Semantic Monadicity with Conceptual Polyadicity

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How are meanings, of expressions in a natural human language, related to concepts? And how is semantic composition related to conceptual composition? I assume that concepts are mental symbols that can be combined in certain ways (see, e.g., Fodor [1975, 1986, 2003]), and that children lexicalize concepts in acquiring a language (see, e.g., Bloom [2000]).[1] Many concepts, which can be constituents of thoughts, are somehow indicated with words that can be constituents of sentences. But this assumption is compatible with many hypotheses about the concepts lexicalized, linguistic meanings, and the relevant forms of composition.

One familiar suggestion is that lexical items simply *label* the concepts they lexicalize, and that composition of lexical meanings mirrors composition of the labeled concepts, which exhibit diverse *adicities*. This makes it tempting to say that names label singular concepts—mental tags for particular things—which can *saturate* the concepts labeled with verbs, where these predicative (unsaturated) concepts may be monadic or polyadic. As we'll see, while the adicities of lexicalized concepts are not obvious, there are many ways of developing the familiar suggestion in detail. But attending to these details invites an alternative proposal according to which (i) lexicalization is a more creative process in which available concepts are used to *introduce* formally distinct concepts that are uniformly *monadic*, and (ii) phrases signify *conjunction* of monadic concepts, as opposed to saturation of one concept by another.

From this perspective, semantic composition is rooted in a conjunctive operation that may be available to other animals, but lexicalization is not simply a matter of pairing concepts with perceptible signals (and/or certain grammatical information). This proposal may initially seem odd. But perhaps it should be our null hypothesis, given that young humans have a distinctive talent for lexicalization.[2]

1. Background: Complications for Labeling and Saturating

In light of Frege's (1879, 1884, 1892) seminal work, as developed by Church (1941) and many others, one might begin with the following idea: a name like 'Caesar' labels a singular concept; an intransitive verb like 'arrived' labels a monadic concept, which can be saturated by a singular concept to form a thought like the one expressed with 'Caesar arrived'; and a transitive verb like 'poked' labels a dyadic concept that can be saturated once to form a complex monadic concept, which can be expressed with 'poked Caesar' and saturated to form a thought expressed with (1).

(1) Brutus poked Caesar

The posited concepts/thoughts can be represented as follows, in small capitals, with order of saturation indicated right to left: CAESAR, ARRIVED(X), ARRIVED(CAESAR), POKED(X, Y), POKED(X, CAESAR), BRUTUS, and POKED(BRUTUS, CAESAR).

Of course, verbs are not the only predicative words, and such words need not combine with names. If 'red' and 'stick' label monadic concepts, RED(X) and STICK(X), then an obvious hypothesis is that 'red stick' expresses a conjunction of these concepts. A sentence like (2)

(2) Every stick is red

may express a thought—e.g., **EVERY[**RED(X)**,** STICK(X)**]**—in which a *second-order* concept is saturated by two first-order concepts whose variables are thereby quantificationally bound. But perhaps combining lexical items always signifies an operation that applies to the labeled concepts, and often, the signified operation combines a concept of adicity *n* with a saturater to form a concept of adicity *n-1*.[3] In this section, I discuss some complications that together motivate an alternative defended in section two: verbs, nouns (including names), and modifiers are uniformly devices for fetching monadic concepts that are often introduced in lexicalization.

1.1 Robust Polyadicity

By hypothesis, POKED(X, Y) is not merely a mental symbol that can combine with two singular concepts to form a thought. One can imagine concepts that are "minimally dyadic" in this sense, yet *cannot* be combined with one concept to form a monadic concept like POKED(X, CAESAR). Indeed, one can imagine a mind stocked with concepts like POKED(<1, 2>) that are satisfied by ordered pairs of singular concepts, though with no possibility of leaving exactly one slot unfilled. And there is no guarantee that children come equipped with all the "robustly polyadic" concepts required for saturation to be a common operation of semantic composition. But if a lexical item *labels* a concept **C** that is only minimally polyadic, yet *fetches* a concept **C'** that is robustly polyadic in this sense, then perhaps **C** was used to introduce **C'**.

The requisite reformatting is now so familiar—see Frege (1892), Church (1941), Montague (1974)—that it is easily ignored. Given a capacity to represent truth values and mappings, from representables to representables, a mind with the concept POKED(<1, 2>) might be able to introduce the following concept: λ2.λ1.TRUE if POKED(<1, 2>) and FALSE otherwise; or abbreviating, POKED(X, Y). If this mind is also constrained to treat a phrase like 'poked Caesar' as an instruction to saturate a concept fetched via the verb, with a concept fetched via the name, then merely labeling POKED(<1, 2>) with 'poked' will preclude execution of this instruction. This might trigger the capacity to create POKED(X, Y), which could then be retrieved via 'poked'. Similarly, even if competent speakers fetch the concept $\textbf{EVERY}_{\textbf{X}}\textbf{[}\Phi(\text{X})\textbf{,}\ \Psi(\text{X})\textbf{]}$ upon hearing 'every', this concept may have been introduced in terms of a minimally dyadic concept that cannot itself be saturated once to form $\textbf{EVERY}_{\textbf{X}}\textbf{[}\Phi(\text{X})\textbf{,}\ \text{STICK}(\text{X})\textbf{]}$. So those who appeal to saturation, in describing semantic composition, should *welcome* the idea that lexicalized

concepts can be used to introduce formally distinct but analytically related concepts, which can be combined via the operation(s) signified by combining lexical items.

That said, let's henceforth ignore any differences between concepts like POKED(<1, 2>) and their robustly polyadic counterparts of matching adicity. If lexicalization always introduces monadic concepts, lexicalized concepts and their introduced counterparts often *differ* in adicity. And by way of easing into this idea, let's consider the apparent complexity of tensed verbs.

1.2 Event Variables

Instead of saying that 'arrived' labels an atomic concept ARRIVED(X), one might say that the lexical item 'arrive' labels ARRIVE(E, X). Saturating this concept once would yield a concept like ARRIVE(E, CAESAR), which applies to an *event* if and only if it is (tenselessly) an arrival of Caesar. This complex monadic concept can be existentially closed, or conjoined with concepts that may be context-sensitive: PAST(E), TODAY(E), ∃X[WITH(E, X) & STICK(X)], etc.[4] While ARRIVE(E, X) is formally dyadic, it may not be a concept of a genuine relation—like UNDER(X, Y) or BEFORE(E, F)—since an event of x arriving is not independent of x. In any case, one can hypothesize that 'arrive' labels a concept that has an event variable. But given this twist on the original hunch that 'arrived' labels ARRIVED(X), lexicalization may not be mere labeling.

Perceptual reports like (3) suggest that 'arrive' is somehow linked to an eventish concept;

(3) Brutus saw Caesar arrive

see Higginbotham (1983). If the untensed clause expresses ARRIVE(E, CAESAR), one can say that 'saw Caesar arrive' expresses ∃Y[SEE(E, X, Y) & PAST(E) & ARRIVE(Y, CAESAR)], thereby accommodating both readings of 'saw Caesar arrive with a spyglass': ∃Y{SEE(E, X, Y) & PAST(E) & ARRIVE(Y, CAESAR) & ∃Z[WITH(**E/Y**, Z) & SPYGLASS(Z)]}; where things seen, corresponding to

the variable ‘y’, include both events and individuals. If ‘see’ labels a formally *tri*adic concept, perhaps ‘poke’ labels POKE(E, X, Y), and ‘give’ labels a formally tetradic concept GIVE(E, X, Y, Z) variables for events, givers, things given, and recipients.

One can still retain the idealization that ‘arrived’ labels a monadic concept of those who arrived. But the underlying truth may be that a sentence like (4) expresses a thought like (4a),

(4) Caesar arrived (4a) ∃E[ARRIVE(E, CAESAR)]

and that abstracting away from the contribution of ‘Caesar’ leaves a complex monadic concept: ∃E[ARRIVE(E, X)]. We cannot just intuit the adicity of a concept lexicalized (or retrieved) with a word. Hypotheses about the relevant conceptual adicities must be evaluated in the light of available evidence, especially given the possibility of covertly closing covert variables. And prima facie, infants have many concepts with event variables; see Leslie (1984), Scholl and Tremoulet (2000). On the other hand, concepts like ARRIVE(E, X)/POKE(E, X, Y)/GIVE(E, X, Y, X) need not be available for labeling independent of lexicalization, since “eventish” concepts may be introduced along the following lines: ∀X{∃E[ARRIVE(E, X) & PAST(E)] ≡ ARRIVED(X)}.[5]

Correlatively, semanticists can appeal to concepts like POKE(E, X, Y) and GIVE(E, X, Y, Z), even if infants do not have such concepts to lexicalize. But those who posit such concepts—perhaps along with the idea that combining a verb and a name signifies saturation of a polyadic concept—should also welcome the following idea: lexicalizing a concept **C** often involves using **C** to introduce a formally distinct concept **C’** that meets certain conditions imposed by whatever aspects of human cognition support semantic composition. For example, one might speculate that labeling POKED(X, Y) triggers introduction of POKE(E, X, Y) given the need to accommodate tense and/or adjunction. But this speculation invites others.

If lexical items can be linked to polyadic concepts like POKE(E, X, Y), they can be linked to monadic concepts like POKE(E), given independently motivated appeal to "thematic" concepts: □E{AGENT(E, X) & POKE(E) & PATIENT(E, X) ≡ POKE(E, X, Y)}; where this generalization can reflect introduction of POKE(E) in terms of the other concepts (cp. Castañeda's [1967] response to Davidson [1967]). While a concept like PATIENT(E, X) is formally dyadic, it may not be a concept of a genuine relation: an event with x as its patient is not independent of x. In any case, one can hypothesize that 'poke' is a device for fetching POKE(E), yet deny that this monadic concept was available for lexicalization. The concept lexicalized is presumably polyadic. Indeed, it may be tetradic—POKE(E, X, Y, Z)—with a variable for the "instrument" with which y is poked by x in e; in which case, lexicalization is not mere labeling if 'poke' is a device for fetching POKE(E, X, Y).

As this last point illustrates, one needs evidence for the hypothesis that the concept *lexicalized* with 'poke' has an adicity that *matches* the number of saturaters (or quantificational binders) indicated in sentences where 'poke' takes a grammatical subject and object. Observing that instrumental adjuncts like 'with a stick' are optional, in such sentences, does not establish that the lexicalized concept has no variable for instruments—just as the passive/nominal uses of 'poke' in (5) do not show that the lexicalized concept has no variable for agents/patients.

(5) Caesar was poked. Brutus gave him a good poke with a red stick.

But such examples do invite a speculation. Perhaps the concept *fetched* with 'poke', for purposes of semantic composition, has no variable for agents/patients/instruments.[6]

Of course, one wants to know what would drive any mismatch between the adicities of lexicalized concepts and the concepts introduced in lexicalization. Other things equal, one might expect a polyadic concept of adicity *n* to be lexicalized with a predicate that can and must

combine with *n* arguments to form a sentence, at least if children can acquire languages that allow for such predicates. But correlatively, in so far as polyadic concepts fail to be so lexicalized, one wonders if there are relevant constraints on acquisition. And suppose, for a moment, that saturation is *not* available as an operation to be signified by phrasal syntax in a natural human language (as opposed to a Fregean *Begriffsschrift*).

If a phrase must be understood as an instruction to conjoin monadic concepts that correspond to the constituents, with 'red stick' being illustrative, lexicalization must be a process in which nonmonadic concepts are used to introduce monadic analogs. But given such analogs, along with some thematic concepts, conjunctions can mimic the effect of saturating polyadic concepts. For example, 'poke Caesar' can be analyzed as an instruction to build the following concept: POKE(E) & ∃X[PATIENT(E, X) & CAESARED(X)]; where CAESARED(X) is a concept of the relevant Caesar. I return to names, which may harbor covert demonstratives (cp. Burge [1973]), in section three. For now, pretend that CAESARED(X) is introduced in terms of a mental tag for a certain individual: ∀X[CAESARED(X) ≡ (CAESAR = X)]; cp. Quine (1963).

This is compatible with a restricted kind of semantic composition based on operations that require monadic inputs: the concepts POKE(E) and PAST(E) can, like RED(X) and STICK(X), be the inputs to an operation that (only) conjoins pairs of monadic concepts; and CAESARED(X) can be the input to a "variable-change" operation that (only) converts one monadic concept into another—e.g., ∃X[PATIENT(E, X) & CAESARED(X)]—via conjunction with a thematic concept and existential closure of the original variable. One can posit a small number of such variable-change operations as the semantic correlates of certain grammatical relations (like being the object of a certain kind of verb), prepositions, and other functional ("closed class") vocabulary items.[7]

1.3 Composition and Procedures

Let me conclude this introductory section by framing the proposal explicitly in the context of a psychological conception of naturally acquirable human languages (like spoken English or ASL).

Following Chomsky (1986), let's identify these languages with states of a mental faculty that supports the acquisition of certain *implemented procedures* that connect human linguistic signals with mental representations. Chomsky speaks of "I-languages" to highlight their intensional/procedural character; cp. Church (1941). By contrast, "E-languages" are *sets* of expressions. Expressions of an I-language can be described as generable pairs of instructions—PFs and LFs, or more neutrally, PHONs and SEMs—via which the language faculty interfaces with articulatory/perceptual systems and conceptual/intentional systems; see Chomsky (1995). These "*i*-expressions" exhibit relations of homophony and rhyme, synonymy and entailment. Focusing on understanding, as opposed to speech production, lexical and phrasal *i*-expressions can be viewed as instructions to fetch and combine concepts.

Each child acquires at least one I-language, in addition to the one or more mental languages that provide lexicalizable concepts. Once acquired, an I-language can be used in both thought and communication. But *i*-expressions have *inherited significance*, as indicators of concepts with which we (and perhaps other animals) can think about things more directly. And the concepts fetched with lexical *i*-expressions need not have been the concepts lexicalized, since the former may have been introduced via the latter.

From an I-language perspective, issues about semantic composition concern the operations invoked by a certain biologically implemented mental faculty. It can sometimes be useful to speak of an unspecified determination relation—as when we say that the meaning of a

sentence is somehow determined by its structure and (the meanings of) the constituent words—or an abstract supervenience relation: expressions that differ in meaning differ, somehow, with respect to their structure and/or constituents; see Szabo (2000). But this abstract relation must be implemented by specific operations (cp. Marr [1982]), like saturation or conjunction, with implications for the kinds of concepts that can be so combined.[8]

Regarding potential differences between lexicalized and introduced concepts, my focus here is on adicity. But there is a more general point concerning respects in which lexicalized concepts vary formally: lexicalization must somehow efface any such variation that cannot be tolerated by the composition operations that I-languages can invoke. Correlatively, the available "*i*-operations" impose limits on the kind(s) of variation that fetchable concepts can exhibit.

For example, semantic composition may require variables that are neutral with regard to a plural/singular distinction—permitting combination, perhaps via conjunction, with PLURAL(X) or ~PLURAL(X)—while at least many lexicalizable concepts are essentially singular or essentially plural; cp. Boolos (1998), Schein (1993, 2001), Pietroski (2005, 2006a). If so, intrinsically "numbered" concepts may be used to create number-neutral analogs. More generally, even if a lexicalized concept is monadic, "formatting" may be required for purposes of semantic composition, depending on which operations are available to I-languages. But if lexicalization is a tool for creating concepts that *abstract* from certain formal distinctions exhibited by prior concepts, this may help explain the remarkable combinability of human concepts.[9]

In any case, as I have been stressing, this idea is not peculiar to any one conception of semantic composition. An old idea is that if phrasal syntax always signifies saturation, phrases like 'red stick' can be accommodated as follows: 'red' lexicalizes RED(X), which can be used to

create the higher-order concept λY.λX.RED(X) & Y(X), which can be saturated by STICK(X) to yield RED(X) & STICK(X); cp. Parsons (1970), Montague (1974), Kamp (1975). The required type-lifting operation can be posited in semantic composition or in lexicalization. On the latter hypothesis, 'red' fetches *either* the core concept of type <e, **t**>—associated with a monadic function from entities to truth values—*or* the adjusted concept of type <<e, **t**>, <e, **t**>>, associated with a function from monadic functions to (conjunctively specified) monadic functions, depending on its syntactic role as the main predicate or adjunct. But instead of saying that monadic concepts are often type-lifted for purposes of saturation, one can say that nonmonadic concepts are paired (in lexicalization) with monadic analogs. And instead of viewing 'red stick' as a nontransparent instruction to saturate, one can view 'saw Caesar' as a nontransparent instruction to conjoin.[10]

With this background in place, my central point is easily summarized. *If* the human language faculty allows for a range of lexical types corresponding to conceptual types, then other things equal, one expects the adicity of the concept fetched with a lexical item to *match* the adicity of the concept lexicalized—perhaps modulo an "extra" (event) variable to accommodate tense and adjunction. If infants can simply label concepts with words, perhaps modulo the minimal kind of reformatting needed for robust polyadicity with event variables, one would expect lexicalization to take this form. And one expects each variable in a concept fetched with a lexical item to correspond to a saturater (or binder) in sentences where the lexical item appears. But if these expectations are massively violated, in ways which suggest that the human language faculty allows for only a narrow range of lexical types, we should look for a conception of semantic composition that predicts the corresponding constraints on lexicalization.

2. Conceptual Adicity vs. Lexical Valence

In the rest of this paper, I review some well-known considerations that together suggest a striking constraint: nonmonadic concepts are regularly lexicalized with expressions that are used to fetch monadic concepts, as if semantic composition required such concepts as inputs. Section 2.2 focuses on singular concepts and proper nouns like 'Caesar'. Later subsections focus on polyadic concepts and various corresponding linguistic devices. But let me first introduce a caveat.

2.1 Opaque Adicities

As already noted, we cannot just intuit the adicities of lexicalized concepts.

Let's assume that for a normal child acquiring English, 'triangle' lexicalizes an available concept. Is this concept monadic, triadic, or other? (Might there be variation across lexicalizers?) Since 'is a triangle' combines with exactly one grammatical argument to form a sentence, we can say—borrowing terminolgy from 19th century chemistry—that the copular phrase has a "grammatical valence" of -1. But even if the word 'triangle' also has this valence, there are various possibilities for the concept fetched—TRIANGLE(X), TRIANGLE(X, T) with a variable for times, TRIANGULARITY(S) with a variable for states that hold at times (cp. Parsons [1990])—and still more for the concept lexicalized: TRIANGLE(X, Y, Z) with variables for lines, or perhaps points, that exhibit a certain relation; TRIANGLE(X, Y, Z, T); TRIANGLE(G, X, Y, Z) with a variable for geometric figures that have points/lines as "participants;" TRIANGLE(G, X, Y, Z, T); etc.

Note that 'mortal', a classical example of monadicity, arguably lexicalizes a concept that *relates* individuals to events of death. We can speak of mortals, who fall under the concept MORTAL(X). But this monadic concept may not be primitive. And in any case, we can speak of mortal wounds. Talk of quartets hardly shows that the concept QUARTET(X) is available for—as

opposed to a product of—lexicalization; and likewise for SQUARE(X). More generally, I don't know how to determine the adicities of concepts lexicalized with common nouns, even setting aside issues about temporal/eventish variables. So I see no reason to assume that these concepts are regularly monadic, modulo some "special cases" like 'sister' and other familial terms.

Of course, ignorance is not an argument *against* the idea that common nouns typically conform to the generalization that lexical valence matches the adicity of the concept lexicalized. But we should not be seduced into assuming such conformity, absent independent evidence concerning the concepts lexicalized. Similar issues arise for verbs. So while I assume that many verbs result from lexicalizing polyadic concepts, I remain agnostic about the details.

Consider 'eat'. We surely have a polyadic concept—perhaps EAT(X, Y) or EAT(E, X, Y)—with which we can think about the relation an eater bears to the eaten. But we may also have a concept akin to GRAZE(E, X) with which we can think about those who eat; compare DINE(E, X). Moreover, (6-9) suggest that 'eat' indicates a concept that is somehow normative.

(6) John ate a tack (7) John ate something

(8) John had a snack (9) John ate

Note that (6) implies (7), on a "purely existential" reading of (7) that does not follow from (8); and so read, (7) does not imply (9). In this sense, (7) and (9) differ in meaning. Likewise, (6) does not imply (9), unless it is assumed that tacks are edible for John; see Chomsky (1986).

So even if 'eat' has a valence of -2, and takes a covert object in (9), the concept lexicalized may lack a variable for the consumed—as in NUTRIFY(E, X) or REFUEL(E, X)—though it may have an additional variable for the relevant norm. More generally, even given assumptions about lexical valence, confirming a "matching" hypothesis requires independent evidence

concerning the relevant conceptual adicities for specific words. By contrast, as I'll now argue, disconfirming evidence is available given the general assumption that we lexicalize some singular and polyadic concepts.

2.2 Singular Concepts and Proper Nouns

Sentences like (10-13) suggest that the lexical item 'Caesar' can be used to fetch a monadic concept, and that in this respect, a *lexical proper noun* (LPN) is like the common noun 'tyrant'.[11]

(10) Every Caesar I saw was a tyrant

(11) Every tyrant I saw was a Caesar

(12) There were three Caesars at the party

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

Of course, the subject and object of (1) are not mere LPNs, and (14) is not a sentence of English.

(1) Brutus poked Caesar (14) *Tyrant arrived

But while the subject and object of (1) are *names*, these expressions may be complex, consisting of an LPN and a determiner akin to 'That' in (13); where this determiner, covert in English, combines with LPNs but not common nouns. On this view, the sound of 'Caesar' can be either the sound of a lexical item, or the sound of a determiner phrase whose head is silent.

This hypothesis is not *ad hoc*, given overt analogs of the posited determiner in other languages. For example, Spanish allows for both 'Juan' and 'El Juan' as devices for referring to a certain Juan.[12] And even English allows for 'our John' ('my John', etc.) as a way of referring to a certain John who is suitably related to the speaker.

I return to alternative diagnoses of the facts. But if LPNs are used to fetch monadic concepts, this presents a puzzle if these nouns *could* be used as labels for singular concepts like

CAESAR. For if lexicalizers could simply label such concepts with distinctive nouns, and thereby acquire names that can combine with a predicate that has valence *n* to form a predicate that has valence *n-1* (treating sentences as predicates with valence 0), one might expect lexicalizers to do so. Such children would become adults for whom examples like (10-13) would be defective; phrases like 'Every Caesar' would be like the nonsensical '∀x:c', where 'c' is a logical constant.

We were not such children. So assuming that we had singular concepts, and often used them to think about named individuals, lexicalizing these concepts was evidently not a simple matter of labeling them with LPNs. On the contrary, such lexicalization led to the acquisition of nouns like 'Caesar' that can appear in sentences like (10-11). And such nouns, like their common counterparts, show all the signs of being devices for fetching monadic concepts. They can be pluralized as in (12), or constituents of complex demonstratives, as in (13); and note that 'one', as it appears in (13), is ordinarily a pro-form for nouns that are *not* singular terms.

This leaves room for various views about the specific meanings of LPNs. The earlier pretense, of treating 'Caesar' as a device for fetching a concept of things identical with a certain individual, is inadequate. But if the LPN is satisfied by individuals called (with the sound of) 'Caesar', then (10-13) should mean what they do mean. So if the singular concept CAESAR is initially labeled with the phonological form of 'Caesar'—PF:'Caesar'—then a mind with access to the relational concept CALLED(X, Y) might form thoughts like CALLED(CAESAR, PF:'Caesar') and CALLED(JULIUS, PF:'Caesar'). Such a mind might come to use the LPN to fetch the complex monadic concept CALLED(X, PF:'Caesar'). And various facts suggest that we have such minds.

Example (16) is most naturally heard as a claim about some people who share a surname.

(16) The Tylers are coming to dinner

But as surnames remind us, even overt "surface" considerations suggest that many names are *not* grammatically atomic. The direct object of (17) seems to have two words as parts.

(17) At noon, I saw Tyler Burge

Prima facie, 'Tyler Burge' is *semantically* related to 'Tyler' and 'Burge', roughly as 'red ball' is to 'red' and 'ball': a Tyler Burge is both a Tyler and a Burge—i.e., someone called 'Tyler' *and* called 'Burge'. Of course, a Burge need not be a Tyler Burge. But in a context where the only Tyler is also the only Burge, one can use (18) or (19) to say what one says with (17).[13]

(18) I saw Tyler at noon (19) I saw Burge at noon

These "monadic uses" tell against the idea that LPNs are labels for singular concepts. Of course, one can posit ambiguities. Perhaps speakers who use 'Caesar' to talk about two people—say, Julius and Romero—have *three* homophonous LPNs, used to fetch the concepts JULIUS, ROMERO, and CALLED(X, PF: 'CAESAR'). This posits "saturating LPNs" *and* "monadic-LPNs." Such ambiguity hypotheses are notoriously hard to refute; see Kripke (1979). But given examples like (10-19) it seems clear that for each name-sound, there is a monadic LPN. And positing additional LPNs, with meanings of another type, is unattractive in several respects.

Since many I-languages permit complex names, in which monadic LPNs combine with a determiner, one cannot assume that English *forbids* a complex-name analysis of (4).

(4) Caesar arrived

Yet if such an analysis is available for children, positing an analysis with 'Caesar' as a saturating LPN makes (4) strangely ambiguous: 'Caesar' might be an instruction to fetch the monadic concept CALLED(X, PF:'Caesar'), or an instruction to fetch any of several singular concepts; and the posited singular meanings can be plausibly redescribed in terms of the monadic meaning.

Relatedly, appeal to saturating LPNs makes "noun" a disjunctive grammatical category, and not just because of the two semantic types: saturating LPNs would not head *phrases*, much less phrases of their own type. (Why posit such lexical items if one can account for the data without them?) A similar point applies to acquisition. The human language faculty supports the acquisition of I-languages in which complex names, with monadic LPNs as constituents, appear regularly. So we must ask if this faculty *also* supports the acquisition of saturating LPNs.

For example, Greek names typically *must* be complex: bare LPNs—as in analogs of (4), without an overt determiner—are anomolous, like (14); see Giannakidou and Stavrou (1999).

(14) *Tyrant arrived

Any child can acquire such a language. And if English has saturating LPNs, along with monadic LPNs, any child can acquire such a language. Innate assumptions must be compatible with each actual language. So *if* the ambiguity hypothesis for English is correct: experience with English leads every normal acquirer to a lexicon with *enough* LPN entries, despite homophony and the grammatical possibility of monadic LPN analyses that would shorten the lexicon; and experience with Greek leads every normal acquirer to a lexicon without *too many* entries, despite the possibility of ambiguity and saturating LPN analyses that would lengthen the lexicon.

Usually, children treat lexical sounds as ambiguous only given reason to do so. So one might expect children to treat LPNs as uniformly monadic, absent evidence of ambiguity. But what would lead children to conclude that English name sounds are ambiguous? One can conjecture that not hearing the determiner, in examples like (1), lets children know that English has lexical names. On this view, children use "negative" evidence to *dis*confirm that English names are complex. But the use of such evidence in acquisition remains unattested; see Crain

and Pietroski (2001). Worse, a special lexical type must be posited to let children use negative evidence to acquire a grammar that admits theoretically superfluous ambiguities.

In short, many considerations converge to suggest that there are no saturating LPNs, even though children plausibly lexicalize many singular concepts with LPNs. Hence, if these nouns are used to fetch monadic concepts, that tells against the idea that combining names with verbs signifies saturation. With this in mind, let me turn to cases in which the lexicalized concepts are plausibly *polyadic* while the concepts fetched still seem to be monadic.

2.3 Supradyadic Concepts: Adicity > 2

If there are no 17-place concepts to lexicalize, the absence of verbs with valence -17 tells us little. But animal navigation apparently requires polyadic representations; see Gallistel (1990). And humans, who can distinguish selling from giving, seem to have concepts that are at least tetradic—e.g., SELL(X, Y, Z, W) as opposed to GIVE(X, Y, Z) with 'w' as a variable for what z transfers to x in exchange for y, ignoring any event variables for simplicity. So why doesn't lexicalization of tetradic concepts result in verbs with valence -4?

We could invent a language in which (20) is a sentence with the meaning of (20a).

(20) *Barry sold ten dollars Peter the wine

(20a) Barry sold the wine to Peter for ten dollars

But in English, (20) is anomolous, and 'sell' can combine with *two* arguments as in (21).

(21) Barry sold the wine

The hypothesis that 'sold' really takes four saturating arguments, with two often being covert, is strained—especially if part of a proposal that eschews a covert constituent of names in English. And then what is wrong with (20)? Similar remarks apply to 'bought'. But note that that (22) is

roughly synonymous with (23), which has a "benefactive" implication, unlike (24).[14]

(22) Professor Plum bought Miss Scarlet the knife

(23) Plum bought the knife for Scarlet

(24) Plum bought the knife for ten dollars

More generally, few if any "supradyadic" concepts seem to be lexicalized with verbs of matching valence. Initially, examples like (25) make it tempting to posit verbs with valence -3,

(25) Scarlet gave Plum the money

corresponding to triadic concepts like GIVE(X, Y, Z). But (25) is roughly synonymous with (26),

(26) Scarlet gave the money to Plum

whose prepositional phrase is plausibly analyzed as a conjunct in a neo-Davidsonian event description, as opposed to a saturating argument that is case-marked by a semantically null preposition. And famously, while (27) is fine, (27a) is odd—suggesting that the verb does *not* fetch a concept that is saturated by correlates of three grammatical arguments; cp. Schein (1993).

(27) Scarlet donated the money to Oxfam

(27a) *Scarlet donated Oxfam the money

Moreover, even if the oddity of (27a) can be explained away, the acceptability of (28) is puzzling if 'give' has valence -3.

(28) Scarlet gave the money away, and Plum gave at the office.

Correlatively, ditransitive *constructions* like (25) invite analysis in terms of a verb whose "indirect object" is understood as part of a semantically optional modifying phrase, as opposed to a grammatical reflection of a recipient variable in the concept fetched.[15] The mere existence of such constructions cannot show that 'give' has valence -3, else (29) would show that 'kick' has

the same valence, making a puzzle of the synonymous (30), which implies (31).

(29) Plum kicked Scarlet the knife (30) Plum kicked the knife to Scarlet

(31) Plum kicked the knife

Likewise, we don't usually think of 'cooked' or 'sang' as taking three arguments or lexicalizing concepts with variables for recipients/beneficiaries. But consider (32-34).

(32) Mrs. White cooked, while Colonel Mustard sang

(33) White cooked an egg for Mustard, while he sang a lullaby to the baby

(34) White cooked Mustard an egg, while he sang the baby a lullaby

The number of noun/determiner phrases that combine with a verb to form a sentence can be lower or higher than the adicity of lexicalized concept. In particular, ditransitive constructions tell *against* the idea that triadic concepts are labeled and fetched with predicates of valence -3. Given the absence of tetradic concepts labeled and fetched with predicates of valence -4, along with the reasons for doubting that lexical proper nouns label and fetch singular concepts, this suggests that lexicalization introduces concepts that exhibit a limited range of adicities.

One can hypothesize that "supratransitive" verbs are disallowed for reasons stemming from the underlying *syntax* of I-languages. But this fits ill with the idea that combining expressions often signifies saturation. If a mode of composition can be employed twice in a sentence, why not thrice or more? And if saturation is not available as a *recursive* mode of composition, why appeal to it, given the neo-Davidsonian alternative?

Indeed, examples like (35) suggest that 'give' fetches GIVE(E),

(35) Even though Scarlet gave until it hurt, not enough was given

a concept with no variable for thing given or the giver. One can say that 'gave' is like a passive

verb, as in 'Caesar was stabbed (by Brutus)', with the active voice subject in an optional prepositional phrase; cp. Baker, Johnson, and Roberts (1989). But while analogies between ditransitive and passive constructions may be apt, passives present further puzzles for adicity/valence-matching hypotheses. If 'poked' indicates a concept with a variable corresponding to pokers, then one wants to know why (36) is understood as a full sentence.

(36) Caesar was poked

Moreover, verbs are not the only devices for indicating supradyadic relations. We understand (37), and surely have a triadic concept BETWEEN(X, Y, Z).

(37) Plum was between Scarlet and White

But this concept cannot be lexicalized with verb 'bewtixt' as in (37a).

(37a) *Plum betwixted Scarlet White

On the contrary, (37a) sounds like a report of something Plum did to a certain Scarlet White. This is puzzling if, but only if, the lexicon of a natural language *can* include predicates of valence -3 that fetch supradyadic concepts. In this light, note that 'jimmied' takes *two* arguments.

(38) Mister Green jimmied the lock (with a screwdriver)

(38a) *Mister Green jimmied the lock with a screwdriver

Any reference to an implement must appear as a modifying adjunct as in (38), not a third argument as in (38a).[16] Yet the concept lexicalized presumably has a variable for an implement with which the jimmier jimmies the jimmied.

2.4 Dyadic Concepts: Adicity = 2

If singular and supradyadic concepts are lexicalized in mismatching ways, with symptoms of monadicity, one wonders if *any* lexical items inherit their valences from nonmonadic concepts.

I readily grant that certain dyadic concepts can be fetched via (contextualized uses of) prepositions. From a neo-Davidsonian perspective, many closed class expressions are functional devices for introducing relations like FROM(X, Y). But in examples like (39),

(39) Plum is from Devon

the prepositional phrase combines with a copula to form a tensed monadic predicate. We can imagine a language with a corresponding semantically dyadic verb, as in (39a).

(39a) *Plum froms Devon

But for naturally acquirable human I-languages, it seems that the relational concept indicated with '(is) from' cannot be lexicalized directly with a verb of matching adicity.

Circumlocution is required, as in (39) or (40). Similarly, we use (41), not (41a),

(40) Plum hails from Devon

(41) Plum is taller than Green (41a) *Plum talls Green

as if relational concepts cannot be lexicalized with open-class monomorphemic expressions. So perhaps dyadic concepts like FROM(X, Y) and TALLER(X, Y) *cannot* be labeled/fetched with verbs, not even verbs that take two grammatical arguments.[17] Note that given standard accounts of causatives, according to which the verb in (42) also appears in (43), the verbs in many transitive *constructions* do not label/fetch concepts like BREAK(X, Y).

(42) Green broke the glass (43) The glass broke

On such views, (42) reflects combination of (i) an overt verb that does *not* fetch a concept that has a variable for the breaker with (ii) a covert functional "causativizing" element that is covert in English but overt in many other languages. The relevant structure is shown in (42a).[18]

(42a) [Green [[*v* broke] [_ [the glass]]]]
|_____|

Advocates of adicity/valence-matching can say that the concept lexicalized with 'broke' is—perhaps modulo an event variable—a monadic concept of broken things, not a dyadic concept of a causal relation. But it is hard to see how the judgment expressed with (42) can be analyzed in terms of any such monadic concept and a plausible correlate of '*v*'; see Fodor (1970), Fodor and Lepore (2002). And my proposal does not require that the verbs in causative constructions lexicalize monadic concepts from which the corresponding causal concepts are built. On the contrary, a neo-Davidsonian mind might use BREAK(X, Y) or BREAK(E, X, Y) to introduce BREAK(E)—a concept of causal processes that have agents and patients—and then a second monadic concept $\underline{\text{BREAK}}$(F) such that: $\exists$F[$\underline{\text{BREAK}}$(F) & TERMINATER(E, F)] $\equiv$ BREAK(E); where $\underline{\text{BREAK}}$(F) applies to events of something breaking, regardless of the cause, and TERMINATER(E, F) is a concept of a whole-to-part relation that processes bear to their final parts.[19]

Once causative constructions are set aside, we need to ask how many verbs remain that plausibly lexicalize dyadic concepts *and* have a valence of -2. For even if a verb must combine with two arguments in a sentence with active voice, such a verb can be described as one that fetches a monadic concept but *also* imposes a lexically specified restriction on which thematic role-bearers must accompany the verb in sentences. This risks missing generalizations; see Levin and Rappaport (1995, 2005). But the question is whether there is *enough* motivation for adicity/valence matching hypotheses, despite the difficulties that such hypotheses face. If nouns like 'Caesar' and verbs like 'give'/'sell'/'break' tell against such hypotheses, one cannot just assume that there is a generalization for matching hypotheses to capture.

To be sure, strings like (43) and (44) are anomalous. But given (43a) and (44b),

(43) *Brutus sent

(44) *Caesar put the cup

(43a) Brutus sent for help (44a) The cup stayed put

one might well say that ‘send’ and ‘put’ fetch SEND(E) and PUT(E), adding that ‘sent’ typically requires specification of a patient, while ‘put’ also typically requires specification of a location. Given the range of facts noted above, it seems that for at least many verbs, any view will require a distinction between the “Semantic Composition Adicity Number” (SCAN) of a lexical predicate—the adicity of the concept fetched—from the “Lexicalized Adicity Number” (LAN), which may be a better indication of a lexical predicate’s “Property of Smallest Sentential Entourage” (POSSE), corresponding to the number of grammatical arguments and/or mandatory adjuncts that must appear with the predicate in an acceptable (active voice, declarative) sentence.

Given some such distinction, one can hypothesize that while SCANs are uniformly monadic, POSSEs vary in part because LANs vary; see Pietroski (forthcoming b). As noted above, passive constructions already suggest that no SCAN is supramonadic. And the ubiquity of “nominalization,” in languages like English, points in the same direction; cp. Chomsky (1970), Marantz (1984), Borer (2005), Ramchand (2008). One can cut to the chase, expect an onsides kick, or give someone a break. So prima facie, ‘chase’, ‘kick’, and ‘break’ fetch monadic concepts. Instead of positing a single lexical item that can appear in diverse constructions, one can posit “SCAN-reducing operations” that create one kind of lexical item from another. But this is hardly costless. And why posit a process that creates a noun that fetches CHASE(E), from a verb that fetches CHASE(X, Y) or CHASE(E, X, Y), given the independent reasons for thinking that the homophonic verb also fetches a monadic concept of events? The relevant kind of reformatting may be a common by-product of lexicalizing concepts, as opposed to nominalizing verbs.

Note too that paradigms of polysemy, like ‘book’, often exhibit a clear sense of semantic

monadicity despite being used to indicate a range of relational concepts. One can book a ticket or a criminal. And upon reflection, even the "core" concept lexicalized with 'book' may be relational, having something to do with authors. As a final illustration of argument flexibility, consider the concept of marriage. Whatever its adicity, this concept can be indicated with a noun. Yet each of (45-49) might be used to describe the same wedding.

(45) Scarlet married Plum, but their marriage was doomed

(46) Scarlet got married to Plum, with the Reverend Green officiating

(47) With reservations, Green married Plum and Scarlet

(48) Plum and Scarlet married, and they got married in a hurry

(49) It was Scarlet's first marriage, though Plum married for third time

This suggests that given three acting participants—Scarlet, Plum, and Green—we can describe various events of marrying that fall under a monadic concept (of marriage) that a competent speaker has given the word 'marry', which lexicalizes a relational concept.

3. Concluding Remarks

I do not deny that verbs are associated, at least statistically, with a "canonical" number of arguments. These associations presumably reflect, in part, the adicities of lexicalized concepts. But they may also reflect complicated *interactions* of grammatical principles with various contingencies of actual language use. We should not assume that the concepts fetched with verbs vary in adicity, much less that this variation helps explain why verbs vary with regard to the number of arguments they require. An alternative point of departure, for purposes of explanation, is that open class lexical items fetch semantically monadic concepts that may have been introduced via prior concepts that exhibit diverse adicities.

From this perspective, lexical items efface conceptual adicity distinctions, making it possible to treat recursive combination of expressions as a sign of monadic predicate conjunction. This conception of semantic composition helps explain the otherwise puzzling massive monadicity of natural language. This conception of lexicalization may also help explain why humans have concepts that combine so rapidly and easily. For if our prelexical concepts (with roots in various modules) are analytically related to some concepts that are systematically composable, via simple operations like predicate conjunction, then we can begin to explain how humans might use I-languages to think in systematic ways.[20]

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Notes

[1] These concepts may not be fully integrated and recursively combinable, in the sense that any two can be constituents of a third; see note 9. But many animals have representations that can be combined with others, in some interesting sense; for reviews, see Gallistel (1990), Margolis and Laurence (1999), Gallistel and Gibbon (2002). And infants can presumably tether at least some of these representations to words.

[2] I have argued elsewhere that a "Conjunctivist" semantics can be descriptively adequate while still explaining various phenomena concerning the meanings of adverbial, causal, plural, quantificational, and speech report constructions; see Pietroski (2005, 2006a), drawing on many others, including Davidson (1967, 1985), Castañeda (1967), Carlson (1984), Higginbotham (1985), Taylor (1985), Parsons (1990), Schein (1993), Larson and Segal (1995). See also Hobbs (1985), Williams (2005), Schein (forthcoming), and for interesting discussion in the context of language evolution, Hurford (2007). Here, I suppress many compositional details to focus on issues concerning the basic operations of composition and how they constrain lexicalization.

[3] Thoughts can be viewed as sentential concepts of adicity zero, or instances of the truth-evaluable type <**t**>. I return to the idea that combining expressions *always* signifies saturation, and that RED(X) is used to introduce a higher-order concept, λX.RED(X) & XX.

[4] See Davidson (1967). Initially, one might speculate that 'arrive' labels ARRIVE(X, T), with a variable for *times*. But Taylor (1985) reviews an argument, due to Gareth Evans, for appealing to event variables that permit simultaneous events. Suppose that at noon, Brutus poked Caesar softly with a red stick and sharply with a blue stick. It doesn't follow that Brutus poked Caesar softly with a blue stick, or sharply with a red stick, because there were *two* pokes of Caesar by

Brutus: a soft one done with a red stick, and a sharp one with a blue stick. And note that if the event variable is the *first* one saturated/bound—as in POKE(X, Y, E)—it hard to explain the adverbial modifications corresponding to the implications that Brutus poked Caesar softly, with a red stick, sharply, and with a blue stick; cp. Higginbotham (1983), Pollack (1984).

[5] Or perhaps the concept initially *lexicalized* is ARRIVED(X, T), with a variable for times, and $\forall X \forall T \{\text{ARRIVE}(X, T) \equiv \exists E[\text{ARRIVE}(E, X) \,\&\, \text{AT}(E, T)]\}$. Any such introduction of concepts raises delicate issues—beyond the scope of this essay—concerning the relations among logic, truth, and existential commitment. But Frege's (1884) discussion of number and "contextual" definitions are relevant, as is his idea that languages are tools for introducing concepts that let us re-present thoughts in fruitful ways; see Horty (2007).

[6] See Parsons (1990). Moreover, if 'poke' labels a polyadic concept with an event variable, we need to explain why 'That Brutus poked Caesar' cannot be used to say that the demonstrated event was a poke of Caesar by Brutus. If the answer is that the event variable must be covertly bound, then one cannot insist that the number of grammatical arguments in a sentence reveals the adicity of the concept lexicalized with the matrix verb. I return to these issues. Kratzer (1996) argues—stressing subject/object asymmetries revealed in passivization and especially idioms (see Marantz [1984])—that while agent variables are "severed" from the semantic contribution of verbs like 'poke', this contribution is still polyadic: combination with an object indicates saturation of a variable, yielding a concept like POKE(E, CAESAR); see also Harley (2006). But this presupposes some kind of creative lexicalization, unless the hypothesis is that (i) concepts like POKE(E, X) are available for labeling, *and* (ii) concepts of higher adicity are not. So absent independent arguments for (i) and (ii), one might blame the relevant asymmetry on cognitive

factors independent of semantic composition, instead of positing distinct composition operations for subjects and objects: language-independent cognition may prefer POKE(E, X) to POKE(E)—perhaps a variable for individuals helps "locate" the events—even if both concepts are introduced via POKE(E, X, Y) or POKE(E, X, Y, Z). Williams' (2007) defends such a diagnosis by offering independent arguments for severing patients (see also Schein [1993, forthcoming] and Pietroski [2005]), and a rebuttal of Kratzer's specific arguments to the contrary.

[7] Existential closure of a "matrix" event variable can also be viewed as operation that converts a monadic concept into **C**(E)—e.g., ∃X[AGENT(E, X) & BRUTUSED(X)] & POKE(E) & PAST(E) & ∃X[PATIENT(E, X) & CAESARED(X)]—into another monadic concept that is satisfied by everything or nothing: everything if **C**(E) is satisfied by something, and otherwise nothing. And since negation can be viewed as an operation that converts one "universal-or-empty" concept into another, appeal to truth values (as entities of type <**t**>) may be unneeded; cp. Tarski (1933). For further discussion, see Pietroski (2008, forthcoming a).

[8] There is, of course, more than one conjunction operation. Given the usual conventions, ampersands indicate an operation that can combine sentences with *any* number of variables left open. By contrast, the operation I have in mind can only take two kinds of inputs: a pair of monadic concepts, or a monadic concept and one of a few available (formally dyadic) thematic concepts; and in the second case, conjunction must be followed immediately by existential closure of the monadic concept's variable. Correlatively, the closure operation need not be applicable to an open sentence of arbitrary adicity; it just needs to target the variable of any monadic concept in its scope. In this sense, using '&' and '∃' may *exaggerate* the composition operations required. But I will retain the usual notation.

[9] While animals have composable concepts, animal thoughts may not satisfy Evans' (1982) Generality Constraint; cp. Spelke (2002), Carruthers (2002). A creature might have more than one mental language, each associated with one or more modules, with the following result: the creature has analogs of 'Fa' and 'Gb' in one mental language, and an analog of 'Γαβ' in another; within each mental language, substituting expressions of the same type preserves well-formedness; so the creature can form analogs of 'Gb', 'Fa', and 'Γβα'; yet it cannot form analogs of 'Fα' or 'Γab'. In this sense, an animal's concepts may not be fully integrated. One can insist that concepts count as Concepts only if they exhibit a certain (independently specified) kind of integration that may turn out to be distinctly human. But then humans may acquire Concepts in the course of acquiring a "second nature" that supplements a less unique but still sophisticated animal nature. Terminology aside, humans do have many mental representations that compose as easily as the words in a phrase; cp. Fodor and Pylyshyn (1998), Fodor and Lepore (2003). But this raises the question of how words can combine so easily, yet still interface with so many disparate cognitive systems. One wants to know *how* humans came to have Concepts and a correspondingly *unified* language of thought; cp. Fodor (1983, 2003). But perhaps lexicalizing concepts introduces new concepts that abstract from formal differences that hinder the combinabilty of prior concepts. For discussion, see Pietroski (forthcoming *b*).

[10] Examples like 'big ant' show that some cases of adjunction invoke more than *mere* conjunction of concepts. But a big ant is still an ant than meets a further condition; and 'big', which presumably lexicalizes a genuinely relational concept, may contain a covert anaphoric element. So perhaps 'big-~~one~~ ant' is an instruction to form the following monadic concept: ∃Y[BIG-ONE(X, Y)^THEANTS(Y)]; where BIG-ONE(X, Y) is a formally dyadic concept satisfied by a

thing, x, and some things, the Ys, such that x is both a Y and a big one. See Higginbotham (1985) on "autonymous" theta-marking and Pietroski (2006b) for elaboration in a Conjunctivist account of plural and comparative constructions, drawing on Boolos (1998). Other kinds of examples require different analyses. But note that if x a fake diamond, there was an event of faking whose intentional content was (roughly) that x seem to be a diamond; see Pietroski (2005) on events and contents.

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

[12] Similar remarks apply to Basque, German, Scandanavian languages, many dialects of Italian, and Greek (discussed below). I won't try to defend a specific proposal about the posited covert functional element. But to illustrate, and stress that complex names can be used to designate rigidly, imagine an indexed determiner D_i with the following character: relative to any assignment **A** of values to variables, every entity e is such that (i) e is a value of D_i iff e is the value assigned to the index *i*, and (ii) e is a value of D_i^*Tyler* iff e is a value of both D_i and the noun *Tyler*. Such an analysis might be extended to pronouns (D_i^*she*) and demonstratives (D_i^*this*); though cf. Segal (2001).

[13] We also want a systematic account of why certain inferences are compelling: 'Tyler Burge is a philosopher' seems to follow from (17) and 'Every Tyler I saw was a philosopher'. But this inference shouldn't be good if 'Tyler Burge' is semantically like 'Mark' or 'Samuel', then 'Tyler Burge' is as semantically distinct from 'Tyler' as 'Twain' is from 'Clemens'. Titles, as in 'Professor Tyler Burge and Doctor Tyler Smith are both philosophers', raise similar issues.

[14] And presumably, the valence of 'bought' is not reduced by combination with 'Scarlet' in (22).

[15] See Larson (1988). Of course, the concept lexicalized can have a variable for recipients. For discussion in the context of Chomsky's (1995) minimalist program and its relation to neo-Davidsonian semantics; see Pietroski (2003), drawing on Baker (1988, 1997), Dowty (1993), Hale and Keyser (1993), and many others.

[16] I am indebted to Alexander Williams for this example, and more importantly, for a series of conversations that deeply influenced the development of this paper—and the next few paragraphs in particular. He has discussed closely related matters in Williams (2005, 2007). Note that if 'He jimmied me the lock' has a meaning, it is that he jimmied the lock *for* me, as opposed to he jimmied the lock with me, and likewise for 'He jimmied the screwdriver the lock'.

[17] One might reply that 'tall' is of this type, with relation holding between entities like Plum and abstracta like heights; cp. Kennedy (1999). But while I agree that 'tall' is used to signify a relation, in a way that invites talk of heights (or degrees thereof), circumlocution is still required. We can say 'Plum is that tall', but not 'Plum talls that'.

[18] See, e.g., Chomsky (1995) and Kratzer (1996), drawing on Baker's (1988) revival of an old idea. For further references and discussion in a neo-Davidsonian context, see Pietroski (2003).

[19] Cf. Levin and Rappaport (1995). See Pietroski (1998, 2003, 2005) for discussion of TERMINATOR(E, X), its relation to PATIENT(E, X), and the extensive literature on these topics. And for present purposes, we can be neutral about whether BREAK(E) should be replaced with BREAK(E, X), on the grounds that verbs are always saturated by internal arguments; see Kratzer (1995). The points about adicity mismatches remain even if verbs are always relational in this limited neo-Davidonsian sense (and the potentially related sense of Hale and Keyser [1993]).

Put another way, our causal concept of one thing breaking another *may* be complex:

CAUSR(X, BREAK(E, Y)); where CAUSR(X, Φ(E)) corresponds to the much discussed relation of causing Φ-ish events "in the right way." But many concepts—of moving, boiling, surprising, drenching, etc.—are intuitively causal. And there is no independent evidence that all these relational *concepts* fit a common pattern of analysis by decomposition; see Fodor (2003). Though pace Fodor, this does not tell against the following idea: (47) implies (48), because (47) has the grammatical structure indicated in (47a).

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