Does a theory of language need a grammar? Evidence from the constraint on identical root consonants in Hebrew

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It is well known that Semitic languages restrict the co-occurrence of identical consonants in the root (Greenberg, 1950). Identical consonants are frequent at the root's end (e.g., *sbb*), but rare in its beginning (e.g., ***bbs***). This restriction has been attributed to a grammatical constraint on identical consonants (e.g., the Obligatory Contour Principle, McCarthy, 1986). Identity, however, is a relationship among variables (XX; where X stands for any instance of the category X). Accordingly, a constraint on identity presupposes the capacity to represent variables and operate over variables. This capacity, found at the core of many grammatical principles and constraints, has been denied by associative accounts of cognition (cf., McClelland & Patterson, 2002; Pinker & Ullman, 2002). These views attribute linguistic productivity to an associative mechanism, guided by the statistical properties of the lexicon—a separate grammatical component is considered obsolete. Specifically, the productive restriction on identical consonants is ascribed to the statistical properties of specific consonant-combinations (e.g., the rarity of the *bb* bigram in *bbs*; the frequency of two adjacent labials, etc.), rather than their identity. Indeed, in the absence of operations over variables, identity (a relationship among variables) is unrepresentable.

This talk examines the representation of identity by investigating the scope of the generalizations concerning identical root consonants in Hebrew. The hallmark of operations over variables is that they generalize across the board, irrespective of the statistical properties of the lexicon. I demonstrate that Hebrew speakers generalize the constraint on identical consonants in this manner (e.g., Berent, Shimron & Vaknin, 2001; Berent & Shimron, 2003). In fact, such generalizations are observed in the absence of any relevant statistical knowledge---for roots including identical phonemes with feature values that are foreign to Hebrew (Berent, Marcus, Shimron & Gafos, 2002). Marcus (2001) has demonstrated that such generalizations are unlearnable by connectionist networks that are not equipped with operations over variables innately (i.e., prior to learning). Speakers' behavior suggests that (a) the restriction on root structure appeals to identity-- a formal relationship among mental variables (XX); (b) The constraint on identical consonants is inexplicable by a restriction on feature similarity; and (c) A constraint on identical consonants is unlearnable from experience with lexical instances. These conclusions are consistent with linguistic accounts that postulate a symbolic grammatical component that is irreducible to the statistical properties of the lexicon.

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