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Systematicity via Monadicity

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Words indicate concepts, which have various adicities. But words do not, in general, inherit the adicities of the indicated concepts. Lots of evidence suggests that when a concept is lexicalized, it is linked to an analytically related monadic concept that can be conjoined with others. For example, the dyadic concept CHASE(_, _) *might be linked to* CHASE(_), *a concept that applies to certain events. Drawing on a wide range of extant work, and familiar facts, I argue that the (open class) lexical items of a natural spoken language include neither names nor polyadic predicates. The paper ends with some speculations about the value of a language faculty that would impose uniform monadic analyses on all concepts, including the singular and relational concepts that we share with other animals.*

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Thinking requires concepts. Talking requires words. We humans have thoughts that are composed of concepts, which we can express with words that can be combined to form sentences, which we can use to express thoughts. I take this as given. But how are human concepts related to the words that children naturally acquire? Do words compose in the same way, or ways, that concepts compose? Does lexicalization leave our concepts unchanged? Are human concepts especially composable? I offer a proposal according to which lexicalization is a creative process, and the composability of words makes human concepts distinctive.

1. *The Idea: Words as Monadicizers*

When a concept is lexicalized, I'll argue, it is linked to an analytically related *monadic* concept. For example, the dyadic concept CHASE(_, _) might be linked to CHASE(_), a concept that applies to certain events. But the monadic concept, which may be formed in the course of lexicalization, is not a constituent of the dyadic concept. Analysis can take the form of abstraction, as opposed to decomposition. Like Fodor (1998), I think words tend to indicate atomic concepts, which vary in adicity.

Though as Frege (1884) showed, it can be useful to *impose* analyses on thoughts; see Horty (forthcoming). My suggestion is that the human language faculty imposes monadic analyses, in a constrained way, letting us build new complex concepts by simple conjunction.

Suppose that concepts are elements of one or more mental languages, whose sentences include PAST⟨CHASE(FIDO, FELIX)⟩; where this mental sentence is the internal translation of the spoken sentence 'Fido chased Felix'. Then setting tense aside, for a moment, the English sentence indicates a thought of the form $\ulcorner \mathbb{R}(\mu, \pi) \urcorner$. Given standard principles of inference, any such thought is logically equivalent to corresponding thoughts of the form

$\ulcorner \exists x \exists y[(x = \mu) \,\&\, \mathbb{R}(x, y) \,\&\, (y = \pi)] \urcorner$ and
$\ulcorner \exists x \exists y[\forall X(Xx \equiv X\mu) \,\&\, \mathbb{R}(x, y) \,\&\, \forall X(Xy \equiv X\pi)] \urcorner$.

The second-order analysis can be useful, for purposes of logic, even if it is not entirely innocent. Other analyses may be useful for other purposes, like associating concepts with words that are systematically combinable in constrained ways. Imagine a neoDavidsonian machine that rewrites CHASE(FIDO, FELIX) as follows: ∃E[**CHASE**(E) & EXTERNAL(E, FIDO) & INTERNAL(E, FELIX)]; where the concept **CHASE**(_) is satisfied by things that have *participants*. Relevant values of the "event variable" would have external participants (Agents) and internal participants (Themes), on analogy with ordered pairs like <Fido, Felix>, which have external and internal elements.[1]

Now imagine a language faculty that analyzes PAST⟨CHASE(FIDO, FELIX)⟩, as follows: ∃E[**PAST**(E) & **CHASE**(E) & ∃X[**FIDO**(X) & EXTERNAL(E, X)] & ∃X[**FELIX**(X) & INTERNAL(E, X)]]; where boldface indicates a monadic analog of a prelexical concept. Suppose that **PAST**(_) applies to past events, the monadic concept **FIDO**(_) applies to whatever the singular concept

[1] Unlike the ordered pair <Fido, Felix>, an event of Fido chasing Felix cannot be identified with the set {Fido, {Fido, Felix}}. Correlatively, as noted by Gareth Evans and others, simultaneous events of the same kind (say, hittings) can have the same participants; see Taylor (1985). But one can hypothesize that values of event variables are asymmetrically related to participants: either by identifying Agents with external participants—∀e:Event(e){∀x[External(e, x) Agent(e, x)]}—or adopting a weaker view, according to which some verbs are satisfied by events whose external participants play another thematic role. Perhaps events of seeing have "Experiencers" instead of Agents. I adopt the stronger view here, partly for simplicity, but also for empirical reasons discussed by Baker (1988, 1997). In any case, this leaves room for predicates of *states* and other event-like values of variables. The literature on these topics is vast; see, e.g., Gruber (1965), Castañeda (1967), Davidson (1967, 1985), Fillmore (1968), Dowty (1979), Carlson (1984),Higginbotham (1985), Taylor (1985), Parsons (1990), and Schein (1993). For more recent discussions and references, see Higginbotham, *et al.* (2000), Schein (2002), Parsons (2005).

The concept indicated with 'chase' may be *triadic*, and CHASE(_, _, _) may apply to certain ordered triples <x, y, e>, where e is an event of one thing chasing another. I return to this possibility. But as we'll see, it makes little difference to the issues at stake here. Creating amonadic analog of the triadic concept is easy. And one can deny that CHASE(_, _, _) has **CHASE**(_) as a part, even if ∀xye[CHASE(x, y, e) Agent(e, x) & **CHASE**(_) & Theme(e, y)].

FIDO applies to, and likewise for **FELIX**(_). This links each element of PAST⟨CHASE(FIDO, FELIX)⟩, to a monadic conjunct in a formally distinct thought with the same intuitive content. The preanalyzed thought reflects saturation of CHASE(_ , _) by two *singular* concepts. But the analysis reflects existential closure of the one variable associated with **CHASE**(_), along with saturation by *monadic* concepts of two second-order concepts: ∃X[__(X) & EXTERNAL(E, X)] and ∃X[__(X) & INTERNAL(E, X)]. Moreover, the concept PAST⟨__⟩, might be saturated by tenseless propositions. Yet the analysis is in terms of **PAST**(_), which is simply conjoined with **CHASE**(_). The idea, borrowing from both Frege (1892, 1893) and Davidson (1967, 1985), is that a judgable content can analyzed—or "recarved"—in an eventish way: PAST⟨CHASE(FIDO, FELIX)⟩ $\equiv_{df}$ ∃E[**PAST**(E) & **CHASE**(E) & ∃X[**FIDO**(X) & EXTERNAL(E, X)] & ∃X[**FELIX**(X) & INTERNAL(E, X)]].[2]

On this view, lexicalization is a process in which a concept is associated with a monadic analog that can combine in certain ways with monadic analogs of other prelexical concepts. If this is correct, the word 'chase' links at least three things: CHASE(_, _), the sound of 'chase', and **CHASE**(_). So acquiring the word might be a complex process, in which the relational concept is first associated with a linguistic sound, and later associated with a concept that applies to chases; where acquiring the eventish concept may be a process that is partly triggered by early stages of lexicalization. But the general idea is that a word "formats" a concept by stipulatively associating it with a mental predicate guaranteed to have the right form for purposes of interpreting complex expressions in which the word appears. If the human language faculty ensures that *combining* expressions signifies some operation **OP**, then lexicalizing a concept c is (*inter alia*) a matter of associating c with an analytically related concept that can be combined with others via **OP**.

More specifically, if complex expressions must be understood as conjunctions of monadic predicates, then lexicalizing C is a matter of associating C with a monadic concept; where the requisite analysis may be trivial if C is already monadic. I have argued elsewhere that this "Conjunctivist" conception of semantic composition is viable and attractive; see Pietroski (2002, 2003, 2005a, 2006a). Since the significance of combining words is more often characterized in terms of function appli-

[2] For simplicity, I'll adopt the usual truth-theoretic idealization that predicates like **CHASE**(_)and **FIDO**(_) have satisfaction conditions, even though my preference is to be agnostic about this,and simply characterize meanings as instructions for building (monadic) concepts; see Pietroski (2005b) and references there, especially Chomsky (2000). Any monadic analysis of names recalls Quine's (1963) regimentation of 'Socrates' in terms of 'Socratizes'. But following Burge (1973) and others, I think the lexical item 'Fido' is a proper *noun* that combines with a covert determiner to form a name; see section two. I suspect that **FIDO**(_) applies to things called 'Fido', and that the relevant eventish concept is really ∃X[Δ_1(X) & **FIDO**(_) & EXTERNAL(E, X)]; where Δ_1(_) is ademonstrative concept indicated with the covert determiner, and **FIDO**(_) can be spelled out metalinguistically as CALLED(_ , LEX_{FIDO}), and LEX_{FIDO} is a concept with which one can think about the lexical item 'Fido'.

cation, it is often assumed that words associate mental representations with concepts of certain functions, or concepts of entities in the relevant domains; where the requisite analysis, if any, is typically trivial—e.g., from CHASE(_, _) to λY.λX.CHASE(X, Y). But this picture of lexicalization and composition is neither required nor empirically desirable. I have argued that we can better accommodate and go beyond the usual textbook cases, and explain various phenomena, in terms of the following claims: subsentential expressions are understood as monadic predicates, which can be like CHASE(_) or ∃X[FIDO(X) & EXTERNAL(_ , X)]; combining such expressions signifies predicate conjunction, as suggested by simple examples of adjunction, like 'red ball'; and sentences usually reflect existential closure of a predicate.[3]

Here, I presuppose that Conjunctivism is an option, and discuss a range of facts that invite the following view: humans have a Conjunctivist language faculty, embedded in a primate mind that is stocked with many singular and relational concepts. I assume that humans have a language faculty in roughly Chomsky's (1986) sense; see Collins (2004) for discussion. My proposal is that this faculty lets us build conjoinable concepts, in certain ways but not others, and that this explains many otherwise puzzling facts. In subsequent sections, I focus on some well-known explananda concerning names, verbs that are not intransitive, functional expressions, comparative constructions, and the rather indiscriminate composability of human concepts.

For now, consider just one illustrative fact. We know that a chase requires at least two participants. Yet we can speak of chases, without mentioning chasers or chasees. And we can describe a particular event by saying 'The chase was exciting'. So difficulties await any view according to which the word 'chase', like the concept CHASE(_, _), is fundamentally dyadic. This raises questions about the grammatical category of 'chase'. But the relevant linguistic atom may be neither a verb nor a noun, much less a transitive verb that can become a noun; cp. Chomsky (1970). And the lexical item 'chase' may indicate a relational concept, yet still be understood in terms of the monadic concept CHASE(_). On this view, 'chase' can combine nounishly with 'the' or verbishly with 'the cat': 'the chase' is understood as a description of some relevant event; and 'chase the cat' is understood as a predicate satisfied by chases of the relevant cat.[4]

[3] Conjunctivists can handle examples like 'Fido did not chase every cat' and 'Three dogs chased five cats'; see Pietroski (2006a) for a presentation of the main ideas, and comparison with approaches deriving from Montague (1974) and mixed views like Heim and Kratzer (1998).Officially, the variables I posit are "potentially plural" in the way described by Boolos (1998) and others; see Schein (1993) and §2.4 below. In my view, this is independently defensible and empirically required; see Pietroski (2005a, 2006a). But for purposes of this paper, one can abstract away from plurality. And while "Functionist" is analysis is not trivial if CHASE(_, _)must be recast as λY.λX.λE.CHASE(E, X, Y), I will not press this point here.

[4] See especially Marantz (1984) and Borer (2005). I won't try to defend a particular analysis of 'the'. But as a first approximation, Conjunctivists can say that 'the' indicates a concept that combines with a monadic concept C(_) to form a monadic

I think this is a model of how lexicalization and composition works in natural languages—i.e., the spoken or signed languages that human children naturally acquire in normal circumstances. Mentalese is not a natural language in this sense; but that is terminology. The more important point is that lexicalizing concepts may be part of acquiring a language that differs importantly from Mentalese with regard to semantic composition. Natural languages may let us analyze thoughts in terms of formally new concepts, which can be combined in new ways *because they do not* preserve certain distinctions. In particular, the lexical item 'chase' may not inherit the adicity of the corresponding prelexical concept. And that may be a good thing.

2. *Expressions of Nonmonadic Concepts*

On the other hand, it is very tempting to assume that a word does inherit the adicity of the concept it indicates, and that natural languages are like Frege's *Begriffsschrift* in the following respect: semantic composition is fundamentally a matter of saturating predicates. One wants to see lots of evidence against this common view, and in favor of the Conjunctivist alternative: lexical items are all semantically monadic, because in natural languages, semantic composition is fundamentally a matter of conjoining predicates. In this section, I extend arguments offered in Pietroski (2005a). But it may help to present the main line of thought in advance of the details.

Humans have many singular concepts. But there are no logically proper names in natural languages. There are proper nouns, including lexical items like 'Tyler', which have the same adicity as ordinary common nouns like 'philosopher'. This is why we can say, 'Every Tyler I know is a philosopher, and each of those Tylers is clever'. A lexical proper noun can also be combined, in English, with a covert determiner. This is why we can say 'Tyler is tall', as well as 'That Tyler is tall, and so is this one'. The complex expression 'That Tyler' is semantically monadic, as is 'That philosopher', and likewise for the expression that results from combining the lexical proper noun 'Tyler' with a covert determiner. If this is correct, one wants to know why singular concepts are *not* lexicalized with syntactically primitive tags corresponding to (things one can think about with) those concepts. This is a hard question given standard assumptions about semantic composition. There is,

concept ιz:C(z){_}, which is satisfied in a given context by *the* thing that satisfies C(_) in that context. Then if 'cat' and 'chase' are understood as CAT(_) and CHASE(_), 'the cat' will be understood as ιz:CAT(z){_}, and 'the chase' will be understood as ιz:CHASE(z){_}; hence, 'chase the cat' will be understood as CHASE(_) & ∃x[ιz:CAT(z){x} & INTERNAL(e, x)]. Implementing the analysis of perceptual idioms in Higginbotham (1983) and Vlach (1983), 'Fido chase the cat' can be the internal argument of 'saw' in 'I saw Fido chase the cat', which, will then be understood as follows: ∃e[∃x[SPEAKER(x) & EXTERNAL(e, x)] & SEE(e) & PAST(e) & ∃x[FIDO-CHASE-THE-CAT(x) & INTERNAL(e, x)]]; where FIDO-CHASE-THE-CAT(x) iff ∃x'[FIDO(x') & EXTERNAL(x, x')] & CHASE(x) & ∃x'[ιz:CAT(z){x'} & INTERNAL(x, x')].

however, an easy answer. Words, even when they indicate singular concepts, must be understood as conjoinable predicates.

Humans also have many polyadic concepts. But in natural language, relatively few lexical predicates even *seem* to take more than two arguments. And it is independently plausible that in a ditransitive construction, like 'Someone gave Fido a bone', no atomic constituent is saturated by three arguments. So one wants to know why there are few if any "supratransitive" words, given many "supradyadic" concepts. It is also plausible that in 'Someone broke the vase', the verb is not a lexical item that takes two arguments; we can say 'The vase broke'. Even setting causatives aside, many verbs that might seem paradigmatically transitive are actually quite flexible. We can say, 'The baby kicked when Pat kicked Fido the bone, and both kicks were good ones', along with 'The baby kicked Pat, who kicked the bone to Fido'. This invites the hypothesis that 'kick' is understood as a monadic predicate, conjoinable with others, as in the following partial analysis of 'Pat kicked the bone': ∃E[∃X[THAT-PAT(X) & EXTERNAL(E, X)] & KICK(E) & PAST(E) & ∃X[THE-BONE(X) & INTERNAL(E, X)]]. In which case, one wants to know why relational concepts are so often lexicalized in monadic terms. One also wants to know why 'tall' and 'good' are grammatically simpler than 'taller' and 'better'. Why are paradigmatically relational concepts, like TALLER(_, _) and BETTER(_, _), not lexicalized monomorphemically?

Conjunctivists have an answer. The human language faculty imposes monadic analyses on relational concepts, because this is how such concepts get associated with words that can combine to form phrases that can be understood as simple conjunctions of predicates. In short, lexicalization simplifies composition. Understanding phrases is easy, once the relevant concepts have been monadically formatted. Manifestations of this formatting are ubiquitous, though often ignored or marginalized. That's the idea. Let me now turn to clarification and defense.

2.1 *Adicity and Diversity in Prelexical Concepts*

For these purposes, I take it as given that we humans lexicalize concepts, and that the concepts we lexicalize have various adicities. But it worth being explicit about this, in order to stress that my conception of prelexical thought is quite standard.

At least typically, acquiring a word is a process in which a sound is associated with (among other things) an already existing mental representation. And I assume that our speechless primate ancestors had structured representations that exhibited various systematicities. Indeed, my suspicion is that those creatures had more than one language of thought, and that we have inherited their conceptual capacities; see section three. We also have a species-specific language faculty. But this is, presumably, an addition to an otherwise chimp-like mind. The addition had dramatic effects; a child lexicalizing concepts may be relevantly like a caterpillar undergoing its remarkable transition. Still, one

expects the child's prelexical concepts to be roughly those of speechless ancestors. Otherwise, a short period of evolution sufficed for both the emergence of new concepts *and* the faculty that lets us express those concepts in natural languages; cp. Hauser, Chomsky, and Fitch (2002). For present purposes, though, I need not press these considerations. The crucial assumption is simply that we humans have concepts of varying adicity, including singular and polyadic concepts, many of which we can and do lexicalize.

The venerable idea that concepts have adicities may still not be as clear as one might like. Given how little we know about concepts, metaphors and analogies are inevitable. But it is hard to see how else one can begin to account for the features of thought that motivate the idea and its veneration.[5] I take the notion of a singular concept to be at least tolerably clear. And if only to fix some terminology, let's say that singular concepts like FIDO have adicity zero, while many other concepts have positive adicity. A monadic concept like DOG(_) has adicity one; a dyadic concept like CHASE(_ , _) has adicity two; and so on. This way of talking dovetails with a Fregean claim about concept composition: if a concept that has a positive adicity *n* combines with a (type-appropriate) singular concept, the result is a concept that has adicity *n-1*. For example, the complex concept CHASE(FIDO, _) has adicity one, as does CHASE(_ , FIDO); and somewhat more interestingly, the "propositional" concept DOG(FIDO)—a.k.a. the thought that Fido is a dog—has adicity zero. Likewise, the concept CHASE(FIDO, FELIX) has adicity zero.

One can use different terminology, suggesting an analogy to molecular valence, and classify concepts as follows: singular concepts are "+1;" propositional concepts are "0;" and each *n*-adic concept is "-*n*." But let's use Frege's metaphor, according to which singular and propositional concepts are similar in being inherently "saturated." These concepts, complete in themselves, can saturate concepts that are not saturated. Indeed, as Frege stresses, one can think of a monadic concept as the result of a certain kind of abstraction: start with a complete thought that involves thinking about a particular thing, in the way that one thinks about it when one thinks about it by deploying a certain singular concept, and then abstract away from that particular thing and that particular way of thinking about something. The concept DOG(_) is what one gets if one starts with the thought DOG(FIDO) and abstracts away from FIDO. And if FELIX is a singular concept, then no matter what it applies to, DOG(_) is what one gets if one starts with DOG(FELIX) and abstracts away from FELIX. Correlatively, DOG(_) has adicity one; and so the result of combining DOG(_) with any singular concept is a complete thought.

This is compatible with the hypothesis that DOG(_) is a primitive thought constituent, not *obtained* by any kind of analysis, and that a thinker needs this very concept in order to entertain any thought logi-

[5] See, e.g., Frege (1879, 1884, 1892), Fodor (1975, 1998, 2003), Fodor and Lepore (2002).

cally equivalent to DOG(FIDO). If this plausible hypothesis is correct, there may be no interesting sense in which we have the monadic concept by abstraction from judgment. And if the monadic concept is just as primitive as the singular concept, for purposes of composition, one might well indicate the resulting propositional concept as follows: $_{-1}$DOG^FIDO$_{+1}$, with subscripts indicating valences. But I want to leave room for the idea that monadic concepts like CHASE(_) are, in some sense, abstractions from propositional concepts like CHASE(FIDO, FELIX). We should also allow for the hypothesis that some prelexical concepts are obtained by analysis/abstraction. My claim is not that the human language faculty is the first biological system to impose a format on concepts. And even if it turns out that (almost) all of our prelexical concepts are primitive thought constituents, that should be an empirical discovery, not a consequence of the claim that concepts have adicities.

If one says that singular concepts are like propositional concepts, in being saturated, one should also note important differences. Propositional concepts can be negated. Thinkers evidently have a monadic concept NEG(__), that can saturated by DOG(FIDO). But the concept FIDO cannot be negated; while it has adicity zero, it cannot saturate NEG(__), which must therefore differ formally from DOG(_). We can encode these distinctions, in terms of a standard type theory, with subscripts that can also signify adicity properties: $\text{NEG}_{\langle t,\, t\rangle}$^($\text{DOG}_{\langle e,\, t\rangle}$^$\text{FIDO}_{\langle e\rangle}$)$_{\langle t\rangle}$. But here, I'll simply use bracket types as reminders of typological distinctions, with angled brackets indicating a propositional constituent: NEG⟨DOG(FIDO)⟩, NEG⟨CHASE(FIDO, FELIX)⟩, etc.

It is unclear how many quantificational concepts we have. But humans, along with some other animals, must have at least one prelexical quantificational concept. (How else could we have any quantificational thoughts?) And if we have at least one, we presumably have the monadic existential quantifier, ∃[_], which is saturated by monadic concepts like DOG(_). The propositional concept ∃[DOG(_)] is intuitively quite simple; though it does have a second-order character; and we remain quite ignorant of how bindable variables are implemented biologically. But in any case, I assume that ∃[_] is part of our basic conceptual toolkit. More substantively, it seems that we must have at least one dyadic quantificational concept—of the form Q[_ , _]— that cannot be characterized in first-order terms. We can judge that *most* of the dogs are brown. We can also entertain proportional thoughts that can be expressed without proportional vocabulary, as in 'For every dollar received, a penny will go to charity'.[6]

[6] With regard to 'most', see Rescher (1962), Wiggins (1980). Boolos (1998) extends the point to examples involving 'every'; the natural reading of 'For every paper accepted, nine are rejected' is that ninety percent of papers are rejected. The relevant (nonfirstorder) cognitive capacities may be old, given that rats can detect changes in rates of reinforcement; see Gallistel (1993).

This already suggests considerable formal diversity in our prelexical atomic concepts: singular, monadic, and dyadic—with further typological distinctions within these broad categories. But returning now to polyadic concepts that can be saturated by singular concepts, there seem to be many examples with adicity three and four. We can think that one thing is *between* two others. The concept GIVE(_ , _ , _), presumably deployed in the course of thinking that someone gave a dog a bone, is another parade case of a triadic concept. And giving differs crucially from selling. We seem to have a tetradic concept SELL(_ , _ , _ , _), which applies when one individual transfers something to another individual who transfers something (else) back to the first. If x gives y to z, but z gives nothing back to x, then x did not *sell* y to z.

Perhaps each four-place concept is somehow built up from concepts of lower adicity, and likewise for each three-place concept. But I doubt it. Studies of animal cognition suggest that "supradyadic" concepts are common; see Gallistel (1993) for review. For example, birds can navigate by recognizing relations among stars; bees are somehow sensitive to relations among the time, the position of the sun, and (compass) direction; etc. It would be amazing if humans didn't have concepts with adicities above two. Prima facie, we often lexicalize such concepts. So our lexical concepts evdidently exhibit a great deal of formal diversity.

Moreover, animal psychology may draw distinctions not yet dreamt of in philosophy or linguistics, even among the concepts of a given adicity. Given the modular character of minds, concepts may come in bundles that are isolated from one another. And even if these concepts can be put into contact, there is no guarantee that they will be commensurate in the ways required for coherent combination. I return to this point in section three: we should allow for a mind with *several* languages of thought, and many concepts, but no domain general Mentalese whose elements include each of these concepts. An animal might have one systematically related cluster of representations that includes a singular concept s, and another such cluster of representations that includes a monadic concept *M*(_) that cannot be combined with s, even though *M*(_) can be combined with singular or quantificational concepts in its own cluster. But let me defer this potentially important consideration. The moral of this section is that many lexical items fail to inherit the adicity of the concepts lexicalized.

2.2 *Names and Singular Concepts*

Here is a condensed version of the argument in this subsection: singular concepts are not lexicalized with singular terms; but that is how such concepts would be lexicalized if natural languages permitted atomic singular terms; so natural languages do not permit lexical items of adicity zero; and while this is puzzling given standard conceptions of semantic composition, it confirms the hypothesis that lexicalization involves monadic analysis. Now let me unpack that.

We can easily imagine a public language, with lexical items of varying adicities, where the adicity of each word matches that of the concept lexicalized. In particular, we can imagine a language that lexicalizes singular concepts with atomic singular terms—simple expressions of adicity zero that can combine with unary predicates to form sentences, or combine with binary predicates to form unary predicates, etc. (Alternatively, we could say that singular terms have valence +1, and that unary predicates have valence -1, etc.) I'll speak of singular *terms* and n-ary *predicates* when talking about the relevant elements of a language with symbols that *indicate* concepts; but this is just a mnemonic. One can also say that mental terms and predicates *are* concepts. The substantive questions concern natural languages.

One can hypothesize that certain natural language expressions—like 'Tyler' and 'Aristotle', which we call proper names—are atomic singular terms. Indeed, this empirical claim is so familiar that (*pace* Russell) it often passes without comment. On this view, the lexicon of a natural language typically includes many elements of adicity zero; where these lexical items, which can combine with a predicate like 'barked' or 'is a dog' to form a complete sentence, are not limited to the relatively few indexicals and demonstratives in the language. The idea is that most words of adicity zero are "open class" vocabulary items that can be freely added to a lexicon. This invites the equally familiar view of names as logical constants: relative to any assignment of values to variables, a name has exactly one value (or perhaps at most one, given names like 'Vulcan'); and a name has the same value (or no value) relative to each assignment.

If this is correct, the sound of 'Tyler' is the sound of distinct but homophonous names, since more than one person is called 'Tyler'. This might not seem implausible. A distinction between two things is significant for singular terms, much as a distinction between two kinds of things—like river banks and financial banks—can be significant for unary predicates. But this truism is relevant only if names *can* be atomic singular terms, in the sense that the human language faculty permits singular-term analyses of name-sounds. And if we don't *assume* that our language faculty is permissive, in this respect, is it plausible that a speaker's *lexicon* expands when she learns that a new acquaintance is called 'Tyler', or 'Barry', or 'Smith'? Moreover, one can use 'Vulcan' in a failed attempt to name something, or a successful attempt to create fiction. And does a speaker's lexicon expand whenever she encounters a new referentless use of a name?

If one is initially agnostic about this, and at least considers the hypothesis that all lexical items are monadic predicates, one can give due weight to facts that favor the following view: a *lexical* item like 'John' is a *proper noun* that is understood as a monadic predicate, satisfied by each of the individuals who (as we ordinarily put it) share that name; and a proper noun can be combined with a functional element, which may be covert, to form a complex rigid designator akin to 'That indi-

vidual called 'John". The covert element in English is presumably like the overt analogs in languages like Greek or Spanish, which allows both 'Juan' and 'El Juan'.[7]

Since the relevant facts are well known (see Burge 1973, Katz 1994, Longobardi 1994), let me offer just a quick review; Natural languages permit constructions like (1–3).

(1) Every Tyler I met is a philosopher
(2) Every philosopher I met was a Tyler
(3) This Tyler is tall, and so is that one

Prima facie, 'Tyler' can appear where nouns like 'philosopher' (or 'smith') can appear. In this regard, (3) is especially striking, since 'one' is usually taken to be a pro-form for nouns that are *not* singular terms. And if 'Tyler' is a monadic predicate, satisfied by individuals called 'Tyler', then (1–3) should mean what they do mean. Combining a universal quantifier with a singular concept would be incoherent; yet 'every Tyler' is fine. In (3), the subject of 'is tall' is neither incoherent nor a Tarzan-sentence, as in (4).

(4) This Tyler. That Jane.

Such facts also remind us that lexical singular terms would differ *grammatically* from other nouns. And that would have consequences. If (5) is grammatical, but (6) is not,

(5) Tyler is tall
(6) *Philosopher is tall

we cannot say merely that 'Tyler' and 'Philosopher' are both atomic expressions of type N (for noun). A serious theory of syntax would need to posit a distinct type for 'Tyler', thus making it an explanandum that natural languages have expressions of that type, just as it is an explanandum that there are verbs. But explaining such explananda is hard, even given just a few expression types; see Baker (2003) for a rare and serious attempt. Multiplying linguistic kinds makes work.

[7] An especially simple version of this view would identify the posited covert element with an index of the same kind often posited to account for bound pronouns. (See Baker 2003, Stanley and Szabo 2000 for arguments that every noun is associated with at least one such index.) One might say the indexed proper noun *Tyler^1* is satisfied by an entity x, relative to an assignment **A** of values to variables, iff: x is a Tyler, and x = **A**(*1*); where for each index *i*, **A**(*i*) is the entity that **A** assigns to *i*. Similarly, one might say the indexed pronoun *she^2* is satisfied by x relative to **A** iff x is a female, and x = **A**(*2*). Ambiguity theorists can hardly object to devices that distinguish homophonic uses. But matters are surely more complex than this simple theory suggests. For example, Tiedke (in progress) suggests that a variable ranging over *events of introduction* will help account for referentless uses of names. The attractive idea is that in "ordinary" cases of reference to a particular Holmes—say, Oliver Wendall—**A**(*1*) will be an event in which the relevant individual was introduced (as a Holmes). But this leaves room for cases in which **A**(*1*) is an *event* of introducing nothing (except perhaps a genuinely new proper name). Still, my aim here is not to defend a specific proposal about the *meaning* the covert element(s) that proper nouns combine with. My point is simply that names in natural laguages are not atomic singular terms.

With this in mind, consider the fact that 'Tyler' is like the common noun 'philosopher' in being pluralizable and potentially generic, as shown in (7–9).

(7) Each of those Tylers is clever
(8) Philosophers have wheels, and Tylers have stripes
(9) The Tylers are coming to dinner

Of course, (9) might be heard as a claim about some relevant people who share a surname. And surnames remind us that many names appear to be complex. The direct object of 'met' in (10)

(10) I met Tyler Burge at noon

looks and sounds like it has two words as parts. But an atomic expression cannot have two lexical parts, and the point here is not merely morphological. Prima facie, 'Tyler Burge' is semantically related to the names in (11) and (12).

(11) I met Tyler at noon
(12) I met Burge at noon

In a context where the only Tyler is also the only Burge, it seems that one can use (11) or (12) to say what one says with (10). This is easily explained if a Tyler Burge is both a Tyler and a Burge—i.e., an individual called 'Tyler' *and* an individual called 'Burge'—as suggested by (13).

(13) Every Tyler Burge I met was a philosopher, and that one wrote about names.

One can insist that 'Tyler Burge' is, nonetheless, an atomic singular term so far as the *semantics* of natural language is concerned. But this is to posit an odd kind of ambiguity, as if 'river bank' and 'financial bank' were atomic predicates. And then one owes an account of why certain inferences are compelling. For example, (14)

(14) Tyler Burge is a philosopher

seems to follow from (1) and (10). But this shouldn't be so if 'Tyler Burge' is, for purposes of semantics, as distinct from 'Tyler' as 'Hesperus' is from 'Phosphorus'.[8]

Moreover, "compound" names are not the only complex name-like expressions. Titles, as in (15–16), raise similar issues: (16) seems to follow from (15), holding the context fixed.

(15) Professor Tyler Burge and Doctor Tyler Smith are both philosophers
(16) Professor Burge and Doctor Smith are both Tylers

If there is more than one Doctor Smith, each is still a Doctor and a Smith. Likewise, any oenophile philosopher Barry Smith has a conjunctive property—being an oenophile, and a philosopher, and a person called 'Barry', and a person called 'Smith'—that distinguishes him from other but perhaps not all other Barry Smiths. Though if this property is uniquely identifying, in the relevant context, we can speak of *the* oenophile philosopher Barry Smith. Yet (17) is fine.

[8] See Pietroski (1996) for related discussion of "Paderewski" cases.

(17) Barry is one of the Smiths I met, Scott from Jersey is another, and the Barrys I met include a Schein

Especially given the use of 'another', this again suggests that lexical items like 'Barry' and 'Smith' are nouns, like 'philosopher' and 'Scot' in (18).

(18) Barry is one of the philosophers I met, John from Jersey is another, and the philosophers I met include a Scot who knows wine

None of this *proves* that a name-sound is not lexically ambiguous as between a semantically monadic noun and a singular term. It is notoriously difficult to establish the falsity of ambiguity hypotheses. This is why such hypotheses are, methodologically, not options of first resort; see Kripke (1977). But if natural language permits both monadic-noun and singular-term analyses of 'Smith', then this lexical sound is multiply ambiguous, given the many singular terms that might share this sound. And if English allows for the requisite covert element, which has overt analogs in other languages, then (5) would be ambiguous in more than one way.

(5) Tyler is tall

For if English permits a singular-term analysis of (5), but English also allows for a covert element that can combine with the monadic proper noun 'Tyler', then the subject of (5) *can* be understood either way. In which case, the reading of (5) posited on a nonambiguity view is one of the *many* readings posited on a nonambiguity view. And recall that in this case, the extra readings are not merely unparsimonius. Positing atomic singular terms generates extra explanatory work.

One can say that children acquiring English would not introduce the covert element, given an alternative. But this is hardly obvious, given the systematic and productive character of proper nouns, which must be posited in any case. So we should ask what gets explained by appeal to homophonous lexical names. What data support the hypothesis that 'Tyler' is often an atomic singular term—and tell *against* a uniform analysis of the relevant lexical item as a semantically monadic proper noun—apart from our not hearing any functional item that combines with 'Tyler' in examples like (5)? If such data are scarce, we should not resist the conclusion that natural languages forbid lexical singular terms.[9] While the conclusion is puzzling given certain assumptions about semantic composition, it is predicted given Conjunctivism.

[9] Or at least open class grammatically atomic singular terms. In my view, demonstratives also fail to be atomic singular terms. My suspicion is that even 'this' is an indexible predicate; see note 7. Pure indices, which may include 'I', may be atomic. But if natural languages allow for these (closed class) elements, whose values can *vary* across assignments, this hardly shows that natural languages allow for (open class) singular terms that lexicalize *constant* singular concepts.

2.3 *Verbs and Polyadic Concepts*

Here is a condensed version of the argument in this subsection: at least often, a polyadic concept is not lexicalized with a predicate that has the same adicity; but that is how such concepts would be lexicalized if natural languages permitted lexical items with adicity greater than one; and this confirms the hypothesis that lexicalization involves monadic analysis.

As noted in §2.1, we have triadic and tetradic concepts. We may have concepts of higher adicity. But four-place concepts already raise obvious questions. For example, why don't natural languages have atomic four-place verbs, like 'bizzled' in (19)?

(19) The girl the wheelbarrow the boy bizzled the dirt.

One can imagine a language with a word signifying a concept, BIZZLED(X, Y, Z, W), that appies to <the girl, the wheelbarrow, the boy, the dirt> iff the girl *brought* the dirt *to* the boy *by using* the wheelbarrow. If natural languages permitted such lexical items, one would expect to see some. So the absence of such verbs suggests that lexicalizing an n-adic concept is not simply a matter of introducing a corresponding predicate that combines with n arguments to form a sentence. Moreover, it seems that tetradic concepts like SELL(X, Y, Z, W) and BUY(X, Y, Z, W) are lexicalized with verbs that can combine with *two* arguments to form a sentence, as in (20).

(20) Barry sold the car, and then he bought some wine

The hypothesis that 'sold' always takes four arguments, with two often being covert, is strained at best—especially if this is part of a proposal that eschews even a single covert element, with overt analogs, that would combine with proper nouns to form names.

Moreover, the recent trend in linguistics has been towards explaining away appearances of polyadicity. Note that (21) is synonymous with (22), which exhibits formal parallels with (23).

(21) Barry gave Peter the money
(22) Barry gave the money to Peter
(23) Barry donated the painting to the museum

Correlatively, there is much to be said in favor of analyzing ditransitive *constructions* like (21) in terms of a transitive verb *and* a covert element, with 'Barry' in (21) being somehow part of a modifier phrase, as in (22).[10] The details remain unsettled, as with pairs of sentences like (24-25).

[10] See Larson (1988), Baker (1988), and references there. I'll return to passives: Barry was given the money; the money was given to Barry; the ball was kicked (to Barry); etc. If one maintains that 'gave' is a lexical ternary predicate that indicates an atomic triadic concept, then unless 'donate' takes a covert argument in 'Barry donated the painting' and 'to the museum' is a saturating argument in (23), an adicity-matching hypothesis leads to the conclusion that 'donate'indicates a dyadic concept that is formally distinct from GIVE(_, _, _). And this raises the question of why (23) implies—and perhaps is implied by 'Barry gave the painting to the museum'.

(24) Barry shattered the glass
(25) The glass shattered

But the usual analyses of causative constructions provide, one way or another, models for characterizing a construction that appears to contain a predicate with adicity n in terms of a covert element and a predicate with adicity n-1. Suppose the structure of (24) is shown in (26),

(26) [Barry [v shattered] [_ [the glass]]]]
|_____|

in which the overt verb takes a single argument ('the glass') and displaces, thereby combining with a covert element 'v' that allows for the second argument ('Barry').

If the lexical item 'shattered' does not itself take 'Barry' as an argument in (24), that raises further questions. Why *don't* children become adults for whom 'shatter' is *lexically* ambiguous, as between the intransitive verb in (25) and a homophonous verb of greater adicity? If our language faculty permits an atomic verb that signifies SHATTER(_, _), sentences like (24) would seem to provide evidence of such a word; cp. Fodor (1970). But for the moment, my point is just that there may not be any "supratransitive" lexical predicates in natural languages.

Note that (27) is perfectly comprehensible, suggesting a triadic concept BETWEEN(X, Y, Z).

(27) Professor Plum is between Miss Scarlet and Mrs. White

But evidently, this triadic concept cannot be lexicalized with an atomic ternary predicate 'bewtixts' that could appear in ditransitive constructions like (28).

(28) *Plum betwixts Scarlet (to/from/with) White

This is puzzling if, but only if, the lexicon of a natural language *can* include predicates of adicity three. So perhaps such predicates are excluded because, given how semantic composition works in natural languages, ternary predicates could not be coherently combined with other expressions.

If this is correct, and there are also no predicates of adicity zero, then the hypothesis that "lexical adicity matches conceptual adicity" does not merely face a few counterexamples. It applies at most to cases of adicity one and two. And Conjunctivists need not be embarrassed if monadic concepts are lexicalized with unary predicates. This makes the situation look bleak for adicity-matching hypotheses. But in fact, the situation is much worse.

As already noted, 'sold' and 'shattered' can appear in transitive constructions. So appearing in such constructions hardly establishes that the verb signifies a dyadic concept. Indeed, verbs like 'sold' and 'bought' can appear in various constructions, as shown in (29–37).

(29) White sold the knife to Plum for ten dollars
(30) Plum bought the knife from White for ten dollars
(31) Plum bought the knife for ten dollars

(32) Plum bought the knife
(33) Plum bought the knife for Scarlet
(34) Plum bought Scarlet the knife
(35) Plum bought Scarlet the knife for ten dollars
(36) White sold Plum on the idea of buying a knife.
(37) Scarlet's broker recommended buying long and selling short

And as shown in (38-39), the verb 'jimmied' seems to be grammatically transitive.

(38) Alexander jimmied the lock with a screwdriver
(39) Alexander jimmied the lock

Any reference to an implement must appear in a modifying phrase—an adjunct, as opposed to a third argument.[11] Yet the verb presumably indicates a triadic concept, JIMMY(_, _, _), that somehow includes a " slot" for an implement with which the jimmier jimmies the thing jimmied. Apparent transitivity tells us little if anything about conceptual adicity.

With this in mind, consider a verb like 'kick', which initially seems paradigmatically transitive. In addition to constructions like (40), we have the perfectly grammatical (41–43).

(40) White kicked the knife
(41) White kicked the knife to Plum
(42) White kicked Plum the knife
(43) The baby kicked (at nothing in particular)

Likewise, one doesn't usually think of 'cooked' or 'sang' as ditransitive. But consider (44–46).

(44) Mrs. White cooked an egg, while Colonel Mustard sang
(45) White cooked an egg for Mustard, while he sang a lullaby
(46) White cooked Mustard an egg, while he sang the baby a lullaby

Each of these sentences might be used, correctly, to describe a single scenario. In principle, one could say that 'sang' and 'cooked' and 'kicked' are *ternary* lexical predicates, with examples like (40) and (44) reflecting the requisite number of covert arguments. But this is quite implausible. And this in turn casts further doubt on the idea that 'give' is a ternary lexical predicate that takes covert arguments in examples like (47).

(47) Since it was a good cause, and everyone else was giving something, each philosopher gave ten dollars

In any case, given that lexical items like 'kick' have the distributions they do, what are we to make of the idea that such lexical items have adicity two? Similarly, while it might be plausible to posit a covert argument for 'ate' in 'Mustard ate', 'dined' does not take a direct object.

[11] 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); and we are exploring these issues in joint work, currently in progress.

Yet as (48) and (49) suggest, the concepts indicated would seem to be equally relational.

(48) Mustard dined on shrimp
(49) Mustard ate shrimp in high style

The earlier remarks about 'chase' take on considerable force in this context. Since one can enjoy a good chase, 'chase' seems to be semantically monadic. But the point is not that verbs can be nominalized, whatever that means. Consider the freckles one has if one freckles, the taxes paid by the taxed, and so on. One lexical item may be more "nounish," as a default, while another is more "verbish" (see note 4). My point is simply that if verbish lexical items are semantically monadic, their nondefault nounish manifestations are easily explicable.

Consider the concept of marriage. Whatever its adicity, this concept can be indicated with a noun. Moreover, each of (50–54) might be used to describe a certain wedding.

(50) Scarlet married Plum, but their marriage was doomed
(51) Scarlet got married to Plum, with the Reverend Green officiating
(52) With reservations, Green married Plum and Scarlet
(53) Plum and Scarlet married, and they got married in a hurry
(54) It was Scarlet's first marriage, though Plum married for third time

These facts are familiar. But they are, to repeat, surprising given standard conceptions of semantic composition. One can accommodate the facts by positing many ambiguities, in addition to covert arguments. But again, ambiguity hypotheses should not be options of first resort. And the facts fall into place, almost immediately, given the independently motivated neo-Davidsonian view urged above: the verbs in question are semantically monadic predicates of events; and *arguments of* such verbs are interpreted in terms of *thematic roles*. For example, verb phrases like 'kicked the bone to the dog' and 'kicked the dog the bone' can be partly analyzed as follows: KICK(E) & PAST(E) & INTERNAL(E, THE BONE) & Θ(E, THE DOG); where 'Θ' indicates a relation, perhaps *recipient*, distinct from the participation relation associated with internal arguments.[12]

That said, I do not deny that particular verbs are associated—at least statistically, and perhaps for principled reasons—with what might be called a "canonical" number of arguments. Such facts presumably reflect, in part, the adicities of indicated concepts. If one drops the idea that each lexical predicate (mandatorily) "selects" a certain number of arguments, saying instead that natural languages are flexible in *this* respect, one still expects verbs to acquire "profiles" regarding the number and kind of arguments they tend to combine with. But the net results

[12] Here, I have simplified, writing 'INTERNAL(E, THE BONE)' and 'Θ(E, THE DOG)' instead of '∃X[ιZ:BONE(Z){X} & INTERNAL(E, X)]' and '∃X[ιZ:DOG(Z){X} & (E, X)]'. For analyses of examples like (40–50), friendly to Conjunctivism, see Schein (1993, 2001) and Pietroski (2005b). Schein (forthcoming) discusses, in detail, examples like 'Plum and Scarlet married'

may be idiosyncratic, and they may reflect complicated *interactions* of grammatical principles with various contingencies of actual language use.

Of course, we want some explanation for why 'Plum arrived Scarlet' and 'Plum sent' sound weird. But we should not assume that these word-strings are ungrammatical *because* each lexical item has a fixed adicity, 'arrived' has adicity one, and 'sent' does not. This is one possible explanation for some facts. But examples like (29–54) tell against the idea that each lexical item takes a fixed number of arguments, especially if this number is supposed to reflect the adicity of the indicated concept.[13] And in my view, such examples do not suggest that a lexical item with a given adicity can somehow "become" a predicate with a different adicity. This borders on incoherence. One can posit covert arguments, or covert argument-taking elements that combine with lexical items. But I don't see how a lexical item can have its adicity contingently. A predicate with adicity one is, *ipso facto*, different from any predicate with adicity two (or zero).

Given this truism, and the apparent flexibility with regard to how many arguments verbs can combine with, I conclude that talk of adicity does not provide a good way of classifying verbs for theoretical purposes. And if all lexical items have adicity one, we must revise standard conceptions of how words compose in natural languages. But such revision is empirically motivated by attention to how words can actually be combined. Moreover, the proposed Conjunctivist alternative is not radical, given that appeals to thematic roles seem to be unavoidable in any plausible account of natural language semantics. This leads to the next point.

2.4 *Grammatical Relations, Prepositions, and Constraints*

When verbs combine with internal and/or external arguments, it seems that specific thematic roles are introduced; see Baker (1988, 1997). For example, (41) and (42)

(41) White kicked the knife to Plum
(42) White kicked Plum the knife

are understood with the following implications: White was the kick*er*, and the knife was the thing kicked. We can imagine a verb 'glicked', grammatically like 'kicked', but such that (55)

(55) Plum glicked White

would have the meaning common to (56–58).

(56) White kicked Plum

[13] One can adopt a substantive "Theta Criterion," according to which each verb has a fixed number of theta roles that it must assign to arguments, with specific numbers for lexical items like 'arrived', 'sent', 'chase', and 'kick'. But such hypotheses must be justified; and as noted by Hornstein (1995, 2001), substantive versions of the Theta Criterion are more often assumed.

(57) Plum was kicked by White
(58) There was a kicking of Plum by White

But there are no such "thematically inverting" verbs in natural languages. So if KICK(_, _) is lexicalized with a word whose adicity is greater than one, we want to know *why* (and how): natural languages associate prepositional/thematic significance with grammatical subjects and objects; any third argument is associated with some other thematic relation; and passivization is even possible, without changing a lexical item's adicity. By contrast, there are no mysteries here if (i) all open class lexical items are understood as monadic predicates conjoinable with others, and (ii) certain grammatical relations are associated with specific thematic relations, because that is how Conjunctivist languages make it possible to express thoughts with polyadic constituents.

We do have closed class words, like prepositions, that can be used to express relations. Indeed, a word like 'with' or 'in' can apparently be used to express various dyadic concepts. And it is a crucial aspect of my view that certain grammatical relations signify certain thematic relations, via formally relational concepts like EXTERNAL(_ , _).[14] So while I sympathize with the medieval desire to reduce much of natural logic to predicate conjunction—see Ludlow (2002) and Pietroski (2003) for discussion—I also assume that semanticists need at least some of the resources Frege provided for dealing with relations and quantification into predicate positions. But the exploitation of these resources, and the introduction of relationality, seems to be severely constrained. Note that when a preposition is the main predicate of a sentence, as in (59),

(59) Plum is from Devon, and they were from Jersey

the preposition does not combine with a tense morpheme or agree with the arguments; these grammatical niceties are left for the copular elements 'is' and 'were'. Correlatively, there is no lexical verb 'frum' that can appear in sentences like (60).

(60) Plum frums Devon, and they frummed Jersey

Though we can say that Plum hails from Devon, much as we can say that Plum descends from Adam, or that birds descend from dinosaurs.

Let me note, without going into details, another class of arguments for the claim that lexical items are understood as monadic predicates. Schein (1993, 2006) argues that in plural constructions like (60), grammatical arguments are "thematically separated," as in (61);

(60) Six professors wrote twenty papers
(61) $\exists E[\exists X[\textbf{SIX}(X)$ & $\textbf{PROFESSORS}(X)$ & $\text{EXTERNAL}(E, X)]$ & $\textbf{PAST}(E)$ & $\textbf{WRITE}(E)$ & $\exists X[\textbf{TWENTY}(X)$ & $\textbf{PAPERS}(X)$ & $\text{INTERNAL}(E, X)]]$

[14] These relations are not, however, irreducibly second order: $\forall E \forall X[\text{External}(E, X)] \equiv_{df} \forall e{:}Ee\{\exists x{:}Xx[\text{External}(e, x)]\}$ & $\forall x{:}Xx\{\exists e{:}Ee[\text{External}(e, x)]\}$; and likewise for 'Internal'. See Pietroski (2003, 2005a, 2006b) for discussion in the context of monadic second-order logic.

where the variables are potentially plural, in that relative to each assignment of values to variables, each variable can have more than one value (see note 3). On this view, a verb like 'wrote' is a predicate of events—*and not* a predicate of triples <e, x, y> such that e was a writing by x of y, not even if 'x' and 'y' can range over collections of professors and papers.[15]

I provide further support for Schein's account of plural noun phrases, and additional arguments for thematic separation, in Pietroski (2003, 2005a, 2006a). For example, (62) suggests that 'explained' is understood as a monadic predicate, and not as an expression that itself relates explainers to propositions. One can explain that P, without explaining why P, or vice versa.

(62) When asked why the floor was wet, Plum explained that he spilled the soup, but Plum did not explain why he spilled the soup.

I have also argued that the conservativity of determiners can be explained, by treating words like 'every' and 'most' as potentially plural predicates satisfied by ordered pairs <x, v>; where x is an entity in the relevant domain, and v is a truth value. But these moderately technical matters require extensive discussion. So let me end this section with two more mundane observations.

First, the existence of adverbial modification does not merely favor some event analysis or other. Many of the relevant facts motivate Conjunctivist analyses. Note that (63)

(63) Plum counted quick(ly)

has no reading on which it implies that *Plum*, as opposed to an event of him counting, was quick. Likewise, (64) has no reading on which it implies that Plum himself is from Devon.

(64) Plum saw the man from Devon

In (64), 'saw the man' cannot be understood as a predicate of *individuals* that is conjoinable with the predicate 'from Devon'; 'saw the man' is understood as a predicate of *events* that is conjoinable with 'from Devon'. So if 'saw' is satisfied by triples <e, x, y>, where e is a seeing by x of y, one needs an explanation for why 'from Devon' *cannot* modify the second variable position. One might still maintain that Themes are not represented separately, and that 'saw' is satisfied by pairs <e, y>; see Kratzer (1996). But even if this is correct, and examples like (60–64)

[15] See also Schein (2001, 2002, forthcoming). Given plural variables and predicates, one can say that 'Dinosaurs are extinct' means that some things are both dinosaurs and extinct; where some things are extinct iff (roughly) they had one or more common ancestors with no living descendants. (See Pietroski 2006b on analogies to other ancestral relations, including c-command.) And while I won't try to defend this claim, I am not convinced that a very simple-minded Conjunctivist treatment of generic sentences—e.g., 'Dogs bark' means that some thing satisfy both 'dogs' and 'bark', with an invitation to generalize on this basis—is worse than extant alteranatives; see Leslie (forthcoming) for relevant discussion, but a different proposal.

can be accommodated without implausible auxiliary hypotheses, the following claim would remain: lexical items are understood as monadic predicates, perhaps modulo a single event variable, whatever the adicities of the indicated concepts. And these concepts may themselves be eventish. Suppose the prelexical concept indicated with 'saw' is really triadic: SAW(_, _, _), satisfied by triples <e, x, y>. Then for present purposes, little changes if 'saw' is understood as a predicate satisfied by events of seeing something, as opposed to a predicate satisfied by events of seeing (with Themes represented separately). The important point is that while (64) is ambiguous, it has no "Plum-from-Devon" reading. This suggests that the adicity of 'saw' differs from that of the indicated concept, whether the relevant conceptual adicity is two or three.

Second, it is striking that paradigmatically relational concepts like TALLER(_, _) are not lexicalized monomorphemically. We have (65) and (66); and we know what (67) means.

(65) Professor Plum is taller than Mister Green

(66) Plum is tall, and Green is not tall

(67) Plum outheights Green, even though Green outweighs Plum

Yet (68), like (60), is impossible;

(68) *Plum talls Green, even though Green heavies Plum

see Pietroski (2006b) for discussion and Conjunctivist analyses of (69–70),

(69) Ants are small, but this is a big ant, and that one is bigger

(70) That is a big one

drawing on Frege's (1884) treatment of ancestral relations. The important point here is that we face a puzzle if humans have dyadic concepts like TALLER(_, _), and the human language faculty allows for binary lexical predicates. For in that case, why is the word for the dyadic concept grammatically complex? One can imagine a language with a binary predicate 'talls' and a derived expression 'tallmos' that signifies the complex monadic concept TALL-MOS(_), which applies to an individual x (in a given context) iff x is taller than most individuals in the relevant comparison class. So one wants to know why natural languages have (65) and (66), instead of (68) and (71).[16]

(71) Plum is tallmos, and Green is not tallmos.

Conjunctivists have an answer. The human language faculty imposes monadic analyses on relational concepts, because this is how such concepts get associated with words that can combine to form phrases that

[16] See Kennedy (1999) for valuable discussion of comparative constructions and "degree analyses;" see Pietroski (2006b) for an attempt to recast such analyses in Conjunctivist terms. But in any case, even if quantification over degrees is required for natural language semantics, it hardly follows that our *prelexical* concept—the one that makes it possible to *think* that Scott is taller than Tyler—applies to degrees. And if we have the concept TALLER(_, _), but we introduce lexical predicates via quantification over degrees, that certainly calls for explanation.

can be understood as simple conjunctions of predicates. To be sure, one wants to see further arguments for this claim, more details, and responses to alternative diagnoses of the facts. But this paper is intended to motivate a picture that requires book-length defenses; see Pietroski (2005a, forthcoming). So let me offer, in the final section, a speculation about the broader role of a Conjunctivist language faculty in human cognition.

3. *Conceptual Promiscuity*

Human concepts are remarkably composable. Given any two concepts that we have, we can easily form a third concept that has the first two as constituents. Moreover, concepts that seem to be rooted in very different cognitive domains often seem to be directly combinable. For example, we typically think of colors as features of surfaces, and animals as three-dimensional things whose surface appearances may change while their internal constitution remains more or less the same. Yet we have no problem forming the concept of a brown dog.[17] And we can go on to form the concept of a *brown dog we saw in Boston yesterday*, thereby creating a mental predicate that classifies dogs in terms of color, us, perception, and spatiotemporal coordinates. Such facts, concerning the combinability of lexicalized concepts, are explananda. One wants some account of how these concepts can compose as they do, along with an account of how there came to be concepts that can compose in this fashion. I think the proposal on offer, according to which prelexical concepts are analyzed as conjoinable monadic predicates, helps on both counts.

3.1 *Connecting the Isolated*

As (72–74) illustrate, human concepts will hook up at the drop of a hat.

(72) Every philosopher bought, read, or wrote a good book about space and time

(73) Socrates, who died and exists no more, thought about life, triangles, and gods

(74) Chomsky furiously denied that ideas can be green while they sleep

These sentences indicate thinkable thoughts, suggesting that we humans have concepts that are as composable as our words. This "double"

[17] Chomsky (2000) observes—echoing Descartes' famous remarks about the many and changing properties of wax—that a brown house need not be brown on the inside.(Likewise for a brown dog.) Perhaps even understanding 'brown dog' requires the imposition of "common denominators," and not mere conjunction of predicates/concepts that are already conjoinable. If the prelexical concept BROWN(_) applies to surfaces/states, while DOG(_) applies to things that have-surfaces/exhibit-states, perhaps the concept indicated with 'brown dog' is complex: $\exists S$[BROWN(S) & SURFACE-STATE-OF(S, X) & DOG(X)]; or simplifying, $\underline{\text{BROWN}}$(X) & DOG(X), where $\underline{\text{BROWN}}$(X) $\equiv_{df}$ $\exists S$[BROWN(S) & SURFACE-STATE-OF(S, X)].

combinatorial freedom calls for explanation. To what degree does it reflect the nature of our *prelexical* concepts? And to what degree does it reflect a language faculty that lets us *make* concepts that are as composable as our words?

At one extreme, one might hypothesize that in humans and other animals, there is a single and fully systematic language of thought; where expressions of this mental language, M, are the only concepts we have, and each of our modules—including our "overt language" faculty—interfaces with expressions of M. I'll come back to this option, and my reasons for skepticism, in §3.2 below. At the other extreme, one might adopt the following hypothesis: the overt languages that we humans acquire are (modulo phonology) the only languages of thought we have; and our concepts are composable at all only because our words are composable. I don't see how this latter view can be squared with the abundant evidence for attributing complex concepts to nonhuman animals. Many experiments strongly suggest that rats and pigeons can construct complex modes of classification from simpler ones, at least when they care to do so; see Gallistel (1993). Primates without speech surely have such capacities. In which case, the human language faculty emerged in minds already stocked with many composable concepts. But one can grant that other animals have concepts, without supposing that theirs are as promiscuous as ours.

Ordinary animal concepts might be unable, or at least very unlikely, to get outside certain restricted circles. This is so, even if all animal concepts are word-like elements of mental languages. For an animal might have *multiple* mental languages—each compositional and systematic in its own terms—but only a limited capacity to form complex concepts by combining expressions from *different* mental languages. Suppose that some animal can form the mental sentence 'Rab', where 'a' and 'b' are tags of the same cognitive type. Then as Fodor and others remind us, the animal should be able to form 'Rba' (*ceteris paribus*). Likewise, if the animal can form 'Φγ*Ψδ'—where 'Φγ' and 'Ψδ' are sentences, 'γ' and 'δ' are tags, and '*' signfies sentential conjunction—we expect the animal to be able to form 'Ψγ*Φδ'.[18] But will it also be able to form 'Rγδ*Ψa' and 'Φb*Rδa'? If the animal can form '♂♡♀', with '♂' and '♀' as tags, will it be able to form 'γ♡γ*Ψ♀'? The answers depend, of course, on which symbols count as instances of the same type for purposes of combination in the relevant mental languages.

I think there could be a mind that has all the prelexical concepts we have, but still cannot entertain thoughts available to us, because it cannot combine its concepts in the requisite ways. Indeed, a primate without a language faculty may approximate such a mind. Spelke (2002) and others defend this suggestion by arguing that human infants pattern with nonhuman animals, as opposed to young post-verbal children, with respect to certain tasks requiring the integration of knowledge across distinct cog-

[18] See Fodor and Pylyshyn (1988), Fodor and Lepore (2002), Fodor (2003).

nitive domains.[19] Though in my view, the suggestion merits development, even if it is not clearly confirmed by these particular experiments.

Since it is easy to get confused by terminology here, it may be worth noting explicitly that one can have more or less demanding conceptions of concepts. We can invent a language such that for any sentence, replacing any constituent expression of adicity n with another expression of adicity n results in another (well-formed, meaningful) sentence; and we can define a technical notion 'Koncept' such that Koncepts satisfy a corresponding "generality constraint" (see Evans 1982). But then concepts, the constituents of structured thoughts, need not be Koncepts.[20] And in any case, one wants to know how humans manage to have promiscuous word-like mental representations that at least approximate Koncepts.

We can entertain the *thought* that colorless green ideas sleep furiously, just as we can entertain the thought that beautiful white stars shine brilliantly. Indeed, we know that the former thought is crazy, in part because we know so much about what it implies—e.g., that there are some ideas, some of which are green and colorless, and these ideas are things that sleep. But this kind of "thinkability" is presumably a reflection of our human capacities to (i) combine words that indicate concepts, and (ii) understand the resulting complex expressions, whether or not the prelexical concepts can be sensibly combined in the corresponding ways. Absent a language faculty, we might well be unable to form the concept of a colorless green idea, or the concept of something sleeping near the triangles that wrote books about Socrates. (And in these cases, there seems to be little if any gap between having the concepts and having Koncepts.) But the promiscuity of more mundane concepts—like the constituents of HAPPY BROWN COWS THAT SLEEP QUIETLY YET EAT NOISILY, and BOTH BOTTLES BARRY BOUGHT—may also reflect our capacities to *lexicalize* concepts that are otherwise less promiscuous, and then *construct* natural language expressions that we can *understand* in terms of analytically related concepts.

Perhaps the concepts lexicalized by the words in 'Beautiful white stars shine brilliantly' could be assembled, without the intervention of our language faculty, into a complex monadic concept that applies to all and only the beautiful white stars that shine brilliantly—and likewise for other examples. But this is a bold conjecture about our prelexical concepts, and the underyling primate biology, especially if one must go on to account for the composability of words *without* assuming an adicity-matching hypothesis. Prima facie, a weaker hypothesis explains the facts at least as well: our prelexical concepts are systematic in many

[19] See Hermer-Vazquez *et al.* (1999). For very helpful discussion, see Carruthers (2002) and his replies to commentary.

[20] Though one can stipulate that Thoughts are composed of Koncepts, leaving it open whether all thoughts are Thoughts. And following Evans, one might hope to characterize a substantive generality constraint for thoughts, or at least human thoughts: a person who can *think that* Fa and *think that* Gb can also *think that* Ga and *think that* Fb; etc.

respects; but the promiscuity of our concepts is due in part to the kind of composability made possible by lexicalization and semantic composition in the languages that human children naturally acquire. To be sure, this hypothesis is interesting only if lexicalization/composition in natural language is less mysterious than a mechanism that somehow (i) associates unpromiscuous mental representations with concepts of functions or entities in the relevant domains, and (ii) allows for the construction of complex concepts characterized in terms of a domain-general notion of function application. But in my view, Conjunctivism offers a better conception of how the human language faculty might impose a common format on diverse concepts.

3.2 *Unity is Imposed*

Still, one might maintain that humans concepts are promiscuous because humans—perhaps along with some other animals, but not the imagined creatures with several "isolated" languages of thought—do have a fully systematic and domain general Mentalese. If conceptual unity can be achieved by analyzing disparate/incommensurate mental representations in monadic terms, given a few thematic roles and logical operations, perhaps conceptual unity was achieved *by some means or other* long ago in the evolution of animal psychology. I am skeptical, in part because I think this hypothesis predicts too much adicity-matching, between concepts and the words that indicate them. But since we know little in this regard, any claims must be tentative. And I do not rule out the possibility of nonhuman animals, perhaps living ones, with a voiceless analog of the human language faculty. Associating grammatical primitives with sounds/signs might well have been an evolutionary devlopment *subsequent to* the emergence of a faculty that permitted recursive combination of such primitives. And I grant that the following alternative hypothesis is coherent: an older faculty had already unified animal thought; so the human language faculty plays another (perhaps purely communicative) role. But this coherent hypothesis is implausible.

Given the modular character of animal psychology, it would be amazing if every animal mind is unified by a systematic language of thought, whose elements include (type-appropriate correlates of) all of the animal's atomic concepts. But if only some animals can think in a mental language that is domain general in this sense, one wants to know how nature fashioned such an expressively powerful Mentalese. If the answer lies with whatever process led to the human language faculty, whose emergence must be explained in any case, we can at least reduce two mysteries to one. Moreover, if primates without a language faculty could already think in a domain general mental language M, that raises unpleasant questions about semantic composition in both M and natural languages like English. With regard to M, it is hard to see how one could avoid the claim that composition is effectively a matter of

function application (or saturation) in the fully general sense relevant to a *Begriffsschrift*; and prima facie, it would be hard for nature to hard-wire such a powerful and abstract notion of composition. But in any case, positing an expressively powerful Mentalese can make it hard to explain restrictions on how the expressions of natural languages can be used to express thoughts.

It is important, in this context and others, that natural languages respect substantive *constraints on how* strings of words can be compositionally associated with concepts and thoughts. Understanding the expressions of a natural language requires more than a mere capacity to associate certain signals with appropriate concepts. Competent speakers know, at least upon querying, boundlessly many facts concerning what certain linguistic signals *cannot* mean. And *un*ambiguity often reveals constraints on lexicalization and semantic composition. Correlatively, acquiring a natural language is not merely a process of acquiring a capacity to associate signals with concepts in a way that allows for communication; see Chomsky (1965), Higginbotham (1983, 1994), Pietroski (2000, 2005b). This assumption has been at work throughout this paper. But let me be explicit.

Borrowing a famous example, (75) is ambiguous: the goose could be *pret-a-manger* or prepared to dine. Likewise, (76) is ambiguous. But (77) and (78) each *lack* a certain reading.

(75) The goose is ready to eat
(76) The goose is ready to please
(77) The goose is easy to please
(78) The goose is eager to please

Sentence (77) means roughly that it's easy for *us to please the goose*, and (77) cannot mean that it's easy for *the goose to please us*. By contrast, (78) means roughly that the goose is eager for *it to please us*, and (78) cannot mean that the goose is eager for *us to please it*. These "negative" facts, about how (77) and (78) cannot be understood, are presumably consequences of how natural languages lexicalize concepts and combine lexical items. We can entertain the following thought: it's easy for *the goose to please us*, and the goose is eager for *us to please it*. So the relevant unambiguities evidently reflect respects in which English differs from Mentalese.

For simplicity, let's represent the thoughts indicated with (77) and (78) as follows: EASY(US, ⟨PLEASE(US, THE GOOSE)⟩), EAGER(THE GOOSE, ⟨PLEASE(THE GOOSE, US)⟩). Then for speakers of English, (77) cannot indicate EASY(THE GOOSE, ⟨PLEASE(THE GOOSE, US)⟩), and (78) cannot indicate EAGER(US, ⟨PLEASE(US, THE GOOSE)⟩). Yet (76) is ambiguous, as between READY(THE GOOSE, ⟨PLEASE(THE GOOSE, US)⟩) or READY(THE GOOSE, ⟨PLEASE(US, THE GOOSE)⟩). I won't try to offer a detailed explanation in Conjunctivist terms; for present purposes, I don't need to.[21] Suffice it to note that we

[21] Conjunctivism does, however, provide a plausible framework for an explanation. Suppose the concept EASY(_, _) is a way of thinking about a certain relation that agents

need *some* explanation for why (77) and (78) *cannot* be associated with certain sentences of Mentalese. So at least prima facie, we cannot say that the compositional semantics for English just *is* the compositional semantics for Mentalese; and *pace* Fodor (1998), we cannot say that English doesn't have a compositional semantics. One way or another, we need to say that natural languages have a compositional semantics of their own, at least in the sense of imposing constraints on how expressions of natural language can be associated with prelexical concepts and modes of conceptual combination.

Constraints on extraction illustrate the point vividly. Question (79) *fails* to have the sensible meaning indicated in (80), because 'was' cannot be displaced from the relative clause.

(79) Was the boy who fed waffles for breakfast fed the kittens at noon

(80) Yes or No: the boy who was fed waffles for breakfast fed the kittens at noon

But finding other examples of "relevant unambiguity" is not hard. If a string of words exhibits at least one sentential meaning, it will be n ways ambiguous, for some n; but these readings will usually fail to include one or more coherent possibilities for combining the concepts indicated with the relevant words—even given various assumptions how semantic structure must "parallel" phrasal structure. Example (64) was a case in point.

(64) Plum saw the man from Devon

The phrase 'saw the man from Devon' can signify neither SAW(X, THE MAN) & FROM(X, DEVON) nor SAW(E, X, THE MAN) & FROM(X, DEVON); see Pietroski (2000, 2005b) for further discussion.

One can still say that natural languages came onto the scene *after* there were already primates with a domain general Mentalese whose word-like elements were promiscuous concepts of varying adicity. Per-

can bear to propositions by virtue of their capacities to *bring about* various states of affairs that might be represented. And suppose the concept EAGER(_, _) is a way of thinking about a certain relation that thinkers can bear to propositions by virtue of their capacities to *represent* various states of affairs that might be brought about. As a first approximation: EASY(α, P) iff α can easily make itt he case that P; EAGER(α, P) iff α is eager for it to be the case that P. Now suppose that both concepts are lexicalized as monadic predicates of states: EASY(S) and EAGER(S). Then the phrase [eager [∅ [_ [to [please us]]]]], with a covert subject of 'please' and a covert complementizer ∅, will presumably be understood as predicate that applies to a potential state s iff: s is a state of eagerness; and s has the *propositional content* specified with ' _ to please us' (see Pietroski[1998, 2005a]). But the phrase [easy [us [to [please _]]]], without a covert complementizer that signals a propositional attitude verb (and induces opacity), will presumably be understood as predicate that applies to a potential state s iff: s is a state of us pleasing the relevant individual; and s is easy, in the sense of an easy walk, and so easily done by the relevant agent. I assume that'eager to ... ' is opaque in a way that 'easy to ...' is not. John can be eager to see Hesperus yet not be eager to see Phosphorus. Nonetheless, it is easy to Hesperus iff it is easy to see Phosphorus.

haps humans have such a Mentalese, but we also have a language faculty that forces us to express thoughts in a language with a different syntax/semantics, with the following odd result: repeatedly, *thoughts* that could be easily assembled from the prexical concepts indicated with certain words *cannot* be associated with natural language *sentences* composed of those very words—not even if context and general knowledge favors a precluded interpretation that could easily be mapped onto the relevant grammatical structure, as in (64). Now if there is a Designer, he may well be this perverse. But otherwise, the emergence of the human language faculty is rather mysterious on this view.

Given the envisioned (prelexical) minds, the benefits of communication could apparently be gained in a less convoluted way: associate the already promiscuous concepts with signals, and let the syntax of thought serve as the syntax of a "public" language. One can imagine adding mechanisms that would allow the envisioned thinkers to pronounce PAST⟨CHASE(FIDO, FELIX)⟩ with the sound of 'past chase Fido Felix', and interpret that sound as having a corresponding (and linearizable) constituency structure like [past [[chase Fido] Felix]]], with the meaning PAST⟨CHASE(FIDO, FELIX)⟩. Such animals might hear (79) as having the meaning indicated in (80), while also being able to hear (81) as a possible but silly reading of (79).

(81) Yes or No: the boy who fed waffles for breakfast was fed the kittens at noon

By contrast, hearing (81) as *the* meaning of (79) shows that you're human.[22]

The imagined animals might also be able to say things like 'past bizzle her it him that'. And they might need to say 'past jimmy alexander the door some', to express the thought that Alexander jimmed the door with something—PAST⟨∃X[JIMMY(ALEXANDER, THE DOOR, X)]⟩. They might hear 'every Tyler Burge' as word salad, yet understand 'every tallmos philosopher'. But such creatures would, it seems, be able to communicate with each other at least as well as we can communicate with our conspecifics. So one has to wonder: if the human language faculty *doesn't* play a significant role in human cognition, by imposing a common format on prelexical concepts that are not already as promiscuous as the concepts of human adults, why is lexicalization and composition in *natural* language *constrained* in apparently idiosyncratic ways?

An alternative picture is that we and our evolutionary cousins share the concepts they deploy, along with a workspace in which many such concepts can be combined in ways that fall short of promiscuity. We may also share *some* of the faculty that makes us special; see Hauser,

[22] I am in debted to Norbert Hornstein for many conversations on these matters. In some respects, my proposal is quite compatible with the overtly mentalistic perspective on semantic surged by Jackendoff (1990), though with tighter constraints on semantic structures and how they relate to the syntactic structures of natural languages.

Chomsky, and Fitch (2002). But we humans lexicalize in unique ways; see Pettito (2005). If we can also combine concepts in ways that other animals cannot, then we should look for a common source of these linguistic/cognitive differences—ideally, in terms of a mechanism that also helps explain why our lexical items apparently do not inherit the adicity of our own prelexical concepts. My suggestion, in this regard, has been that natural language is far more monadic than prelexical thought, but that for this very reason, postlexical thought is far more interesting.

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