ‘Antony betweened Brutus Caesar’. Given BIGGER(X, Y), and FROM(X, Y), one would expect ditransitive constructions like ‘Antony bigged Caesar’ and ‘Brutus froms Rome’.

Or put another way, if a mind stocked with such concepts *could* acquire a language that conforms to the neo-Fregean picture, one would expect it to acquire such a language—especially if presented with a lot of evidence suggesting that other minds had acquired such a language. So if young minds of this sort regularly mature into minds that *don’t* acquire the expected verbs—indeed, their ditransitive constructions seem to involve conjunction of thematic concepts, and their transitive constructions may be similar—but they can understand sentences like (55),

(55) Caesar was given a poke when they baby kicked

this would suggest that these minds *cannot* acquire languages that conform to the neo-Fregean picture. One would want a hypothesis about the kinds of languages they can acquire. But if many facts together invite the conjecture that verbs and names express monadic concepts, despite a stock of singular and polyadic concepts, one might conclude that (i) these minds are constrained, perhaps because of the available composition operations, to use lexical items that express monadic concepts, and (ii) they can still express interesting thoughts because they can use many nonmonadic concepts to introduce related monadic concepts that can be coordinated with some formally dyadic/thematic concepts to create simulacra of thoughts with polyadic constituents.

I have suggested that these possible minds, or variants, are ours. Defending this proposal requires far more evidence, technical detail, and consideration of potential neo-Fregean replies. But a first step, in my view, is to recognize that a host of well known facts can be seen as symptoms of the massive monadicity of lexical meanings, and verb meanings in particular.<sup>19</sup>

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## Notes (incomplete)

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<sup>1</sup> For discussion, see CITATIONS

<sup>2</sup> Starting with ARRIVED(CAESAR) and abstracting away from the specific content of CAESAR yields the monadic concept ARRIVED(X). Starting with SAW(CAESAR, BRUTUS) and abstracting away from the contents of both saturating concepts yields the dyadic concept SAW(X, Y). I assume that concepts have contents, which need not be meanings, if only because meanings may be (instructions to fetch) concepts. I follow the usual conventions of using small capitals to indicate concepts, and using letters ('x', 'y', ...) to indicate the number and logical order of saturaters: SAW(CAESAR, BRUTUS) implies that Caesar saw Brutus, not that Brutus saw Caesar; SAW(X, BRUTUS) is monadic concept that applies to any entity that saw Brutus, while SAW(CAESAR, Y) is a monadic concept that applies to any entity that Caesar saw. But as discussed below, I do not assume that the contents of unsaturated concepts are functions, or that ARRIVED(CAESAR) denotes the value of some function with Caesar in its domain.

<sup>3</sup> I assume that talk of lexical items expressing concepts is to be understood, eventually, in terms of how concepts are indicated in speech and/or fetched in comprehension. But I do not assume that each lexical item  $\lambda$  is paired with a single concept C: if only because of polysemy, and the possibility of different perspectives on the things thinkers think about, a speaker might indicate one concept with a word that fetches a related but distinct concept in a hearer. For me, saying that  $\lambda$  expresses C is a simple of saying that  $\lambda$  is linked, in a special indicating/fetching way, to one or more concepts that share a certain form and perhaps a common root; see section two.

<sup>4</sup> References

<sup>5</sup> But if events of arriving are not (represented as) independent of arrivers, no value of the variable in ARRIVE(E, BRUTUS) is independent of Brutus, and so ARRIVE(E, X) is not a concept of a genuine *relation*. Compare AFTER(E, F), ABOVE(X, Y), and ARRIVE-AT(T, X), whose first variable ranges over *times*, which are independent of arrivers. Likewise, while SEE(E, X, Y) is formally triadic, the corresponding relation does not hold among three independent entities. In this sense, hypothesizing that verbs indicate concepts like ARRIVE(E, X) and SEE(E, X, Y)—as opposed to ARRIVED(X) and SAW(X, Y)—adds one to the posited adicities in a formal way, allowing for adverbial modification of event variables, as noted below—without changing much else.

<sup>6</sup> If the adverbial phrases correspond to conjuncts of a complex monadic concept, closed by existential quantification, the valid inferences are instances of conjunction reduction:  $\exists E[\Phi(E) \ \& \ \Psi(E) \ \& \ \Delta(E)]$  implies  $\exists E[\Phi(E) \ \& \ \Psi(E)]$ , which implies  $\exists E[\Phi(E)]$ . But an instance of  $\exists E[\Phi(E) \ \& \ \Psi(E) \ \& \ \Delta(E)] \ \& \ \exists E[\Phi(E) \ \& \ \Gamma(E) \ \& \ \Theta(E)]$  need not imply either  $\exists E[\Phi(E) \ \& \ \Psi(E) \ \& \ \Theta(E)]$  or  $\exists E[\Phi(E) \ \& \ \Delta(E) \ \& \ \Gamma(E)]$ . See Taylor (1983), expounding an argument due to Gareth Evans. The example also shows that values of event variables are not ordered n-tuples consisting of participants and a moment in time; a sharp hit (of y by x) with a red stick can occur at the same time as a soft hit with blue stick.

<sup>7</sup> If 'poked Caesar' expresses POKED(X, CAESAR), perhaps 'sharply' expresses a concept that relates concepts to individuals, and (9) expresses SHARPLY[POKED(X, CAESAR), BRUTUS]. But then one needs to explain: why anything that falls under SHARPLY[POKED(X, CAESAR), Y], the

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monadic concept expressed with ‘poked Caesar sharply’, also falls POKED(X, CAESAR); how speakers know that ‘sharply’ is in this sense a restrictor; and how this model extends to ‘poked Caesar sharply with a red stick’.

<sup>8</sup> For further discussion of these arguments, see Parsons (1990) on “subatomic” semantics. Schein (1993, 200x) extends the arguments for “thematic separation” to plural constructions; see also Pietroski (2005) on action descriptions, including causative and serial verb constructions.

#### OTHER CITATIONS

Note that while thematic concepts are formally dyadic, like AFTER(E, F) and ABOVE(X, Y), the corresponding relation does not hold between independent entities; compare note 5.

<sup>9</sup> By contrast, suppose that ‘ate’ can polysemously express CONSUME(E) or REFUEL(E), and that a covert argument forces the second choice because no “thing consumed” is specified. Events of consumption might be represented as having agents and patients, but without any necessary connection to nourishment, while events of refueling need not be represented as having patients.

<sup>10</sup> Again, see Parsons (1990) and Schein (1993, 200x). One can say that (31) has a covert direct object, and that it means something like ‘The baby did a kick’; cp. Hale and Keyser (199x). But if anything, this supports the idea that ‘kick’ expresses KICK(E) in both (31) and (32). And if one has already posited the concept KICK(E, Y), one might use it to introduce a monadic concept of events:  $\forall E \{ \text{KICK}(E) \equiv \exists Y [\text{KICK}(E, Y)] \}$ . Kratzer offers a few reasons for not going this far, and instead leaving Themes/Patients semantically “unsevered” from verbs that apply to pairs of events and their “internal” participants. But as Williams (200x) shows, Kratzer’s arguments are far from decisive even for English, and they seem incorrect for languages like Igbo and Mandarin.

<sup>11</sup> I am indebted to Norbert Hornstein for a series of conversations on these topics.

<sup>12</sup> But I have no firm commitments about any particular example. It is *very* hard to know the adicity of any prelexical concept. Even the classically monadic ‘mortal’ may express a concept that relates individuals to events of death. Indeed, this should make us wary of hypotheses according to which some feature of verbs *matches* the adicity of the concept expressed. How does one tell if such a hypothesis is correct, absent a reliable independent means of discerning the relevant conceptual adicity?

<sup>13</sup> This is an instance of a more general idea: P-concepts may exhibit certain formal distinctions that L-concepts do not; L-concepts may, by design, abstract away from certain respects in which P-concepts differ. For example, each P-concept may be essentially singular or essentially plural, while at least many L-concepts are neither; see Pietroski (2006), drawing on Boolos (1998) and Schein (1993).

<sup>14</sup> Note that ‘Cats and dogs rained down on Rome’ does not have the idiomatic meaning of ‘It rained cats and dogs in Rome’, which is roughly that it rained heavily in Rome. One might argue that ‘snow’ expresses SNOW(E, L), with a variable for locations; see CITATIONS. But even if this is correct, it is little comfort to neo-Fregeans. For unlike the variable for the fallen in FALL(E, X),

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the location variable is not saturated by the concept expressed with any argument of the verb. We can say ‘Snow fell’ and ‘Rome fell’, but not ‘Rome snowed’. And if one insists that ‘It snowed’ has a covert *saturating location argument*, as opposed to a covert *conjoining location adjunct*, one needs appropriate analyses of (46) and (47).

15. See Burge (1973) and many others, e.g., Katz (1994), Longobardi (1994), Elbourne (2005), Matushansky (2006).

<sup>16</sup> A similar point applies to acquisition. We must ask if the faculty that supports the acquisition of languages that allow for complex names—names composed of lexical proper nouns and overt determiners—*also* supports the acquisition of lexical singular names. For example, in Greek, names may and typically *must* be complex: a bare proper in a context like (51) is anomalous, like (52) in English; see Giannakidou and Stavrou (1999). Any child can acquire a “G(reek)-style” language. And *if* languages like English allow for lexical singular names, any child can acquire such an “E-style” language; in which case, experience with E-style languages must differ from experience with G-style languages, in a robust way that leads *every* normal child to acquire a lexicon of the right sort: in cases of acquiring English, a lexicon with *enough* entries, despite homophony and the possibility of complex-name analyses that would shorten the lexicon; in cases of acquiring Greek, a lexicon with *fewer* entries, despite the possibility of ambiguity and lexical-name analyses that would lengthen the lexicon. Usually, children treat lexical sounds as ambiguous only given reason to do so. So what would lead children to conclude that English name sounds are ambiguous? One can conjecture that not hearing the determiner, in examples like (52), lets children know that English has lexical names. But on this view, children use “negative” evidence to *disconfirm* that English names are complex. The use of such evidence in acquisition remains unattested; see Crain and Pietroski (2001). Worse, an unwanted lexical type must be posited to allow children to use negative evidence to acquire a grammar that admits theoretically superfluous ambiguities.

<sup>17</sup> Compare Church (194x), who was echoing Frege (189x). Given homophony and synonymy, a signal may be paired with an n-tuple of interpretations, and an interpretation may be paired with more than one signal.

<sup>18</sup> This leaves room for the externalist idea that interpretations are individuated by features of the environment (see Putnam [197x], Burge [1989], ... Higginbotham [198x]), even if these interpretations are themselves concepts; cf. Pietroski (2006, 2008) for discussion drawing on Chomsky (2000). And of course, the point is not to deny that humans can have languages of thought that are independent of public signals. But such languages may be neither acquired nor distinctively human.

<sup>19</sup> Acknowledgements