Lexicalizing and Combining

Paul M. Pietroski
University of Maryland

Often, theorists mean different things by 'meaning', and understandably so.[1] 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, certain systems of animal communication, possible languages of thought, formal languages invented for purposes of computation or for 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's 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 (1892) 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 for how to access *monadic* concepts that can be *conjoined* with others; cp. Hobbs (1985), Parsons (1990), Schein (1993, 2001), Pietroski (2005, 2006). 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.

Section one reviews some facts that motivate the view I want to challenge, and then some other facts that motivate the search for an alternative view 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 expressions, which combine in ways that somehow mirror the ways in which the concepts combine. Frege offered a model language whose expressions reflect thoughts of a certain kind (*Gedanken*). But as Frege stressed, even if humans can have such thoughts, his *Begriffsschrift* may not be a good model of the languages that 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 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 names,

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

each name is an argument of the verb. The relation a verb bears to its argument(s), in a sentence or sentential clause, is somehow asymmetric. 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 phrase that is grammatically akin to 'Brutus'. In some sense, the names appear 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.[2]

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.[3] If verbs have unsaturated meanings in this sense, then perhaps the *number* of arguments that a verb can combine with 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 this determination is often transparent: 'arrived' takes a single argument because it indicates the monadic concept ARRIVED(X); 'saw' takes two arguments, at least in active voice, because it indicates the dyadic concept SAW(X, Y). On this view, 'saw Caesar' indicates the complex monadic concept SAW(X, CAESAR), which is like ARRIVED(X) in being saturatable by BRUTUS. One can also 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 over (as opposed to saturation of) the conceptual "slot" for the thing given to the recipient by the giver, as shown in (3a).

(3a) ∃Z:SANDWICH(Z)[GAVE(BRUTUS, CAESAR, Z)]

In this thought, the complex monadic concept GAVE(BRUTUS, CAESAR, Z) saturates the second-order concept ∃Z:SANDWICH(Z)[Φ(Z)], which is the result of saturating a dyadic concept, ∃Z:Ψ(Z)[Φ(Z)], with the monadic concept SANDWICH(Z). The idea is that an unsaturated concept can saturate suitable concepts of a higher order; by contrast, BRUTUS and CAESAR are said to be inherent saturat*ers*. Correlatively, "surface syntax" need not reflect the order of saturation. In (3), 'a sandwich' is a grammatical constituent of a verb phrase headed by 'gave'.[4]

Given a "saturationist" conception of semantic composition, a verb's valence may *exceed* its overt arguments, at least in some sentences. Perhaps 'ate' is fundmentally transitive/dyadic, as suggested by (4), and (5) somehow involves a 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 (1967) 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).[5]

(1) Brutus arrived.

(1a) ∃E[PAST(E) & ARRIVE(E, BRUTUS)]

Eventish analyses of this sort account for the pattern of entailments and nonentailments exhibited by (the thoughts expressed with) 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 (6) and (7) have the logical forms displayed in (6a) and (7a).[6]

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

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

Moreover, a tenseless version of (10) can appear as the direct object of certain verbs, as in (15). This suggests that the perceptual verb 'saw' does *not* express the dyadic 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 (1927). Instead, one can say that 'saw' expresses 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) ∃E{PAST(E) & ∃F[SEE(E, ANTONY, F) & POKE(F, BRUTUS, 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.

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

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

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

On one reading, Antony 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 how to account for such facts, in any systematic way, without appealing to event variables. So I assume that saturationists will allow for such variables, and maintain that a verb typically expresses a concept whose adicity *exceeds* the number of arguments that the verb takes in a sentence. (And covert existential closure is not limited to event variables.) But let me note one more reason for positing event variables in the concepts expressed with verbs.

If verbs like 'poked' express dyadic concepts like POKED(X, Y), which applies to poker-pokee pairs, it is hard to describe (much less explain) the thematic asymmetry that these verbs exhibit; see, e.g., Dowty (1991), Baker (1997). Consider the possible concept KOPED(X, Y): when saturated by CAESAR and then BRUTUS, the result—KOPED(BRUTUS, CAESAR)—is true just in case Caesar poked Brutus; KOPED(X, Y) applies to pokee-poker 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' expresses a concept with an event

variable, *and* that if this concept also includes variables for a poker and pokee, then this concept has a thematic decomposition along the lines shown in (17).[7]

(17) $\forall E \forall X \forall Y[\text{POKE}(E, X, Y) \equiv \text{POKE}(E) \,\&\, \text{AGENT}(E, X) \,\&\, \text{PATIENT}(E, Y)]$

One can maintain that monadic concepts like POKE(E)—concepts of events that may be expressed with nouns—are abstracted from the polyadic concepts expressed with verbs. So one can embrace generalizations like (17) while saying that intransitive, transitive, and ditransitive verbs express concepts that exhibit distinct adicities. Nonetheless, appeal to event variables can feed doubts about the saturationist picture of semantic composition for verb phrases.

1.2 Messy Facts

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

If 'arrive' and 'poke' express ARRIVE(E, X) and POKE(E, X, Y), respectively, then one needs some explanation for why (18) and (19) cannot have the indicated meanings.

(18) That Brutus arrived.

(18a) #That was an event of Brutus arriving.

(19) The witnessed event Brutus poked Caesar.

(19a) #The witnessed event was one of Brutus poking Caesar.

Why can't the event variable correspond to an overt grammatical argument? If a verb cannot be combined with an overt argument for *each* variable that the verb introduces, then 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 as arguments *because* they express saturating concepts. For now, recall (5) and consider its relation to (20-22). Note that (5) does not follow from (20); these sentences are not synonymous.

(5) Caesar ate.

(20) Caesar ate something.

(21) Caesar dined.

(22) Caesar dined on pencils.

Suppose that Caesar ate a pencil, but Caesar is a normal human for whom pencils are not nutritious. Then an utterance of (20) can be true while an utterance of (5) is false. In this respect, (5) is more like (21). Prima facie, the implications go from (22) to (21) to (5) to (20). So even if (5) has a covert argument, and 'eat' always expresses the polyadic concept EAT(E, X, Y), one needs to say why (5) implies that the unspecified thing eaten is food for the eater. And the concept expressed with 'dine' presumably does not have a *lower* adicity.[8]

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 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 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 capture the intuition that events of eating/dining require eaters and things eaten. But in any case, 'eat' and 'dine' differ: the former can take a direct object that specifies whatever was eaten; the latter requires use of a prepositional phrase to specify what was dined on. This difference must be encoded somehow, whatever concepts the verbs express. And as we'll see, it

is easily encoded if the concepts expressed are monadic. So in my view, the interesting questions here concern the *kinds* of concepts that verbs indicate/fetch for purposes of semantic composition. Do the thoughts expressed with (20-21) have the forms shown in (20a-21a),

(20a) ∃E{PAST(E) & ∃X[EAT(E, CAESAR, X)]}

(21a) ∃E{PAST(E) & DINE(E, CAESAR)}

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

(20b) ∃E{PAST(E) & AGENT(E, CAESAR) & EAT(E) & ∃X[PATIENT(E, X)]}

(21b) ∃E{PAST(E) & AGENT(E, CAESAR) & 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 GIVE(E, X, Y, Z), one wants to know why 'donate' does not express DONATE(E, X, Y, Z) and also take three arguments. So perhaps 'give' expresses a concept of *lower* adicity. The synonymy of (23) and (26)

(26) Brutus gave a painting to a museum.

invites the hypothesis that 'give' expresses GIVE(E, X, Y), and that (23) is used to express thoughts of the form shown in (23a), as opposed to (23b); cp. Larson (1988).

(23a) ∃E{PAST(E) & ∃Y[PAINTING(Y) & GIVE(E, BRUTUS, Y)] &
∃Z[MUSEUM(Z) & RECIPIENT(E, Z)]}

(23b) ∃E{PAST(E) & ∃Y[PAINTING(Y) & ∃Z[MUSEUM(Z) & GIVE(E, BRUTUS, Y, Z)]]}

And upon reflection, the mere availability of ditransitive *constructions* like (23) does not favor the second analysis.

Examples like (27) do not lead us to say that 'kick' expresses 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) ∃E{PAST(E) & ∃Y:BOTTLE(Y)[KICK(E, BRUTUS, Y) & RECIPIENT(E, 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 (1995).

(23c) ∃E{PAST(E) & AGENT(E, BRUTUS) & ∃Y[PAINTING(Y) & GIVE(E, Y)] &
∃Z[MUSEUM(Z) & RECIPIENT(E, Z)]}

The existence of passive constructions like (29)

(29) Caesar was kicked.

is puzzling if 'kick' expresses KICK(E, X, Y). One can posit a process of introducing a related concept—KICK(E, Y)—that has no variable for kickers, yet still has a saturatable variable for kickees: ∀E∀Y{KICK(E, Y) ≡ ∃X[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 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.[9]

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). So if combining verb V with 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 (ignoring any event variable). But prima facie, neither verb can take four arguments. Note that (33) only has a bizarre meaning,

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

according to which Caesar is a car *for whom* Brutus sold/bought a dollar; cp. (40) below. 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 with no variable for recipients. And note that while (35) follows from (38), much 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 saturater of the concept expressed by the verb in (38), then prima facie, 'Caesar' does not indicate a saturater 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, which would follow from the stronger constraint that all verbs express monadic concepts of things that can have participants. But in any case, once saturationists adopt the weaker constraint, this reduces the interest of the hypothesis that verbs inherit adicities from the concepts they express. Moreover, if saturationists posit processes that *introduce* concepts like GIVE(E, X, Y) in terms of concepts with *higher* adicities, they can hardly complain if other theorists do the same and extend this 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" and set them aside for special treatment. But we shouldn't suppose that we have any clear conception of how a concept can *have* an adicity that (if coerced) *changes*. 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 Conjunctivst 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 certain 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 be a process of using 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 like prepositions, or certain grammatical relations that verbs can bear to their 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.

2.1 Possible Minds

One can imagine minds that simply pair combinable concepts with perceptible signals, yet manage to communicate tolerably well by producing the signals in a linear order. Producing a string of atomic signals $S_1 \ldots S_k$ could be interpreted as the expression of a thought whose atomic components are the corresponding concepts $C_1 \ldots C_k$, 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 so limited.[10] We acquire lexical items that can be combined to form phrases, of unbounded length, that exhibit a nontrivial syntactic typology. But if our lexical items signal concepts that are independently combinable because of their valences, and the semantic role of syntax is basically to determine order of saturation, one wonders why we have the syntax we do. So perhaps lexicalization and syntax conspire in a less obvious way, with a restricted form of conjunction as the primary mode of semantic composition.

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). So here, let me simply present the main ideas in the context of an example that initially seems unfriendly.[11] 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; see Horty (2007) for related discussion of Frege's notion of definition. 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:

∀E∀X∀Y∀Z[GIVE(E, X, Y, Z) & PAST(E) ≡ GAVE(E, X, Y, Z)]. And given *n* thematic concepts, a monadic concept can be introduced: ∀E∀X∀Y∀Z[GIVE(E) & AGENT(E, X) & PATIENT(E, Y) & RECIPIENT(E, X) ≡ GIVE(E, X, Y, Z)]; cp. Castañeda (1967).

As one would expect, this is a "contextual" introduction of GIVE(E), which applies to certain events that occur when three individuals exhibit the relation that GIVE(X, Y, Z) is a concept of. And the biconditionals in question need not be logical truths. The hypothesis is that in lexicalizing GIVE(X, Y, Z), we effectively assume an equivalence: ∀X∀Y∀Z{GAVE(X, Y, Z) ≡ ∃E[PAST(E) & GIVE(E) & AGENT(E, X) & PATIENT(E, Y) & RECIPIENT(E, X)]}; where the right side implies each of its conjunct-reducing variants. But this generalization need not hold—like ∀X∀Y∀Z~[GAVE(X, Y, Z) & ~ GAVE(X, Y, Z)], which is an instance of noncontradiction—as a matter of logic. There is much more to be said here about the relations among logic, meaning, and psychology. But for present purposes, let me bracket these larger issues.

2.2 Recapturing Distinctions

Let's assume that for any given speaker, finitely many concepts are can be fetched with lexical items. Call these lexically fetchable concepts, which can be combined via operations corresponding to phrasal syntax, *L-concepts*. For any given lexicalizer, let her *P-concepts* be 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 many of our L-concepts are not P-concepts, but rather, concepts introduced in the course of lexicalization: a P-concept like GIVE(X, Y, Z) might be used to introduce an L-concept like GIVE(E) that would otherwise be unavailable for fetching with a lexical item.[12]

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 words 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 PUT(E, X, Y, L), with a variable for locations—or PUT(E, Y, L), without a variable for agents; cp. Hale and Keyser (1993). We can say instead that 'put' expresses PUT(E), or perhaps 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; cp. Levin and Rappaport (1995), Levin and Rappaport Hovav (2005). If the grammatical relation between 'put' and its direct object invokes the concept PATIENT(E, X), and the preposition invokes LOCATION(E, X), then 'put a book on a table' meets this requirement by expressing concepts like PUT(E) & ∃X[BOOK(X) & PATIENT(E, X)] & ∃X[TABLE(X) & LOCATION(E, X)].

If 'put' lexicalized a polyadic concept of making something be in a place, locations might be "conceptually tied" to puttings in a way they are not tied to eatings, even if we know *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 clause with active voice: the POSSE of a verb V reveals how many satellites are needed to make V into an active voice 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; though 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 (2005, 2007). Otherwise, one *is* positing 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—yielding constructions like 'Brutus betweened Antony Caesar', 'Caesar talls Antony', and 'Brutus froms Rome'. The intended thoughts are expressible, with circumlocution, by using functional expressions: Brutus *is* between Antony *and* Caesar; Caesar *is* tall*er 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 saturationist 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 (1974). But if 'rain' expresses RAIN(E), and the argumentless verb corresponds to an argumentless concept modulo the event variable, we need 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 initial 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; cp. Boolos (1998). If some events satisfy RAIN(E), they are falls; 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 typically use 'rain' to think/talk about waterdrops, we might add a nominal use as in (50).[13]

(50) Brutus watched the rain fall.

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, then "argument optionality" is not surprising. If 'rain' expresses RAIN(E), then absent lexical restrictions of the sort imposed by 'put', (46-50) do not present puzzles. 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 saturationist picture can come from considering words that do *not* take arguments. 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 CAESAR. As Russell and Montague showed, this is hypothesis is not required: one can analyze names as quantificational expressions of the same higher-order type as 'every logician'. 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.[14] For present purposes, the details are not important. The idea is that one way or another, (51) is used to express a thought like the following: ∃E{PAST(E) & ∃X[D(X) & CALLED(X, PF: CAESAR) & AGENT(E, X)] & LEAVE(E)}; where D(X) is a monadic concept, perhaps demonstrative in character, expressed by the posited covert element. As noted by Burge (1973) 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 other 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, then (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 in English. 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 needlessly positing odd subcategories; see Baker (2003).[15]

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 saturationist 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 saturationist 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 if the saturationist 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 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.[16] 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.[17] 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 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 and communication. Indeed, we may use "Human I-expressions" mostly in thought. The significance of such expressions is presumably *inherited* from the significance of lexicalizable concepts; see, e.g., Fodor (1975, 2003). But 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 several.

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, operations of semantic composition must be applicable 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 (2009). 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 adoping a Fregean/saturationist conception by default, one might well explore the idea that combining Human I-expressions often signifies an operation that is *reversible* and in some sense *additive*. If one focuses on considerations of easy computability, and not mere recursive specifiability, one might see patterns of conjunction reduction as manifestations of the core operation invoked by the Human Faculty of Language to combine lexically fetchable concepts.

From this perspective, the distinctively human aspect of this faculty may 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 (2002), Chomsky (2009). Indeed, lexically fetchable concepts may be special in various respects. We know that human children are distinctive primates who lexicalize with a vengeance. So perhaps we should 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 (2005, 2006, 2011) for further discussion.

3.2 Reprise

Imagine a mind that has unsaturated concepts, of various adicities, and singular concepts that can saturate them. 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 expect this mind to express its concepts in accord with the saturationist 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’ that expresses POKE(E, X, Y), with no variable for instruments, or a ditransitive verb that expresses 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), but with the meaning that Brutus sold a car for a dollar.

(54) *Brutus sold a car a dollar.

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

Put another way, if a mind stocked with such concepts *could* acquire a language that conforms to the saturationist picture, one would expect it to acquire such a language—especially given evidence that local adults had acquired such a language. So if human children have the concepts, but they *don’t* acquire the expected verbs, this suggests that kids *can’t* acquire languages that conform to the saturationist picture. Defending this suggestion requires far more evidence, technical detail, and consideration of potential saturationist replies. But a first step 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.[18]

References

Baker, M. (1997): Thematic Roles and Grammatical Categories. In L. Haegeman (ed.), *Elements of Grammar*, Dordrecht: Kluwer, pp. 73-137.

Baker, M. (2003): *Verbs, Nouns, and Adjectives*. Cambridge: Cambridge University Press.

Boolos, G. (1998): *Logic, Logic, and Logic*. Cambridge, MA: Harvard University Press.

Burge, T. (1973): Reference and Proper Names. *Journal of Philosophy* 70:425-39.

Burge, T. (1989): Wherein is Language Social. In A. George (ed.), *Reflections on Chomsky*. New York: Blackwell.

Carlson, G. (1984): Thematic Roles and their Role in Semantic Interpretation. *Linguistics* 22: 259-79.

Castañeda, H. (1967): Comments. In Rescher (1967).

Chomsky, N. (1970): Remarks on Nominalization. In R. Jacobs and R. Rosenbaum (eds.), *Readings in English Transformational Grammar* (Waltham: Ginn).

Chomsky, N. (1986): *Knowledge of Language* (New York: Praeger).

Chomsky, N. (1995): *The Minimalist Program*. Cambridge, MA: MIT Press.

Chomsky, N. (2000): *New Horizons in the Study of Language and Mind*. Cambridge: Cambridge University Press.

Church, A. (1941): *The Calculi of Lambda Conversion*. Princeton: Princeton University Press.

Crain, S. and Pietroski, P. (2001): Nature, Nurture, and Universal Grammar. *Linguistics and Philosophy* 24: 139-86.

Davidson, D. (1967): The Logical Form of Action Sentences. In Rescher (1967).

Davidson, D. (1985): Adverbs of Action. In Vermazen, B. and Hintikka, M. (eds.), *Essays on Davidson: Actions and Events* (Oxford: Clarendon Press).

Dowty, D. (1991): Thematic Proto-roles and Argument Selection. *Language* 67:547-619.

Elbourne, P. (2005): *Situations and Individuals*. Cambridge, MA: MIT.

Fodor, J. (1975): *The Language of Thought*. New York: Crowell.

Fodor, J. (2003): *Hume Variations*. Oxford: OUP.

Frege, G. (1892): Function and Concept. In Geach and M. Black (trans.), *Translations from the Philosophical Writings of Gottlob Frege*. Oxford: Blackwell (1980).

Giannakidou, A. and Stavrou, M. (1999): Nominalization and ellipsis in the Greek DP. *The Linguistic Review* 16: 295-332.

Hale, K. and Keyser J. (1993): On argument structure and the lexical expression of syntactic relations. In K. Hale and J. Keyser (eds.) *The View from Building 20*. Cambridge, MA: MIT Press.

Hauser, M., Chomsky, N., & Fitch, T. 2002. The faculty of language: what is it, who has it, and how did it evolve? *Science* 298: 1569-1579.

Higginbotham, J. 1983: The Logical form of Perceptual Reports. *Journal of Philosophy* 80:100-27.

Higginbotham, J. (1985): On Semantics. *Linguistic Inquiry* 16: 547-93.

Hobbs, J. (1985): Ontological Promiscuity. *Proceedings, 23rd Annual Meeting of the Association for Computational Linguistics*, pp. 61-69. Chicago, Illinois, July 1985.

Hornstein, N. and Pietroski, P. (2009): Basic Operations. *Catalan Journal of Linguistics* 8:113-39.

Horty, J. (2007): *Frege on Definitions: A Case Study of Semantic Content*. Oxford: OUP.

Jacobson, P. (1999): Variable Free Semantics. *Linguistics and Philosophy* 22:117-84.

Katz, J. (1994): Names Without Bearers. *Philosophical Review* 103: 1-39.
Kratzer, A. (1996): Severing the External Argument from its Verb. In J. Rooryck and L. Zaring (eds.), Phrase Structure and the Lexicon. Dordrecht (Kluwer Academic Publishers).
Kripke, S. (1979): Speaker's Reference and Semantic Reference. *Midwest Studies* 2:255–276.
Larson, R. (1988): On the Double Object Construction. *Linguistic Inquiry* 19: 335-391.
Levin, B. and Rappaport M. (1995): *Unaccusativity: At the Syntax-Semantics Interface*. Cambridge, MA: MIT Press.
Levin, B. and Rappaport Hovav, M. (2005): *Argument Realization*. Cambridge: CUP.
Longobardi, G. (1994). Reference and Proper Names, *Linguistic Inquiry* 25: 609-65.
Margolis, E. and Laurence, S. (1999): *Concepts: Core Readings*. Cambridge, MA: MIT Press.
Marr, D. (1982): *Vision.* WH Freeman and Company, New York NY.
May, R. (1985): *Logical Form: Its Structure and Derivation*. Cambridge, MA: MIT Press.
Montague, R. (1974): *Formal Philosophy*. New Haven: Yale University Press.
Matushansky, O. (2006): Why Rose is the Rose: on the use of definite articles in names. *Empirical Issues in Syntax and Semantics 6*: 285-307.
Parsons, T. (1990): *Events in the Semantics of English*. Cambridge, MA: MIT Press.
Pietroski, P. (1998): Actions, Adjuncts, and Agency. *Mind* 107: 73-111.
Pietroski, P. (2003): Small Verbs, Complex Events. In L. Antony and H. Hornstein, eds., *Chomsky and His Critics*. New York: Blackwell.
Pietroski, P. (2005): *Events and Semantic Architecture*. Oxford: Oxford University Press.
Pietroski, P. (2006): Interpreting Concatenation and Concatenates. *Philosophical Issues* 16: 221-45.
Pietroski, P. (2010). Concepts, Meanings, and Truth. *Mind and Language* 25: 247-78.
Pietroski, P. (2011). Minimal Semantic Instructions. In C. Boeckx (ed.), *The Oxford Handbook of Linguistic Minimalism* (Oxford: Oxford Univ. Press).
Pietroski, P. (2012a). Semantic Monadicity with Conceptual Polyadicity. In M. Werning, W. Hinzen, & E. Machery (eds.) *Oxford Handbook of Compositionality*. (Oxford: Oxford University Press).
Pietroski, P. (2012b). Language and Conceptual Reanalysis. In A. DiSciullo (ed.), *Towards a Biolinguistic Understanding of Grammar: Essays on Interfaces* John Benjamin (2012).
Ramsey, F. (1927): Facts and Propositions. *Proceedings of the Aristotelian Society (Supplementary)* 7:153-170.
Schein, B. (1993): *Plurals*. Cambridge, MA: MIT Press.
Schein, B. (2001): Adverbial, descriptive reciprocals. In R. Hastings *et. al.*, *Proceedings of Semantics and Linguistic Theory XI.* Ithaca: CLC Publications.
Schein, B. (forthcoming). *Conjunction Reduction Redux*. Cambridge, MA: MIT Press.
Segal, G. (2001): Two Theories of Names. *Mind and Language* 5:547-63.
Taylor, B. (1985): *Modes of Occurrence*. Oxford: Blackwell.
Williams, A. (2005): *Complex Causatives and Verbal Valence*. Doctoral Dissertation: University of Pennsylvania.
Williams, A. (2007): Patients in Igbo and Mandarin. In J. Dölling and T. Heye-Zybatow (eds.) *Event Structures in Linguistic Form and Interpretation* (Berlin: Mouton de Gruyter).

Notes

[1] This paper, a written version of material presented at the Verb Concepts conference in 2008, has older descendants; see Pietroski (2010, 2011, 2012a, 2012b). Though for various reasons, I have not revised this early presentation of my views in light of subsequent work.

[2] I take concepts to be composable mental symbols of a special sort; see Margolis and Laurence (1999), especially their introduction. In Fregean terms, 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 linguistic meanings. I follow the usual conventions of using small capitals to indicate concepts, with variables ('x', 'y', …) indicating the number and logical order of saturaters: SAW(CAESAR, BRUTUS) implies that Caesar saw Brutus; SAW(X, BRUTUS) is a monadic concept that applies to anything 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.

[3] 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 accessed in comprehension. But I do not assume that each lexical item λ 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 λ expresses C is a simple of saying that λ 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.

[4] This divergence can be described in terms of "covert" movement or type-adjustment; see, e.g., May (1985) and Jacobson (1999).

[5] But if events of arriving are not 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, allowing for adverbial modification of event variables, without changing much else.

[6] 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 $\exists E[\Phi(E) \& \Psi(E) \& \Theta(E)]$ or $\exists E[\Phi(E) \& \Delta(E) \& \Gamma(E)]$. See Taylor (1985), 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.

[7] Or perhaps $\forall E \forall X[\text{POKE}(E, X, Y) \equiv \text{POKE}(E, Y) \,\&\, \text{AGENT}(E, X)]$; where POKE(E, Y) applies to event-pokee pairs (cp. Kratzer 1995, but also note 9 below). See Parsons (1990) on "subatomic" semantics. Schein (1993, 2001) extends arguments for "thematic separation" to plural constructions; see also Pietroski (2005) on action descriptions, including causative and serial verb constructions. 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; cp. note 5.

[8] By contrast (20) has a more permissive construal; cp. 'There is something that Caesar ate'. So perhaps 'eat' can express INGEST(E) or REFUEL(E), and that for whatever reason, a covert direct object forces the second choice. Perhaps events of ingestion are represented as having agents and patients, without any necessary connection to nourishment, while events of refueling need not be represented as having patients.

[9] Again, see Parsons (1990) and Schein (1993, 2001). 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 (1993). 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 (1995) 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; see note 7. But Williams (2007) argues that Kratzer's arguments are not decisive for English, and that they seem less plausible for Igbo and Mandarin.

[10] I am indebted to Norbert Hornstein for a series of conversations on these topics.

[11] See also note 1. 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?

[12] 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).

[13] 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' expresse SNOW(E, L), with a variable for locations. But even if this is correct, it is little comfort to saturationists. For unlike the variable for the fallen in FALL(E, X), 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).

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

[15] 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 "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 (51), lets children know that English has singular names. But on this view, children use "negative" evidence to *dis*confirm that English names are complex; and 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.

[16] Compare Church (1941), who was echoing Frege (1892). 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.

[17] This leaves room for the externalist idea that interpretations are individuated by features of the environment (see, e.g., Burge [1989]), even if these interpretations are themselves concepts; cp. 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 these languages may be neither acquired nor distinctively human.

[18] My thanks to the conference organizers and participants for very helpful discussions.