

representation of structure in action, and perhaps also will ultimately help to explain cross-domain differences in representational structure. All in all, as an explicitly domain-general approach, CPP holds promise for accelerating understanding in the action domain in a way that promotes interdisciplinary convergence with theorizing about language.

Many important language universals are not reducible to processing or cognition

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Abstract: Christiansen & Chater (C&C) ignore the many linguistic universals that cannot be reduced to processing or cognitive constraints, some of which we present. Their claim that grammar is merely acquired language processing skill cannot account for such universals. Their claim that all other universal properties are historically and culturally based is a nonsequitur about language evolution, lacking data.

In this latest attempt to reduce language to other mental systems, Christiansen & Chater (C&C) present two main points, each with two subpoints: (1a) Working memory constraints account for many features of sentence processing during comprehension; (1b) these features in turn can account for a variety of universal properties of language. (2a) Thus, learning a language is actually learning a set of rapidly deployable recoding templates and processes; (2b) what appear to be other kinds of psychologically or biologically determined structures of language are actually culturally and historically determined. Such attempts have a long history, with a considerable modern literature on the issue started in the 1970s (e.g., Bates & MacWhinney 1982; Hawkins 1983; Rumelhart & McClelland 1988; notable recent examples include Arbib 2012; Bybee 2007; Christiansen & Chater 2008; Perfors et al. 2011; Reali & Christiansen 2005; Rizzolatti & Arbib 1998; Tomasello 2003; 2006. All of these attempts have been quickly and persuasively countered: Berwick et al. 2013; Crain et al. 2009; Gualmini & Crain 2005; Kam & Fodor 2013; Piattelli-Palmarini et al. 2008; Pietroski 2008; Wexler 2002.)

Irreducible language universals. Many linguistic systems are irreducible to processing or cognitive explanations. We highlight several that seem particularly challenging to C&C's views.

(a) The Verb+Object Constraint (VOC) (Baker 2008; 2013). In our conceptualization of the world, actions are more intimately connected with their agent than with the object, but not syntactically so. Verb+Complement forms a syntactic constituent (a chunk) but Subject+Verb does not. This abstract structural relationship explains the fact that in all languages of the world idioms are formed by a verb and its object (In English, for example, *kick the bucket*, *sell the farm*, *hits the fan*, etc.). This fact is particularly surprising for VSO languages, on the "Chunk-and-Pass" perspective: Surface adjacency ought to lead to V+S idioms being more readily chunked and learned in such languages, while V ... O idioms are, in simple clauses, discontinuous.

(b) There is a universal hierarchy of syntactic and semantic dominance relations (Belletti 2004; Cinque 1999; 2013): for example, evidential (*allegedly*) > epistemic (*probably*) > necessity (*necessarily*) > continuative (*still*) > durative (*briefly*) > obligation (*obligatorily*) > completive (*partially*). (The > indicates dominance in the ordering of modal modifications of a sentence, a transitive relation.) For example, in English we have:

- (1) Jim is allegedly probably unable to frequently deliver assignments on time.
- (2) *Jim is frequently unable to probably deliver allegedly his assignments on time.

There is a large literature on many languages suggesting that this ordering is universal. Explanations based on statistical regularity, general cognition, pure logic, or social conventions appear utterly implausible.

(c) Conceptually possible but linguistically impossible word ordering.

"[M]any potential orders are never found ... which poses a puzzle for any culturally based account" (Cinque 2013, p. 17). Consider, for example, the relative ordering of the categories demonstrative, numeral, adjective, and noun, the topic of Greenberg's Universal 20 (Greenberg 1963; see also Hawkins 1983; Dryer 1992; 2009; Cinque 1996; 2005; 2013). All descriptions agree that some orders are never found: Whereas (3) and (4) are common orders, no language is reported to have as a basic noun phrase order (5) *Num Adj Dem N or (6) *Adj Dem N Num.

- (3) These three blind mice Dem Num Adj N
- (4) Mice blind three these N Adj Num Dem
- (5) *Three blind these mice *Num Adj Dem N
- (6) *Blind these mice three *Adj Dem N Num

The observed restrictions on nominal ordering are particularly interesting in light of experimental work by Culbertson et al. (e.g., Culbertson & Adger 2014; Culbertson et al. 2012). Briefly, they find their adult subjects, in a series of artificial grammar learning experiments, to reproduce typological word ordering patterns, apparently drawing on innate cognitive biases. This is a strong piece of evidence that the distribution of word order patterns is not historical bricolage; subjects discriminate novel typologically favored patterns from disfavored patterns, with no obvious basis in their native language.

Grammar learning is "merely" process and pattern learning. C&C argue that in learning to comprehend (and, we presume, talk), the child perforce must be learning a range of statistically valid local patterns so that the system can proceed rapidly. The heart of the idea is that learning patterns from repeated stimulus similarities is endemic to many aspects of maturation, hence not specific to language. In this, they agree with a variety of learned pattern accounts (e.g., Bever 1970; Townsend & Bever 2001). However, there are severe empirical problems. Their account says nothing, for instance, about which chunks may relate to each other; as far as C&C are concerned, anything goes. But there is considerable evidence for richly nuanced, universal principles governing many kinds of grammatical relations (subjacency, case, theta relations, etc.). It also makes long-distance dependencies mysterious. If learners look first for local associations in blindly segmenting their language, subject to a crippling limit on short-term memory, it is unclear how long-distance dependencies could be stable in any lineage, much less universal.

The "rest" of apparent linguistic structures (i.e., those that are not explained by immediate processing or by cognitive or statistical facts) are culturally and historically determined.

We do not belabor a response to this point because it is irrelevant to the major substantive claims by C&C, and they offer very little independent or new evidence for it. It is a claim about how the structures evolved that we see in today's languages that cannot be immediately accounted for in their interpretation of processing and cognitive constraints.

To us it seems like a very far-fetched claim about how things worked in the forest primeval. We do know from contemporary facts that (most) languages live in families suggesting some historical devolution; and there are clusters of shared properties among neighboring languages that do not share families, also suggesting historical influences. But these facts presuppose the existence of

fully fledged languages, ready to differentiate and to be influenced by neighbors.