Recursive Misrepresentations: a Reply to Levinson (2013)

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Citing cross-linguistic grammatical data and specific corpus studies, Levinson 2013 (Language 89.1, 149-162; henceforth *L13*) argues against the idea that "recursion, and especially recursive center-embedding, might be the core domain-specific property of language". *L13* offers an alternative: language inherits its recursive properties "from the action domain". We argue that *L13*'s grammatical, statistical and formal claims are at best unwarranted, and in many instances demonstrably false. *L13*'s reasoning is similarly flawed -- in particular, the presumption that center-embedding can stand proxy for embedding (and clausal embedding can stand proxy for recursion). Thus, no support remains for *L13*'s conclusions. Furthermore, though these conclusions are pitched as relevant to specific published claims about the role of syntactic recursion, *L13* misrepresents these claims. Consequently, even an empirically supported, better-reasoned version of *L13* would not bear on the questions it claims to address.*

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Citing cross-linguistic grammatical data and specific corpus studies, Stephen C. Levinson (*Language* 89.1, 149-162; henceforth *L13*) argues against the idea that "recursion, and especially recursive center-embedding, might be the core domain-specific property of language". On the basis of "facts from interactive language use", *L13* offers an alternative conjecture: that language inherits its recursive properties "from the action domain". In this reply, we will not take any particular stand on the "core domain-specific properties of language" or *L13*'s conjecture about the cognitive roots of recursion. We write instead to express our concern at the pervasive misrepresentations of fact and faulty reasoning presented in *L13* in support of its claims. *L13*'s argument can be summarized as follows:

1. Cross-linguistic peripherality of embedding: "Many languages ... show little evidence of indefinite embedding." A response to this fact that views embedding as part of a "'toolkit' whose tools may not be all deployed [...] fits ill with the claim [...] that 'recursion' (understood as embedding) may be the one crucial domain-specific feature of linguistic ability."
2. Rarity and shallowness of center-embedding: Corpus studies have shown that degree-2 center-embedding "occurs vanishingly rarely in spoken language syntax", and degree-3 center-embedding is hardly observed at all. These conclusions converge with the well-known psycholinguistic observation that "after degree 2 embedding, performance rapidly degrades to a point where degree 3 embeddings hardly occur".
3. Ubiquity and limitlessness of center-embedding in interactive discourse: "Whether or not languages have clear syntactic embedding, however, they always seem to make use of 'pragmatic embedding'" — "embeddings in interactive discourse that have the same basic properties exhibited in sentential syntax, but that are distributed over two (or more speakers)", with no depth limitation.
4. Conclusions: Points 1 and 2 cast doubt on the claim that "a core element of language design is indefinite embedding of the kind produced by a context-free grammar." Claims 1-3, taken together, suggest that "'recursion' understood propositionally" is not so much a universal property of grammar as a property of human psychology, most evident in language use" (with possible evolutionary roots in the "action domain") which languages have a limited option of recruiting for use in sentence-syntax.

We begin by summarizing our empirical and logical concerns about points 1-3. We argue that *L13*'s grammatical, statistical and formal claims are at best unwarranted, and in many instances

demonstrably false. *L13*'s reasoning is similarly flawed — in particular, the presumption that center-embedding can serve as a proxy for embedding in general (and that clausal embedding can stand proxy for recursion in general). If our concerns are justified, no support remains for the conclusions summarized in point 4. Furthermore, as we discuss in the concluding section, though these conclusions are pitched as relevant to specific published claims about the role of syntactic recursion, *L13* misrepresents these claims. As a result, even an empirically supported, better-reasoned version of *L13* would not bear on the questions it claims to address.

1. POINT 1: CROSS-LINGUISTIC PERIPHERALITY OF EMBEDDING. *L13*'s first example of a language without recursive clausal embedding is Pirahã. While acknowledging the possibility that Pirahã permits clausal embedding (Everett 1986, 1987; contra Everett 2005), *L13* describes as "not in doubt" the claim "that embedding is very limited, and at most seems capped at one level deep". No evidence is cited for these assertions. In fact, an example of possible double embedding is cited in Everett's own grammatical sketch (Everett 1986, 260, ex. 226; though with complications noted by Nevins et al. 2007, 27 fn. 38). No attempts to elicit multiple levels of embedding have been reported in the literature, no substantial corpora of Pirahã texts have been published, and none are cited by *L13*. So the claim described by *L13* as "not in doubt" is actually utterly unverified.

L13 claims next that "Australian languages provide a wealth of better-documented cases" of languages "lacking evidence of indefinite recursion" (*L13*, 151), citing Hale's (1976) famous paper on the Warlpiri "adjoined relative clause" as a locus classicus. Hale, however, made no such claim. Far from arguing that such clauses are "juxtaposed" (*L13*, 151) or instantiate "parataxis" (*L13*, 153), Hale repeatedly identifies them as "subordinate" throughout the paper and gives no reason to doubt this label. The point of interest for Hale was not their status as embedded clauses, but rather his claim that they are embedded at the clause level, even when they appear to modify a nominal within the clause. Hale additionally notes that center-embedding — a topic to which we return shortly — is possible for the infinitival variant of the adjoined relative clause (though not for its finite counterpart; see Hale 1982 and Hale, Laughren and Simpson 1995 for further evidence of nonfinite clausal embedding in Warlpiri):[1]

(1) Wawiri ø-rna [parnka-nja-kurra] luwa-rnu ngajulu-rlu.
kangaroo PFV-1SG.SUBJ run-INF-COMP shoot-PST I-ERG
'I shot the kangaroo while it was running.' (Hale 1976, 94 ex. 40)

He also notes the possibility of multiple subordination of adjoined finite relative clauses:

(2) Karli ø-ji ma-rni-nji-nta yali, [ngula-ka marda- rni
boomerang PFV-1SG.OBJ get-NPST-ASSOC.MOTION-IMP that, COMP-PRS.IMPRF have-NPST
yapa-kari-rli, [ngula-ka ngurra ngalipa-nyangu-rla nyina.]]
person-other-ERG COMP-PRS.IMPRF camp 1INCL-POSS-LOC sit.NPST
'Go get me that boomerang that that other person who lives in our camp has.' (Hale 1976, 90 ex. 30)

Furthermore, even if the adjoined relative were to turn out to be juxtaposed or paratactic after all (i.e. even if Hale were wrong and *L13* right about this construction), later research on Warlpiri, uncited by *L13*, offers clear examples of clausal embedding. In 3, for example, the dependent clause (marked with the dependent complementizer *kuja*) is clearly a constituent of the matrix clause, since it is interpreted in the scope of the matrix intensional predicate `disbelieve'. See Legate 2011 for further discussion:[2]

(3) Kapuru-nyina-mi ka-lu-rla-jinta wati-ki
disbelieve-sit-NPST PRS.IMPRF-3PL.SUBJ-3DAT.OBJ-3DAT.OBJ man-DAT
yali-ki [kuja-ka ya-ni wirlinyi].
that-DAT COMP-PRS.IMPRF go-NPST hunting
'They don't believe that man that he is going hunting.' (Legate 2011, 114, citing Warlpiri Dictionary Project 1993)

L13 follows its discussion of Warlpiri with a consideration of Nordlinger's (2006) analysis of similar constructions in Wambaya (Nordlinger 1998). *L13* claims that it is "a completely live issue as to whether we are dealing with structural dependence or parataxis" (*L13*, 151) — despite the fact Nordlinger's central point in the cited discussion is the contention that constructions in Wambaya that resemble adjoined relative clauses are "clearly subordinate" (2006, 7).[3] *L13* dismisses her arguments as follows: "Nordlinger argues that the 'subordinate' construal may be forced by prosody, but as Hale noted, there is often a pause between clauses of these types in

Australian languages generally". (*L13*, 151). In fact, *L13* has misrepresented both Nordlinger's and Hale's claims.

Though Hale (1976) did observe a "characteristic falling-rising intonation [...] followed almost invariably by a pause" in clause-initial adjoined relatives in Warlpiri and some other Australian languages, he also noted that this tendency is not found when the adjoined relative follows the main clause: "when the main clause precedes the subordinate clause, the intonation over both clauses is more often falling, and the pause between them, if any, is brief" (p. 78). Far from showing that adjoined relatives are independent sentences or instances of parataxis[4], the distribution of this prosodic pattern actually provided Hale with an argument that the adjoined relative is base-generated as a right-sister to the main clause, and appears in initial position only as the result of an optional "transformational rule which positions them to the left of the main clause and Chomsky-adjoins them to the top-most S-node" -- thus "account[ing] for the prevailing tendency to pause between a preposed subordinate clause and the main clause since, after preposing [but not before], the former would be removed from the latter by two S-nodes".

For Wambaya, the disambiguating prosody to which Nordlinger refers is the "fall—rise intonation" (2006, 17) characteristic of subordination, which crucially disappears under a coordination construal.[5] Furthermore, Nordlinger provides independent arguments from word order distinctions for subordination in Wambaya. In particular, though the order of coordinate clauses mirrors the temporal ordering of the described events, and adverbial clauses may precede or follow the main clause, the finite clausal object of a matrix speech/perception predicate obligatorily FOLLOWS the matrix, as in 4 — and relative clauses obligatorily follow the noun they modify.

(4) Didima irri ngaya [nganku ngiy-a ngirra
tell 3PL.A(NP) 3SG.F.OBL this.II.SG.ERG 3SG.F.A-PAST steal
bungmanya-nka gijilulu].
old.woman.II-DAT money.IV(ACC)
'They told her (that) she'd stolen the old woman's money.' (Nordlinger 2006, 18)

The final Australian language mentioned by *L13* is Kayardild (Evans 1995), where the existence of clausal embedding is beyond dispute, since case morphology is assigned to subordinate clauses, and is affixed to the subconstituents of such clauses outside their other morphology (Kayardild being famous for CASE-STACKING). The literature does indeed claim, as *L13* states, that

Kayardild disallows multiple levels of clausal embedding — but *L13* also accepts Evans' morphological explanation for this observation: the morphology assigned to the subconstituents of a subordinate clause is both obligatory and "terminal". A second level of subordination would yield patterns of affixation that the morphology would block. If Kayardild has subordinate clauses, and there is an independent morphological explanation for those constructions in which subordination is blocked, it is hard to see why the language was even discussed as an example of the supposed cross-linguistic peripherality of clausal embedding.[6]

Finally, *L13* (p. 152) asserts that "languages with very limited morphology often offer no clear evidence for subordination at all", referring the reader to "Englebretson 2003 on Indonesian" for a relevant example. We note first that Englebretson (2003) is describing a particular variety spoken in Yogyakarta, on the basis of a corpus of conversation comprised of only 36,265 words. Subordination in other varieties of Indonesian and Malay is well-documented, much-studied and beyond dispute; see among many others Sneddon 1996, Cole and Hermon 1998, 2005. Yet even in Englebretson's limited Yogyakarta corpus, we do in fact find subordination. Example 5, for instance, includes a relative clause introduced by the relative complementizer *yang*:

(5) Kamu kan pernah lihat pencopet [yang di= Koperasi Pemuda] itu?
2sg PRT ever see pickpocket REL at co-op youth that
'Have you ever seen that pickpocket on the Koperasi Pemuda [bus line]?' (Englebretson 2003, 15)

Englebretson (2003) appears to have been cited by *L13* because of his claim that "complementation […] does not exist in this language variety" (p.1), where complementation is defined as "a clause which serves as the subject or object of another clause" (p.22). This is a significantly narrower claim than *L13*'s claim of "no clear evidence for subordination at all". Yet even this narrower claim is not accurate. Despite setting remarkably stringent criteria for identifying subordination,[7] Englebretson acknowledges the existence of a number of unambiguous clausal arguments — including 6, in which the subordinate clause is marked as an argument of *mengata-* 'say' by the applicative suffix *–kan*. Note additionally that the subordinate declarative clause has a relative clause further embedded within it, thus providing what *L13* would call an instance of degree 2 embedding (a point of particular relevance to *L13*, to which we return below):

(6) saya lebih ingin,me- … lebih suka untuk mengata-kan
1SG more want (truncated) more like PURP AT.word-APPL
[silahkanlah keluarga itu menentu-kan …
go.ahead-PRT family that.DEM AT.certain-APPL
cara berhubungan yang paling baik bagi mereka berdua gitu lho.]
way MID.connect REL most good for 3PL MID.two thus PRT
`I prefer to say: let the family go ahead and determine the best way of relating for the two of them.' (Englebretson 2003, 87)

The remaining language cited as one of "many languages that show little evidence of indefinite embedding" is Amele (p. 151, fn. 4). To illustrate its supposed absence of embedding, *L13* refers the reader to a WALS article by Comrie and Kuteva (2008), which presents a single sentence from that language in support of a specific claim about relativization.[8] In fact, however, Roberts' (1987) grammar of Amele reveals that the language shows a number of constructions that are good candidates for embedded clauses, including center-embedding of sentential complements:

(7) Naus uqa [ege qila bele-q-an fo ec] sisil-t-en.
Naus 3SG 1PL today go-1PL-FUT QU NMLZ ask-1SG-3SG.REMPST
'Naus asked me whether we would go today.' (Roberts 1987, 48)

Strikingly, Roberts even offers an example of two-level center-embedding in Amele (characterized as "clumsy" but "grammatical"):[9]

(8) Naus ija [Duwe [cabi haun wele cehe-i-a ec]
Naus 1SG Duwe garden new already plant-3SG-TODAYPST NMLZ
mad-en ec] ma-t-en.
say-3SG.REMPST NMLZ say-1SG-3SG.REMPST
'Naus told me that Duwe had said she had already planted her new garden.' (Roberts 1987, 17)

In sum, none of the languages cited in *L13* provide support for its claim that clausal embedding is cross-linguistically peripheral.

2. POINT 2: RARITY AND SHALLOWNESS OF CENTER-EMBEDDING. *L13* summarizes its cross-linguistic findings as a "demonstration that parataxis can be hard to distinguish from embedding, especially since an embedding-like construal is likely to be driven by the pragmatics even when there is no syntactic motivation for it" (p. 153). As we have seen, this conclusion does not withstand basic scrutiny of *L13*'s own sources. Every language discussed by *L13* shows evidence of clausal embedding, and in the sole example where clausal embedding actually does appear to be limited to a single level (Kayardild), *L13*'s own source provides an independent reason for this limitation (though see fn. 6).

Of course, the evidence relevant to the question of embedding varies from language to language. Evidence for embedding can be found, for example, in the use of complementizers not available in matrix clauses, selection of clause-types by higher predicates, semantic opacity and scope phenomena, dependent mood, sequence of tense, long-distance movement, quantifier binding, constraints on anaphora, and characteristic prosody. Which tests are relevant in a given language depends on other properties of the language: its lexical resources, morphological peculiarities, prosodic patterns, and so on. Wherever possible, a researcher hopes that evidence from more than one relevant factor will converge on the same conclusion.

Center-embedding can also test for subordination. If we find a putative subordinate clause sandwiched between elements of a matrix clause, no obvious analysis in terms of parataxis or juxtaposition can explain the observed order.[10] Nonetheless, center-embedding enjoys no special pride of place in linguistic analysis, but is just one of many phenomena that can demonstrate clausal subordination in the languages of the world.

Nonetheless, *L13*, after summarizing its supposed "demonstration that parataxis can be hard to distinguish from embedding", declares: "these difficulties are circumvented if instead of focusing on edge-recursion we focus on center-embedding". The discussion then proceeds to a discussion of processing problems posed by center-embedding and the alleged rarity of center-embedding in language use — as if special facts about center-embedding can stand proxy for facts about clausal embedding in general. Taken together, *L13*'s cross-linguistic claims, psycholinguistic observations and claims about language use are presented as preparation for the claim that embedding is limited or peripheral in sentence syntax, but "is exhibited in a much more fulsome way outside of sentential syntax".

But *L13*'s shift from general properties of clausal subordination to specific claims about center-embedding is illegitimate. The field has known since Chomsky and Miller (1963a, b) that

certain types of degree 2 center-embedding (specifically, self-embedding) present special processing difficulties not characteristic of other instances of embedding — but this fact holds of languages and constructions where there is no difficulty distinguishing parataxis from embedding, such as English relative clauses. Likewise, if it should turn out that certain center-embedded structures are rare, no conclusions can be drawn about embedding as a whole unless other clauses whose embedded status is beyond doubt are also rare to a similar degree. *L13*'s decision to "focus on center-embedding" as a means of clarifying the true status of all clausal embedding is therefore misleading.

Once again, there are also factual problems. Though the processing difficulties posed by degree 2 center-embedding are uncontroversial, *L13* makes the further claim that they are specially restricted in production as well, calling attention to the supposedly remarkable rarity of multiply center-embedding clauses in in naturally occurring texts. *L13* cites Karlsson (2007), who gathered statistics from corpora in seven European languages. According to *L13*'s description of Karlsson's findings, degree 2 center-embedding is said to occur "vanishingly rarely in spoken language syntax" (p. 155), and no examples of degree 3 were observed in the corpora —facts taken to support *L13*'s claim that there is something peripheral about syntactic embedding.

Corpus statistics, however, must always be evaluated against a baseline, before concluding that the relative rarity of a given phenomenon requires special explanation. Neither *L13* nor Karlsson provides such an evaluation. In recent work, however, Bader (2012; see also Trotzke, Bader and Frazier 2013) provides a first step toward the proper assessment of quantitative data concerning embedding. His results are both instructive and cautionary in the context of *L13*. Using German corpus data, he argues that the low frequency of multiple center-embedding follows from processing considerations, and does not require a special grammatical constraint.

In German, relative clauses may be center-embedded or extraposed. The extraposition option avoids the disruption of syntactic dependency for well-known and independently motivated processing reasons (Hawkins 1994, 2004). Both embedded and extraposed relative clauses may contain a noun phrase that introduces another relative clause. This lower relative clause may itself be either extraposed or embedded within the higher relative clause. These combinations produce four different structures: EXTRAPOSED WITHIN EXTRAPOSED; CENTER-EMBEDDED WITHIN EXTRAPOSED; EXTRAPOSED WITHIN CENTER-EMBEDDED; and CENTER-EMBEDDED WITHIN CENTER-EMBEDDED.[11] Bader estimated the frequencies of these structures in a very large German corpus of 92 million sentences. Of these, 2157 sentences contain a relative clause within a relative clause,

including 23 that contain three or more relative clauses. Within the 2157, 423 are doubly center-embedded relative clauses (instances of embedded-in-embedded).[12] On average, then, double center-embedding occurs at a frequency of just above 4.6 per million sentences, a figure which one might indeed be tempted to describe informally as "vanishingly rare".

Crucially, however, though the frequency of double center-embedding in Bader's corpus is subjectively low, it is close to its expected frequency under the traditional assumption that the grammar and processing factors are independent (cf. Chomsky and Miller 1963a, b). For each of the two relative clauses, the grammar allows for two options, center-embedding or extraposition, and processing preferences, which have been independently established in psycholinguistic studies, result in the latter option being chosen more frequently. Absent any additional constraint on multiple center-embedding, we expect that this choice will be made independently by language users for each relative clause in each example – both the higher and the lower. If there were an additional constraint against multiple center-embedding, we would expect the choices between center-embedding and extraposition to be interdependent – if the higher relative clause is embedded, then the lower relative clause should not be. Bader's study shows that the relative ratio of center-embedding versus extraposition for the lower relative clause is largely constant whether the higher relative clause is itself center-embedded or extraposed,[13] indicating that the choices are made independently. The rarity of double center-embedding is thus the result of repeated application of a less preferable syntactic option; there is no motivation for an additional constraint disfavoring multiple center-embedding. The moral for our overall discussion is that, absent such principled comparisons of the sort undertaken by Bader, the significance that *L13* attaches to the subjective "rarity" of multiple center-embedding is at best premature and most likely misplaced.

Furthermore, even if a more principled application of statistics were to show that multiple center-embedding is unexpectedly rare in some corpus, such a finding would not "undermine the idea that natural languages are not regular and necessarily context-free or higher" (*L13*, p154). Nor would it support *L13*'s assertion that "it remains an interesting question whether treating, say, English as regular (with large numbers of simple rules) is more complex than treating it as context-free (with fewer, more complex rules; see Perfors et al. 2010)."

In fact, there is now broad consensus that a variety of syntactic models (including Tree Adjoining Grammar, Combinatorial Categorial Grammar, Minimalist Grammar and others) converge onto the "mildly context sensitive" class, which appears to have the appropriate descriptive power for natural language syntax (Joshi 1985).[14] The inadequacy of regular language

has been known for decades. Furthermore, *L13* seems to suggest that regular grammars may be in effect sufficient despite being less powerful than context free grammars, since center-embedding structures are very rare. But the paper that *L13* cites in support of this claim (Perfors et al. 2010) shows no such result. In that study, the authors considered three handcrafted context free grammars: one contained recursive rules, one contained only depth-limited non-recursive rules, and the third contained a mixture of both. A Bayesian analysis of a small child-directed English corpus showed that the grammar with a mixture of recursive and non-recursive rules has the highest posterior probability and is thus favored. But all three grammars under consideration are context-free, and regular language is not mentioned at all — so it is a misinterpretation of Perfors et al. (2010) to suggest that they favor regular languages. In a related study, three of the same authors (Perfors, Tenenbaum and Regier 2006) did compare a regular grammar with a context-free grammar (see Berwick, Pietroski, Yankama and Chomsky 2011 for further discussion). They found, however, that the context-free grammar is favored even when one only considers very simple child-directed English, where each utterance averages only 2.6 words, and no utterance contains center-embedding or remotely complex structures. In sum, *L13*'s "interesting question" about the descriptive adequacy of regular language was settled long ago in the formal studies of grammar — and is also refuted from an empirical and quantitative perspective by the very paper that *L13* cites.

3. POINT 3: UBIQUITY AND LIMITLESSNESS OF CENTER-EMBEDDING IN INTERACTIVE DISCOURSE. AS its pièce de résistance, *L13* presents the following claim: that "there are [center] embeddings in interactive discourse that have the same basic properties exhibited in sentential syntax, but that are distributed over two (or more speakers) [...] with no parallel limit on embedding" (p. 154). The dialogue in 9, for example, is described as an instance of degree 1 center-embedding:

(9) A: May I have a bottle of Mich?
B: Are you twenty-one?
A: No.
B: No. (*L13*, 155 ex 12)

L13 describes this interaction uncontroversially as one in which "the second question leaves the first unanswered until a preliminary question is addressed". *L13* then proceeds to describe the

interaction as "a nested dependency just as in *The boy the horse kicked has a broken leg*" and proposes to account for it with a context free grammar that generates recursive center-embedding:

(10) Q&A → Q (Q&A) A

Strikingly, no evidence is offered for the claim that interactions like 9 are governed by a rule such as 10. Example 9 does indeed contain two question-answer pairs that are both temporally nested and informationally connected, but temporal nesting and informational connectedness do not in and of themselves argue for a center-embedded STRUCTURE. For one thing, the absence of one or another property makes no difference to the well-formedness of discourses that differ minimally from 9. The very natural discourse in 11, for example, has the same temporal nesting as 9 but lacks informational connectedness. The equally natural discourse in 12 has informational connectedness but the question-answer pairs are interdigitated, rather than nested:

(11) A: Do you carry Michelob?
B: (*sees A has a wet umbrella.*) Is it still raining?
A: Yes, unfortunately.
B: It's over there, near the plastic cups.

(12) A: Where are my keys?
B: Oh, are you ready to leave now?
They're on the kitchen table.
A: Yes, I'm ready to leave

Does a center-embedded structure underlie temporally nested sets of question-answer pairs such as 9, licensed by a dedicated embedding rule of discourse syntax? In light of the temporal and informational variants seen in 11 and 12, and the absence of any evidence or argumentation to the contrary, it seems equally plausible to attribute these discourse possibilities to a general human capacity for conversational multitasking. People can carry on more than one conversation at once, even with the same person. If a secondary conversation is initiated by a speaker in order to gain information crucial to an already initiated conversation (as is the case in 9, the result will, of course, be a temporally nested structure, since the secondary question is prompted by the primary question,

and the secondary answer is crucial to formulation of the primary answer. But we need not appeal to a recursive grammatical rule to explain the temporal sequencing of question-answer pairs under such circumstances — just a general multitasking capacity that FAILS TO FORBID nesting, put to use by speakers with specific informational needs best met by nesting.

We are not claiming that that there is no structure underlying discourse, nor do we dismiss the possibility that future research might show that a rule such as 10 plays a role in example 9 after all. Our objection is not theoretical but methodological. As discussed at the beginning of the previous section, claims about embedding at the sentence level are tested in a variety of ways, just like any claim about any type of syntactic constituency. Similar rigor is required in the analysis of formal grammars (at the level of weak generative capacity; see fn 14). While the language A^nB^n COULD be attributed to a context free grammar, one needs to deploy mathematical tools such as the Pumping Lemma to prove that it MUST be, and that no finite state grammar can be sufficient. We should demand no less from claims at the discourse level. Though *L13* hails as "very surprising" the claim "there are embeddings in interactive discourse that have the same basic properties exhibited in sentential syntax", *L13* fails to offer even one "basic property" of sentential embedding that holds of the discourses discussed by *L13* (and offers no discourse-specific arguments either).

In fact, we do know of one consideration that might ultimately provide support for a center-embedding analysis of 9, but its implications for *L13* are not positive. In particular, it is not at all obvious to us that temporal nesting of question-answer pairs is in fact free from depth limitations as *L13* claims. Consider the following pragmatically plausible extension of example 9, which *L13* would analyse as an instance of degree 2 embedding at the discourse level.

(13) A: May I have a bottle of Mich?
B: Are you twenty-one?
A: Is that the drinking age around here?
B: Yes.
A: No.
B: No.

This interaction strikes us as decidedly odd. We find it almost impossible to keep track of which question is answered by the two final utterances. The acceptability of the interaction improves

dramatically when information is added to the final two answers that makes it clear which question is being answered by each utterance:

(14) A: May I have a bottle of Mich?
B: Are you twenty-one?
A: Is that the drinking age around here?
B: Yes.
A: Unfortunately, I'm not twenty-one yet.
B: Sorry, I can't sell you a beer.

In light of 12, the source of the unacceptability of 13 might be ambiguity between a nested and interdigitated parse of the interaction, but we might also be observing the ameliorable processing difficulty that is the hallmark property of center-(self-)embedding past degree 2 (Chomsky and Miller, 1963b, 467). If that is so, *L13*'s analysis of 11 as center-embedding will be supported, but at the cost of *L13*'s central claim: that discourse-level center-embedding is free of the constraints that limit its sentence-internal counterpart. By asserting as fact a similarity between discourse-grammar and sentence-grammar (center-embedding) and a difference (constraints on center-embedding), without proper evidence for either the similarity or the difference, *L13* has done its cause no favor.[15]

4. POINT 4: CONCLUSIONS. But what IS *L13*'s cause? *L13* has claimed that sentential embedding is cross-linguistically limited and that center-embedding is "surprisingly rare" in language use, while center-embedding at the discourse level is ubiquitous, unconstrained, and common. We have argued that *L13* is wrong on all these points: its cross-linguistic claims misrepresent the facts; the move from embedding to center-embedding is logically illegitimate; there is nothing self-evidently surprising about the frequency with which center-embedding occurs in texts; and the claims about embedding in discourse are completely unsupported. Still, suppose *L13*'s empirical claims had turned out to be accurate. What broader conclusions would be warranted?

L13 offers the beginning of its answer in the very first paragraph: that its conclusions will bear on the well-known proposal by Hauser, Chomsky, and Fitch (2002; henceforth HCF) "that the sole feature of language that may be domain-specific is the recursive nature of syntax". "The aim of this short report", *L13* continues, "is not to engage in further commentary, but rather to clarify that

there is one central sense of the term recursion — namely embedding [...] — that clearly is not exclusive to syntax, and that is exhibited in a much more fulsome way outside of sentential syntax". In its concluding section, however, *L13* states its conclusions more strongly: "The idea that recursion, and especially recursive center-embedding, might be the core domain-specific property of language is rather directly undercut by the facts from interactive language use."

We would draw a very different conclusion. If the organization of discourse parallels the organization of syntactic structure as strongly as *L13* suggests, we would conclude that the core rule responsible for syntactic structure (e.g. Merge) extends beyond the sentence level — i.e. that the "faculty of language - narrow sense" (to use HCF's terminology) controls some aspects of discourse. Far from undercutting the idea that recursion "might be the core domain-specific property of language", such a discovery would be interesting in its own right, but entirely orthogonal to HCF's proposal.

Needless to say, if it were true that sentence-internal clausal embedding is more constrained than its discourse-level counterpart, figuring out the reasons could be an interesting topic for syntactic research. As noted by Nevins et al. (2009) in a similar context, "although Merge may *in principle* combine any two lexical items or phrases an unbounded number of times, not every imaginable instance of Merge is acceptable in actual languages. There are many restrictions on Merge that constrain the repertoire of structures that individual languages allow [...] These restrictions, and the laws that underlie them, form a continuing topic of syntactic research and debate." HCF's claim concerned the human capacity to recursively combine words and phrases into larger units. Though English clausal embedding provides a convenient, standard illustration of this capacity, there are countless other ways that the same point can be made. If we were attempting to illustrate this capacity with Kayardild examples, for instance, we would not be able to demonstrate syntactic recursion with clausal embedding, but any evidence for any kind of hierarchical syntactic structure in the language would do just as well. That is why "the metaphor of universal grammar as a 'toolkit' whose tools may not be all deployed" (*L13*, 152) is apt, and *L13*'s claim that it "fits ill" with HCF's conjecture is misguided. While it is conceivable that an investigation of specific restrictions on clausal embedding MIGHT turn out to bear on deeper issues of the sort discussed by HCF, there is no reason to expect it to.

L13 makes a further claim, which strikes us as potentially interesting. If sentential embedding is found at the discourse level, perhaps it is in some fashion evolutionarily connected to the human "action-planning system in general", a system that "needs to be able to hold a stack of

subgoals, and check them off one by one". Perhaps. But this proposal is pure speculation: an intriguing start for a future research program, but unsupported (for now) by evidence or argument.

Far be it from us to condemn speculation in linguistics. From speculations grow useful theories, from which may grow specific hypotheses about the puzzles of human language. HCF's proposal concerning syntactic recursion is itself a speculation of this sort, no more or less worthy in principle than *L13*'s claims about the "action domain". We do believe, however, that a speculation like *L13*'s, if advanced on the basis of misrepresentations, mischaracterizations and confusion about basic issues, is not off to a good start.

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NOTES

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1 We have updated Hale's (1976) examples to conform with current orthography and standard glossing conventions.

2 Hale himself offered relevant examples of subordination in the part of his paper devoted to the adjoined relative clause in Kaytetye [Kaititj], which he analyzed in much the same terms as Warlpiri. In the following example, for instance, the dependent clause (marked with the dependent complementizer clitic ar) is clearly a constituent of the matrix clause since it serves as the host for the matrix second position clitic *ŋ* "you":

(i) [agir-ar kangaroo-COMP ampwari-nhi-wal] die-PST-DIR ŋ you.NOM api-n go-IMPER
'Go up to the kangaroo that died' (Hale 1976:100)

3 Nordlinger 2006 also contains excellent corrective discussion regarding the treatment and portrayal of the 'adjoined relative clause' in Australian languages more generally.

4 As Richard Kayne notes (personal communication), if parataxis is viewed as a form of coordination (and coordination obeys the principles that govern syntactic structure more generally; cf. Munn 1993; Zwart 2005, among others), it is a species of embedding, rather than an alternative to it.

5 Nordlinger cautions that this claim about intonation is a "purely impressionistic observation, which needs to be verified by proper prosodic analysis" (p17, ftn 15), but in any case does not describe any "pause". As far as we can tell, the sole mention of "pause" occurs elsewhere (p. 19, note 16), where the ABSENCE of a pause is cited as support for the claim that an entirely different construction (which superficially resembles the adjoined relative) should be analyzed as an embedded complement question.

6 Round (2013, 189-201) proposes an alternative to Evans' (1995) analysis of the Kayardild inflectional system that does not constrain embedding as Evans' analysis does. We will not decide

between Round's and Evans' proposals here, but if Round's alternative should turn out to be on the right track, Kayardild might then be the single language identified appropriately in *L13* as requiring a syntactic restriction on unbounded recursive clausal embedding.

[7] It is not enough for Englebretson for a clause to form a single intonational unit with an appropriate matrix predicate, even in the default predicate-complement word order; instead, the clause must be unambiguously morphologically marked as an argument of the verb, which for this variety of Indonesian means either indexed by an applicative morpheme or promoted to subject ("trigger") position of a passive verb. He then considers it noteworthy (2003, 88) that only 11 of the 263 potential clausal arguments he identifies in the corpus succeed in meeting these conditions.

[8] Comrie & Kuteva's example involves subject relativization (the topic of their article), and the relative clause is characterized as "the same as an unmarked simple (declarative) clause". A more careful reading of Roberts' (1987, 49-56) description of Amele relative clauses, however, indicates that this identity with unmarked simple declaratives is an accident of the example chosen. Relative clauses differ from declarative clauses in that the relativized noun must be initial in a relative clause, whereas declarative clauses show unmarked S IO DO V ordering (Roberts 1987:70). As a consequence, the unmarked and relativized positions happen to coincide for subject relatives. In addition, relative clauses are optionally marked with the “subordinating demonstrative conjunction *eu* 'that' which follows the relative clause” (Roberts 1987:49). Comrie & Kuteva's example omits this optional marker.

[9] Example 8 is elicited data. Roberts (1987) notes that in recorded texts, the nominalizing particle *ec* is typically absent and the speech verb "say" is elided, leaving only the agreement suffixes associated with this embedding verb. No such option is discussed for embedded questions, which is why we reproduce an embedded question to illustrate center-embedding in 7.

[10] See, for example, the discussion by Nevins et al. (2009, 375) of a center-embedded complement clause in Pirahã (ex. 23) noted by Everett (1986, 278 ex. 290).

[11] Bader considers instances of these structures found within embedded clauses, such as the naturally-occurring examples below (Bader 2012, 20; also cited by Trotzke et al. 2013, 7-9). (Underscores indicate depth of embedding.) Note that the final structure is an instance of degree 2 center-embedding:

(i) EXTRAPOSED WITHIN EXTRAPOSED

Grundlegend ist hier die Annahme, dass es keine allgemeingültige Definition gibt,
Essentially is here the assumption that it no universal definition gives
die die Lieder beschreibt, die sich für den Einsatz im Unterricht eignen.
that the songs describes that itself for the use in class suit.
'Basically here is the assumption that there is no generally accepted definition describing the songs that may be suited for use in class.'
(deWaC1/27201 – http://www.diplomarbeiten24.de)

(ii) EXTRAPOSED WITHIN CENTER-EMBEDDED

Ihr werdet bemerkt haben, dass Völker, die in Ländern leben, in denen ein
you will realized have that peoples who in countries live in which a
besseres Verständnis von Leben und Tod herrscht, den Weggang eines geliebten
better understanding of life and death governs the depature of-one loved
Menschen oftmals zelebrieren.
person often celebrate.
'You will have realized that peoples who live in countries where there exists a better understanding of life and death often celebrate the passing away of a beloved person.'
(deWaC-1/27569 – http://www.das-gibts-doch-nicht.de)

(iii) CENTER-EMBEDDED WITHIN EXTRAPOSED

Hector Sanchez ist davon überzeugt, daß der Geist von Tom Donovan zurückgekehrt
Hector Sanchez is by-that convinced that the ghost of Tom Donovan returned
ist, der vor zehn Jahren während einer Explosion, die Annie, Dan und er
is who before ten years during a explosion which Annie Dan and he
versehentlich ausgelöst hatten, ums Leben kam.
accidentally caused had over life came
'Hector Sanchez is convinced that the ghost of Tom Donovan has returned, who was killed in an explosion that was accidentally caused by Annie, Dan and himself.'
(deWaC2/45707 – http://www.epguides.de)

(iv) CENTER-EMBEDDED WITHIN CENTER-EMBEDDED

Internationale Studien belegen, dass Medizinstudenten, denen identische
International studies prove that medical-students to-whom identical
Krankenakten, die nur in Bezug auf Alter und Geschlecht variieren, vorgelegt
patient's files that only in relation to age and gender vary presented
werden, unterschiedlich entscheiden.
are unequally decide
'International studies show that medical students decide unequally if they are confronted with patient's files that only differ with respect to age and gender.'
(deWaC2/23755 - http://www.das-parlament.de)

12 Of these 423, 72 were missing a VP. On the MISSING VP EFFECT, see Frazier 1985 and subsequent work. Bader's statistical analysis considers these separately.

13 If anything, Bader finds that the lower relative clause is center-embedded slightly MORE frequently when the higher relative clause is center-embedded versus when the higher relative clause is extraposed.

14 The result pertains to the weak generative capacity of grammars, in the sense that the grammars under study generate an equivalent set of strings. However, these formal models of grammar have different mechanisms for string generation, resulting in different syntactic structures. Such strong generative properties have more direct empirical consequences for linguistic analysis. Nevertheless, the weak convergence result is notable, suggesting a necessary condition on the adequacy of all syntactic theories.

15 *L13* does not present any examples of discourse embedding that illustrate rule 10 for cases more complex than example 9. A single example (p. 155, ex 14) is claimed to illustrate degree 2 embedding, but despite a diagram that appears to center-embed an interaction resembling 9 in a larger discourse constituent, the larger constituent does not instantiate 10 at all, as simple inspection will make clear. (Both the question and its answer appear to the left of the smaller constituent, and what appears to the right is a stage direction for an action undertaken as a consequence of the discourse as a whole.) *L13*'s other examples of supposed center-embedding stray even farther from 10 and minimal pairs with 9, counting repairs and repetitions as instances of recursive embedding and subordinating certain question-answer pairs with no obvious motivation.

Remarkably, *L13* includes a supposed example of interdigitation (p. 159, ex 22), citing it as SUPPORT for the claim that discourse-syntax mirrors sentence-sentence (which we have argued is exactly backwards; cf. our discussion of 12 — on the grounds that "cross-serial dependencies" have also been noted in sentence syntax. Since *L13*'s example merely consists of two connected utterances by speaker A punctuated by a "what?" and a "wow" from speaker B (with no obvious connection between the "what" and "wow"), we see no reason to accept this analysis in any case.