

Evolution of the speech code: higher-order symbolism and the linguistic Big Bang

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Abstract: As our ancestors innovatively juxtaposed one meaning-bearing sound to another, a huge increase in the inventory of speech sounds was triggered. Still, sporadic semantic ambiguity required deeper structural analyses in order for listeners to extract intended meanings, culminating in the emergence of compositional, post-compositional, and ultimately hierarchically-arranged and recursive constituent structures. These primordial pressures and their yielded structures, in remarkably similar function and form, continue to constrain, shape, and change the speech code to this very day. The early juxtaposition of two meaning-bearing sounds was thus both necessary and sufficient for full-blown linguistic complexity to evolve, triggering a linguistic “Big Bang”.

- 19 • ***First-order symbolism***: one-to-one correspondence between (arbitrary)
20 symbol and meaning, a consequence of single vocal symbols produced in
21 isolation.
- 22
- 23 • ***Second order symbolism***: evolves from first-order symbolism as two vocal
24 symbols are juxtaposed to each other. It triggers a breakdown of a one-to-
25 one symbol-meaning correspondence, culminating in many-to-one and
26 one-to-many correspondences between symbol and meaning.
- 27
- 28 • ***Third-order symbolism***: evolves from second-order symbolism, as a
29 consequence of string-medial phonetic content being of sporadically
30 ambiguous affiliation between our two juxtaposed symbols, thus triggering
31 this ordered string's analysis into a hierarchical constituent structure, and
32 paving the way for recursion.

34 **1. *Zero-order symbolism*: the iconic manual gesture**

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36 **2. *First-order symbolism* in the speech code: one-to-one correspondence**
37 **between sound and meaning**

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- 39 • The four “A”s: Articulation, Aerodynamics, Acoustics, Audition

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41
42 **pu, ti, ka**

43



“Run!”, “Kill!”, “Sex!”

- 44 • Despite this move toward a speech-based semiotic system, this one-to-one
45 correspondence between event and meaning is perhaps characteristic of
46 almost all animal sound communication systems.
- 47 • *We are far from language.*

48 **3. *Second-order symbolism* in the speech code: one-to-many and many-to-**
 49 **one correspondence between sound and meaning**

50 **pu-pu, pu-ti, pu-ka, ti-pu, ti-ti, ti-ka, ka-pu, ka-ti, ka-ka.**



51

52 **pu-ti**

“Run! Kill!”

52

53 **ti-pu**

“Kill! Run!”

53

54

“Run if you don’t want to get killed!” OR “Run to kill that animal!”

55

- 56 • **pu-ti**: the end of the first sound is systematically modified by the
57 immediate succession of the second, and likewise, the second sound is
58 systematically modified by the immediate precedence of the first.
- 59
- 60 • Now it is *two* sounds that correspond to one meaning:
- 61
- 62 • **pu-** when immediately followed by **-ti** is systematically phonetically distinct
63 (though semantically non-distinct) from **pu** in isolation.
- 64
- 65 • **-ti** when immediately preceded by **pu-** is systematically phonetically
66 distinct—though semantically non-distinct—from **ti** in isolation.
- 67
- 68 • The juxtaposition of one sound to another thus opens the floodgates of
69 second-order symbolism.
- 70

- 71 • As these sound complexes are repeated and repeated in their appropriate
72 real-world contexts, *new* sounds inevitably arise.
- 73
- 74 • The medial closure in our **pu-ti** example may eventually undergo a process
75 of voicing, becoming **pu-di**.
- 76
- 77 • Both **ti-** and **-di** correspond to a single meaning: every time **ti** (with a
78 voiceless closure) is immediately preceded by another sound, it is replaced
79 by **di** (with a voiced closure).
- 80
- 81 • **-di** may now be assigned an additional meaning, and thus becomes free to
82 appear as the first element of a complex, for example, **di-bu** (as opposed to
83 a different complex, **ti-bu**).

84

- 85 • Two different meanings are now cued by the same sounds in comparable
86 or even identical contexts. We may have **bu-di** in which **-di** means one
87 thing, but also **bu-di** in which **-di** means something else.
- 88
- 89 • This establishes a *one-to-many relationship between sound and meaning*, a
90 development also found in all languages.
- 91
- 92 • The mere juxtaposition of two simple sounds triggers remarkable growth
93 and complexity of both the phonetic and the semantic inventories.
- 94
- 95 • Both one-to-many and many-to-one correspondences between sound and
96 meaning naturally evolve and potentially flourish.
- 97
- 98 • This is **second-order symbolism**.
- 99

100 **3.2 More examples, more complexity**



101

102

bu- di- ga- → pu- ti- ka-

pu- ti- ka- → p^hu- t^hi- k^ha-



103

104

bu- di- ga- → mbu- ndi- nga-

bu- di- ga- → pù- tì- kà-

- 105 • Modern-day pressures on sound patterning are not merely characteristic
106 of the modern-day linguistic system. Rather, they were in place long before
107 the linguistic system came into existence, acting as a driving and inertial
108 pressure on the very development of language itself.
- 109
- 110
- 111 • Systematic phonetic changes are not a *result* of linguistic complexity.
112 Rather, they are a very *cause* of this complexity.

113

- 114 • The juxtaposition of two simple speech gestures may evolve to convey
115 increasingly complex meanings.
- 116
- 117 • Such juxtapositions necessarily change the phonetic character of both
118 gestures in systematic ways.
- 119
- 120 • The consequent sound complexes now achieve second-order symbolic
121 status: both many-to-one and one-to-many sound-meaning
122 correspondences come to be present in the speech code.
- 123
- 124 • These sound complexes may also be harnessed to encode new meanings,
125 thus precipitating an explosive growth in the complexity of both the
126 phonetic and the semantic inventories, but yet may, on occasion, result in
127 semantic ambiguity, hence listener confusion and communicative failure.

128

129 **3.3 Entrenching the juxtaposition of two symbols, and the rise of post-**
 130 **compositionality**



131

132 **pu-ti** → **puti?** **pudi?** **p^huzi?** **púti?**

133

- 134 • Earlier, the juxtaposition of one sound to another involved only two
 135 mouth-opening gestures.
- 136 • Now such juxtapositions may involve three or four opening gestures, for
 137 example, **puti-ka**, **puti-kati**, etc.
- 138 • ***We are moving closer to language.***

139 **4. *Third-order symbolism* in the speech code: the ambiguous affiliation of**
140 **string-medial content, and the triggering of hierarchical constituent**
141 **structure and recursion**

142

- 143 • Semantic ambiguity of structural origin feeds a hierarchical constituent-
144 structural analysis, which in turn feeds recursion.

145

146 **4.1 The tug-of-war between first-order and second-order symbolism**

147 • There are now pressures *towards*, and pressures *against* the development
 148 of third-order symbolism. We first consider a passive *resistance to* the
 149 triggering of third-order symbolism.

150

151 • **pu-ti** → **pu-di**, **-di** → **di-**



152
 153 **putika**



154 **pu-tika puti-ka**



155

putiga

156



pu-tiga



157

pudika

158



pudi-ka

- 159 • Oral closure voicing now acts to cue the compositionality of the forms:
160 “boundary signals”.

161



162

163

putika

pu-tika puti-ka



164

165

'pu'tika

'pu-'tika



'puti'ka



'puti-'ka

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- The juxtaposition of a very small inventory of simple meaning-imbued sounds inevitably leads to an explosion of phonetic and semantic complexity, rife with cues to structure and meaning, of the sort possessed by all languages.
- This complexity now sets the stage for full-blown language to emerge, as second-order symbolism gives way to symbolism of the third order.

176 **4.2 The ambiguous affiliation of string-medial content, and the rise of**
 177 **hierarchical constituent structure**



178
 179 **putika**



178
 179 **pu-tika OR puti-ka**

- 180 • Listeners' conditioned expectation of binarity, coupled with the string's
 181 semantic ambiguity, triggers its deeper, higher-order analysis.
 182
- 183 • Structural ambiguity opens the gateway to third-order symbolism, by
 184 requiring listeners to perform a deeper analysis of the sounds than had
 185 been heretofore required.

- 186 • The ambiguous affiliation of the middle term thus opens the gates to
187 hierarchical structure.
- 188
- 189 • (1) sound-sequencing cues
- 190 • (2) meaning-sequencing cues
- 191 • (3) pragmatic cues to the intended meaning and structure of the string.
- 192
- 193 • It is exactly those rarely-encountered ambiguous forms that are most
194 important for the development of the system toward third-order symbolic
195 status.
- 196

197 **4.3 Hierarchical constituent structure, and the rise of recursion**



198
199 **putikakatipu**



200 **putika-katipu** OR
201 **putikaka-tipu** OR
202 **[[pu-ti]-kaka]-tipu** OR
203 **puti-[kaka-[ti-pu]]** OR
[[puti]-ka]-[[kati]-pu], etc.

- 204 • It is the listener's expectation of binarity, coupled with the semantic
205 ambiguity of the string, that triggers deeper structural analyses by the
206 listener, analyses that quickly culminate in both hierarchical and now
207 recursive structures, when embedding involves elements of the same type.

- 208 • *Semantic ambiguity drives linguistic complexity.*

209

210 • The phonetic product of two juxtaposed sounds of increased length may
211 lack semantic clarity, due to an ambiguous affiliation of its middle span.
212 The resulting string is thus ambiguous between (at least) two different
213 structures, each involving these sounds' hierarchical structuring, and thus
214 opening the floodgates of recursion.

215

216 • All the major structural components of language are now in place: a
217 lexicon, a phonology, a morphology, a syntax, a semantics.

218

219 • *We have now arrived at language.*

220

221 **5. Conclusion: the linguistic Big Bang**

- 222 • The humble origins of the speech code likely consisted of extremely short,
223 meaning-imbued sounds uttered in isolation that first accompanied, and
224 then replaced our manual iconic communication system.
- 225 • These sounds' yielding to their juxtaposition in pairs may indeed have
226 triggered a sort of linguistic "Big Bang".
- 227 • Phonetic and semantic pressures came to interact in a way that inexorably,
228 and perhaps rather suddenly, led to genuine linguistic complexity.
- 229 • Listeners' conditioned expectation of binarity, coupled with the sporadic
230 semantic ambiguity of these increasingly long structures, required deeper
231 cognitive analyses in order to extract their meaning, which in turn
232 triggered the emergence of hierarchical and recursive linguistic structures.
- 233 • Semantic ambiguity drives linguistic complexity.
- 234 • These primordial pressures and their yielded structures, in remarkably
235 similar function and form, continue to constrain, shape, and change the
236 speech code, even unto to this very day.

237 **Thank you.**

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