Syllables, Templates and Third factor: why your baby is neither a bird, nor a whale and even less a cotton-top tamarin

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The minimalist program seeks to reduce UG to the bare minimum of what is unique to human language (Chomsky, 2005). Given results in ethology and animal cognition, phonological representation and computation are considered to lie outside the Faculty of Language in the Narrow sense: rather, they result from more general human and non-human cognitive faculties (“third factor”) that are not specific to language. These faculties may have been separately observed in animals and are “recruited” by humans for the purpose of externalizing language (Samuels, 2011). In this perspective, we expect that 1) the same general cognitive constraints used in language and elsewhere produce the same structural patterns wherever they are in place, i.e. in language, in other areas of human cognition, and in non-human animals (e.g. primates, whales and birds); 2) non-human and human animals acquire these cognitive constraints in the same way. We also expect that “animal phonology” is possible and that other species are able, as human babies do very early on and very easily without any explicit learning, to group the sounds by natural classes, to compute statistical distributions from transitional probabilities, to learn arbitrary patterns of distribution, and to segment a linear speech signal into syllables, feet, words, phrases and to combine them hierarchically in production. From what we know, many species (and especially mammals) are able to recognize and even produce patterns resulting from “grouping patterns”: cotton-top tamarins are able to chunk the speech signal into strings of alternating consonants and vowels (Samuels, 2011), while birds and whales produce branching-structured songs (Doupe & Kuhl, 1999). Neither primates nor birds or whales, however, seem to be able to either perceive or produce syllabic patterns.

Syllables are built on the basic binary onset/nucleus structure and the most important distinction is between closed and open syllables, i.e. ones that do vs. do not bear a coda. A consonant is a coda iff it occurs either string- (word-)finally, or before another consonant (further sonority-related intricacies left aside). The coda pattern thus identifies as the disjunction $\{#,C\}$. We also know that the coda is a marked structure universally, which is acquired by every child after the onsets (Fikkert et al., 2004). In order to show that animals are equipped to do human phonology, it would need to be shown that, given two sets of items A and B (A being consonants in phonology, B vowels), they either naturally produce or are able to extract from a linear stimulus, and without any explicit learning, those A-tokens that occur before another A and string-finally ($A_2$ and $A_3$ in $A_1BA_2A_3BA_4BA_5#$), to the exclusion of all other As. This very basic coda pattern is a little more sophisticated, and foremost non-linear, than what cotton-top tamarins have supposedly been found to be able to do, i.e. to segment for example a linear stimulus into "CVCVCV" units. The same is true for what is quoted in the literature regarding bird- or whalesongs: these do group patterns that are made of series of notes bordered by silences produced in repetitive motives by copy (Samuels, 2011). But these patterns are not akin in any way with syllabic patterns produced by humans: they do not exhibit anything that could be interpreted as an onset, a nucleus or a coda. Note that it cannot be argued that the coda pattern is an adaptation of the more general cognitive capacities mentioned to the specific environment of human language that issues specific demands due to vocal tract properties or the human perceptual system. The first focus of the talk will be to support that syllable structure is purely grammatical/cognitive: it is not predictable from the phonetic signal (all attempts in this direction are unsuccessful, e.g. Steriade 1999, and the syllable is not a category for phoneticians). Therefore whatever being or cognitive system possesses the relevant faculties should produce and be able to perceive syllabic patterns in the same way. We also expect that “animal phonology” is possible and that other species are able, as human babies do very early on and very easily without any explicit learning, to group the sounds by natural classes, to compute statistical distributions from transitional probabilities, to learn arbitrary patterns of distribution, and to segment a linear speech signal into syllables, feet, words, phrases and to combine them hierarchically in production. From what we know, many species (and especially mammals) are able to recognize and even produce patterns resulting from “grouping patterns”: cotton-top tamarins are able to chunk the speech signal into strings of alternating consonants and vowels (Samuels, 2011), while birds and whales produce branching-structured songs (Doupe & Kuhl, 1999). Neither primates nor birds or whales, however, seem to be able to either perceive or produce syllabic patterns.

The second focus of the talk is on the acquisition of syllable structure. It also claims that children use specifically human and specifically phonological faculties in the acquisitional process. Their output does not exhibit the kind of grouping patterns that are reported in the literature on non-human animals, but rather reflects a templatic organization which allows them to ultimately build syllable structure from the linear input. The templatic hypothesis (Macken, 1992; Vihman, 2001) refers to a general behavior of children which is very frequently observed in production. From the 50 words-stage on, and whatever the input language, each child seems to begin with a few systematic structural shapes built on the basis of a small inventory of features, as if s/he had to match her/his incomplete segmental content onto a predefined...
number of prosodic (syllabic?) positions. For example, in the data under (i) below, Sacha tends to
generalize on two main templates (CVC and CVCVC) with either a velar or a labial consonant melody
and two vowels [a, u]. In this perspective, templatic activity is a structural (phonological) response of the
babies that enables them to be linguistically active, i.e. to extract relevant linguistic information from the
linear input, in a situation where necessary grammatical and lexical knowledge is still missing. Templates
thus facilitate production and help babies to interpret their own output as a structured input; this in turn
supports a looping learning mechanism: the stabilization of their own phonological representations is
reinforced.

The talk proposes a modelization of such a template in French from the very early stages towards
the adult target shape. The developmental scenario exposed is supported by three sets of data: a corpus of
six children aged 17-29, longitudinal data of a child from 25 to 30 months, and a corpus of elicited and
semi-elicited production from 38 three- to five-year-old. It is based on a flat, non-branching model into
which children systematically and gradually add CV units. The analysis traces a developmental course from
early to later word forms and demonstrates that children begin with open CV and VCV structures,
systematically avoid codas and deploy in parallel planar segregation between consonantal and vocalic
melodies to progress by the addition of internal CV units towards the adult target shape of the words.
It will also raise the following question: where templates in acquisition come from? It may be argued that
they are a "spontaneous" response of each individual child facing the overwhelming input that s/he
cannot make sense of (yet). Alternatively, templates may be considered as a part of a hard-wired, i.e.
genetically coded tool kit that children are equipped with in order to face the acquisitional task. The latter
scenario implies that similar templates will also be found in other areas of human cognition, and in
relevant non-human animals. Nothing of the kind has been reported as far as we can see, and the animal
grouping patterns mentioned are objects that have quite distinct properties. But even in the former
scenario, the avoidance of codas shows that templates are not just arbitrary sequences of Cs and Vs:
constraints on codas known from adult grammar are also active before proper syllable structure is
available.

(i) Sacha's data, 16.5 months (French, 2009).

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<tr>
<th>kak</th>
<th>sac / bag</th>
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<tbody>
<tr>
<td>mak</td>
<td>masque / mask</td>
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<td>gagak</td>
<td>dessert / desert</td>
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<td>kukuk</td>
<td>poule / hen</td>
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<td>papum</td>
<td>chapeau / hat</td>
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<tr>
<td>bam</td>
<td>ballon / balloon</td>
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<td>dam</td>
<td>dame / lady</td>
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