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Add the fact that any human being, placed in any one of these language communities at birth, will acquire full competence in the local language, and the cultural model equates to two null hypotheses: Every extant and past mapping between linguistic form and meaning is learnable under the circumstances in which humans typically encounter them, and we come into the world equipped with the capacity to acquire, and eventually to transmit, such mappings across generations by cultural learning. The impression that language requires constraints on its form (such as its grammar) other than those imposed by the logic of cultural transmission itself stems from a half-century-old strategic confound introduced into linguistics by Noam Chomsky (1959).

One argument Chomsky opposed to behaviorist claims regarding language acquisition was a formal one: The sophisticated Suppes-Estes formalization of behaviorist learning theory lacks the power to acquire a grammar of human caliber (Chomsky 1975, in Piattelli-Palmarini 1980, p. 111). Although the logical possibility remained that behaviorist learning theory is inadequate as learning theory, Chomsky took the unlearnability of human grammar by its means to support the proposition that grammar is innate. Through his persistent efforts, the fact that humans have a unique biological endowment for language has come to be identified with a presumptive innate grammar to which learning contributes but “minor modifications that give one language or another, depending on experience” (Chomsky, in Harnad 1976), as if this were the only way to have an endowment for language.

There is neither need nor justification for biologically oriented work on human language to continue to accommodate this strategic confound. Cultural transmission delivers the restricted search space needed to enable language learning, not by constraining the form language takes on an innate basis, but by ensuring that the form in which language is presented to the learner is learnable (Zuidema 2003). The target of the new generation’s learning process is itself the outcome of a learning process (a previous generation). Good’s 1967 theorem—cited as recently as 2002 by Hauser, Chomsky, and Fitch (see Hauser et al. 2002)—accordingly cannot decide between learned and innate grammar (Zuidema 2003; see also Clark 2001; Horning 1969; Johnson 2004; Lappin & Shieber 2007). Moreover, across generations of learning agents, cultural transmission has the power to transform a state of arbitrary strings randomly paired with meanings into a shared and efficient grammar without intervention of natural selection or differential reinforcement of outcomes (Kirby 2002). This apparent magic results from competition among strings for access to subsequent generations via the “learner bottleneck,” a central aspect of the “poverty of the stimulus” argument. In this competition more efficient and general forms tend to outlast others over generations.

What remains is to complete the cultural model with a way to sustain the chain of transmission of initial nonsense (unsemantized, ungrammaticized strings) over the many generations required for convergence on a shared grammar. The ideal prior state for this can be found among the cultural traditions of complex learned songs of many songbirds and a few mammals. Some of these are not confined to cultural variations on an innate pattern, the “species-specific song” recently invoked by Fitch (2008), but are emancipated from innate constraint on the form song takes (calls and songs of 76 species of birds from two continents have been identified in the repertoire of the marsh warbler: Baylis 1982; Dowsett-Lemaire 1979). Under circumstances explored in Merker and Okanoya (2007), a prelinguistic human adaptation for emancipated song would provide the mechanism to sustain string transmission for however long convergence might take, because it would be driven by the need to impress by elaborate vocal display rather than to communicate meaning.

But “Something about the faculty of language must be unique in order to explain the differences between humans and other animals” (Fitch et al. 2005, p. 182, emphasis in original). Indeed, this is a condition met by the very adaptation needed for song learning to be possible, as first proposed by Darwin (1871). It is a dedicated learning capacity missing in all other primes—our ape relatives included—but essential for every word and sentence we know how to pronounce, namely the capacity to learn to reproduce, by voice, patterns of sound originally received by ear, technically known as vocal production learning (Janik & Slater 1997). We share this capacity with some of the singers and all mimics among the birds, and with a few mammals, yet we alone, of all species, have evolved vocal learning in the setting of a primate brain.

Supported by a conformal motive (Merker 2005) and de novo evolution of a direct projection from primary motor cortex to the respiratory and phonatory motor nuclei of the lower brainstem (Brown et al. 2008; Okanoya & Merker 2007), vocal learning turns the cerebral territories centered on Wernicke’s and Broca’s areas from their non-language uses in other primes to the service of human language by recruiting them to the generative production and intergenerational transmission of culturally learned vocal lore. To it we owe not only our developmental trajectory for language learning, infant babbling included, but our propensity for imitation and ritual culture more generally (Merker 2005), along with a robust selection pressure for encephalization (Merker, in press; Merker & Okanoya 2007). As repeatedly urged by students of birdsong (Doupe & Kuhl 1999; Marler 1970; Nottebohm 1975), this distinctive capacity of ours for vocal learning holds the biological key to the singularity of human language. Through it, and unconstrained by innate so-called universal grammar, the historical filter of cultural transmission— which passes only the possible—continually adapts the actual forms of languages to multiple interacting constraints such as use, utility, learnability, and neural resources (Christiansen & Chater 2008), as well as cultural norms (Everett 2005), with diversity in train.

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On formal universals in phonology

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Abstract: Understanding the universal aspects of human language structure requires comparison at multiple levels of analysis. While Evans & Levinson (E&L) focus mostly on substantive variation in language, equally revealing insights can come from studying formal universals. I first discuss how Artificial Grammar Experiments can test universal preferences for certain types of abstract phonological generalizations over others. I then discuss moraic onsets in the language Arrernte, and how its apparent substantive variation ultimately rests on a formal universal regarding syllable-weight sensitivity.

The target article by Evans & Levinson (E&L), questioning not only the existence of universals but the methodology of pursuing them, raises many issues for discussion. In this commentary, I limit my remarks to the importance of formal (as opposed to substantive) universals—a distinction E&L do not draw with sufficient clarity. Formal universals in phonology are constituted by the analytic elements that human minds employ in constructing representations of sound structure. Put simply, formal universals refer to the set of available data structures (e.g., binary features, metrical grids, autosegmental tiers) and the possible operations on them that can be used in constructing a grammar of a language.

Phonotactic dependencies of the form Given segments A, B in the same word, if A has feature F, then B must have feature G are
Commentary/Evans & Levinson: The myth of language universals

constrained by analytic restrictions on what can be referred to. These analytic restrictions are, by hypothesis, formal universals that are independent of the historical contingencies or cultural practices of any given language community. One of the best ways of studying formal universals of this kind is by constructing Artificial Grammar Learning experiments, using the methodology of cognitive science.

In one such recent study, Moreton (2008) conducted an experiment in which participants were taught a miniature artificial language containing phonotactic dependencies of the form outlined above. There were three conditions: in one, F and G were both vowel height; in a second, F and G were both obstruct-ent voicing; and in a third, F was vowel height and G was obstruct-ent voicing. Importantly, the rules of English phonotactics do not contain any of these three dependencies. The results, however, showed that the height-voice dependency was not learned by participants. Moreton’s conclusion was that an analytic bias favors learning certain phonotactic dependencies over others; the resulting formal phonological universal is in (1):

(1) Learning phonotactic dependencies of the form Given seg-ments A, B in the same word, if A has feature F, then B must have feature G. Is universally easier when F and G are the same feature than when F and G are different features.

Formal universals like (1) lend themselves to eminently more possibilities for integration with the cognitive sciences than E&L’s proposed research program based on “the dual role of bio-


cultural-historical attractors” (target article, sect. 8, para. 6, E&L’s thesis 5). Formal universals allow for experimental testing in laboratory conditions under which the historical-cultural factors are completely controlled for, and hence irrelevant to the outcomes.

It is worth considering how apparent exceptions to universals are analyzed in other fields. As an example, consider the case of the Jacana bird, one of nature’s species exhibiting a “sex-role reversal,” whereby it is the females that engage in polyandry and cuckold of the males. At the right level of analysis, the sex-role reversal in these shorebirds is entirely unsurprising, because it is the males that perform the raising of the chicks. The correct asymmetry between sexes is not that males have multiple mates while females do not, but rather, that the sex that commits to what biologists call “parental investment” is the one who is stuck in the harem. When the universe is correctly formulated, the Jacana bird is actually an exception that proves the rule.

I argue that E&L err in concluding that there are no universals within human phonology based on apparent substantive exceptions:

But in 1999, Breen and Pensalfini published a clear demonstration that Arrernte organizes its syllables around a VC(C) structure and does not permit consonantal onsets (Breen & Pensalfini 1999). With the addition of this one language to our sample, the CV syllable gets downgraded from absolute universal to a strong tendency, and the status of the CV assumption in any model of UG must be revised. (target article, sect. 2.2.2, para. 2)

Arrernte is not, as E&L would have it, but one language that recently “ruined the entire sample,” so to speak. The question of VC syllabification in Australian languages was raised by Somner (1970; 1981) on the language Oykangand, later insightfully analyzed in terms of onset-maximization by McCarthy and Prince (1986). There was, historically, a widespread loss of initial cons-
ons throughout Australian languages, which Hale (1964) and Blevins (2001) attributed to stress shift and lenition processes. Although Arrernte was apparently no exception to this sweeping change, nonetheless, “25% of Arrernte words are pronounced in isolation with an initial consonant” (Breen & Pensalfini 1999, p. 2). To account for words such as mp’ar and tajk, Breen and Pensalfini (1999) have to propose that these words have an under-


lying initial vowel, a red-flag for any “clear demonstration” that the language disallows consonantal onsets.

In general, the deduction of which syllabification pattern a word contains depends on particular phonological processes that refer to syllabic divisions. In this light, consider the following formal universal:

(2) Stress assignment, weight-sensitive allomorphy, compensa-
tory lengthening and prosodic morphology, when sensitive to distinctions among syllable types, refer exclusively to the representa-tional unit of weight called the mora.

The phonological universal in (2), developed by Hyman (1985), McCarthy and Prince (1986), and Hayes (1989), is formal, not sub-

stantive in nature: it restricts the data structures that can be referred to by morphophonological processes, and is not about the substantive question of which segments can bear moras. In fact, Topinjizi (2009) has gathered evidence from a wide range of languages demonstrating the ability of onset consonants to be moraic. The existence of metrical processes referring to onsets has been a topic of research for many years; see Davis (1988), Downing (1998), Goedemans (1998), and Gordon (2005), who discuss onset-sensitivity of stress in languages ranging from English and Italian to Pirahã and Iowa-Oto.

If vowels and onset consonants, but not coda consonants, are moraic in Arrernte, the statement of stress assignment and weight-sensitive allomorphy become quite straightforward in the light of (2). In Arrernte, stress is assigned within a word to the first vowel preceded by a consonant: mp”ar, “is making,” versus i.kwe`nt, “policeman.” Since onset consonants are moraic, the stress rule is simple: the left-most bimoraic syllable receives stress. Similarly, the statement of plural allomorphy in Arrernte is simple: bimoraic-or-greater forms like i.piel and taŋk take the suffix -ewar, while monomoraic forms like ar and aŋk take the suffix -erir. The reduplication patterns can receive a similar treatment in terms of moraic targets, within the prosodic morphology framework: for example, the copying of VC strings to a reduplicant is driven by the demand to fill a bimoraic template.

Like the Jacana bird’s sex-role reversal, which has a mechanis-

cal and principled explanation at a different level of primitives (partner with greater parental investment, instead of male and female), the patterning of weight-sensitive process in Arrernte exhibits a principled conformity to a formal universal at the level of which consonants are moraic, instead of in terms of sylla-

bification. Rather than positing a silent initial vowel for 25% of Arrernte words, attention to the statement of formal universals enables a consistent representational property for syllables throughout the language. The universal in this case pertains to the set of data structures that learners use to encode sound patterns: moras, and only moras, are the formal unit that can be referred to by weight-sensitive properties.

E&L trumpet the slogan “A linguist who asks ‘Why?’ must be a historian” (sect. 7, epigram, quoting Haspelmath 1999, p. 205). Integration with the cognitive sciences, however, will come from mechanistic explanations, not from hand-waving at diachro-

nic contingencies. Formal universals are restrictions on representa-
tional vocabulary, and they rear their heads even when history deals them an odd shuffle or, as in the case of artificial grammar experiments, no historical shuffle at all.

Universal grammar and mental continuity: Two modern myths

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