1 Universal 18

1.1 Culbertson & Smolensky 2009

Greenberg’s Universal 18

Adjective-Noun order implies Numeral-Noun order.

According to the World Atlas of Linguistic Structure:

<table>
<thead>
<tr>
<th>Order</th>
<th>Instances</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noun–Adj</td>
<td>443</td>
<td>52%</td>
</tr>
<tr>
<td>Adj–Noun</td>
<td>32</td>
<td>4%</td>
</tr>
<tr>
<td>Noun–#</td>
<td>149</td>
<td>17%</td>
</tr>
<tr>
<td>#–Noun</td>
<td>227</td>
<td>27%</td>
</tr>
</tbody>
</table>

- Adj–N is marked.
- N–# is marked.
- Harmonic orders are preferred (N–# and N–Adj, or #–N and Adj–N).

The mixture shift paradigm

Culbertson & Smolensky (2009) employ the “mixture shift paradigm” (Hudson Kam & Newport 2005). Learners are exposed to an inconsistent mixture of grammatical systems in an artificial language—trying to look at the conditions under which learners regularize the input mixtures to produce a less variable system.

Learners are told they will be learning an alien language. In this case, they hear Noun-Adjective and Noun-Numeral phrases, each of which predominantly appears in one order. One hour-long session, including two training phases each followed by tests, two more testing phases, one production and one judgment.

Let’s learn Alien

10 nouns, 5 adjectives (‘big’, ‘small’, ‘green’, ‘blue’, ‘furry’), 5 numerals (2, 3, 4, 5, 6). Mixtures (apart from the control condition) were 70%–30%.

50 exposure trials (shown picture, heard name), then tests naming picture until 75% correct on 50 trials. Then modifiers. 80 exposure trials, then test (pick the picture that matches the utterance).
2 Ludlings

Attested cases
Nevins (2010) look as language games—like Pig Latin—claiming that they are a reasonable way to explore certain aspects of phonological structure.

Move $\sigma_1$ to end  Fula  pii.roo.wal → roo.wal.pii
Move $\sigma F$ to start  Fula  ka.ma.tis → tis.ka.ma
Transpose $\sigma_1$ and $\sigma_2$  Marquesan  nu.ku.hi.va → ku.nu.hi.va
Transpose $\sigma F$ and $\sigma F^{-1}$  Luchazi  ya.mu.nu.kwe → ya.mu.kwe.nu
Invert order of all $\sigma$s  Saramaccan  va.li.si → si.li.va

All of these yield $\sigma_1 \sigma_2 \rightarrow \sigma_2 \sigma_1$—these are different ways of generalizing that pattern.

Bagemihl’s generalizations
Bagemihl (1989) arrived at some generalizations about what are possible ludlings.

- No ludling reverses the middle two syllables.
- No ludling moves the final syllable to the arithmetic middle.
- No ludling permutes every other segment in a word.
- No ludling permutes feet.
- No ludling permutes sub-segmental features.
Nevins & Endress 2007

Presented 123 → 321, and then asked about 1234. There are four possibilities:

1. Invert the order: 4321
2. Exchange first and last: 4231
3. Exchange final and antepenult: 1432
4. Exchange every other syllable: 3412

Only the first two match up with Bagemihl’s generalizations—only these are “natural” ludlings.

Accounting for the patterns

Nevins (2010) proposes that we can understand the typology of ludlings as arising from either (a) total inversion, or (b) a transposition operation that has the following properties:

(5) Transpose $x, f(x)$ where $x$ is First or Last, and $f(x)$ is one of:
   a. Preceder ([1][2$\leftrightarrow$3])
   b. Succeeder ([1$\leftrightarrow$2][3])
   c. Complement ([1$\leftrightarrow$2][3],[12$\leftrightarrow$3])
   d. Polar ([12345 $\rightarrow$ 52341])
   e. Doppel ([1234][789] $\rightarrow$ [7234][189])

Syllable parts

We need some names for syllable parts.

<table>
<thead>
<tr>
<th>onset</th>
<th>nucleus</th>
<th>coda</th>
<th>rhyme</th>
<th>body</th>
</tr>
</thead>
<tbody>
<tr>
<td>da</td>
<td>d</td>
<td>a</td>
<td>—</td>
<td>a</td>
</tr>
<tr>
<td>bat</td>
<td>b</td>
<td>a</td>
<td>t</td>
<td>at</td>
</tr>
<tr>
<td>play</td>
<td>pl</td>
<td>ay</td>
<td>—</td>
<td>ay</td>
</tr>
<tr>
<td>couch</td>
<td>k</td>
<td>ow</td>
<td>ch</td>
<td>ouch</td>
</tr>
</tbody>
</table>

This works not only with syllables but syllable parts

(6) a. dito $\rightarrow$ doti
    Tagalog
    First, Successor over Nucleus
b. wudit → duwit  
   Javanese  
   First, Successor over Onset

c. balaynun → nulayban  
   Hanunoo  
   First, Polar over Body

d. kenkänsä polki → ponkansa kelki  
   Finnish  
   First, Doppel over Body

2.1 Experiment

Martian rites

Participants watched a Martian rite, where first a chief Martian pronounces a sentence and a subordinate replies. First apprentice was perfect, second apprentice was working on it. Participant’s task was to judge how well the second apprentice was doing.

After the syllable experiment, the same experiment was performed with tones (here, intervals counted instead of syllables, so there were 4-tone sequences demonstrated first, then 5-tone sequences tested.)

Results: syllables

Results: tones
So it looks like musical sequences are not learned in the same way as linguistic transformations.

Also, not every logically possible generalization is pursued when learning syllable-precedence-modifying ludlings, perhaps that edge-switch is unique to linguistic computation.

2.2 Nevins & Toro (2007)

Consonants and vowels

The roles that consonants and vowels play seem to differ. Consonants are really the substance, the vowels kind of hold the consonants together. Semitic languages define roots in terms of consonant sequences, inflected by different interconsonantal vowel patterns, the path from kebra to kobra is easier than that from kebra to zebra.

Languages often have “dissimilation” constraints, that require distinctness between adjacent phonological segments—but almost always between consonants. Vowels harmonize.

Nevins & Toro (2007)

Nevins & Toro (2007) played CVCV words (broadcast of an alien language, listen carefully). C1=C2, always either CaCuCE or CiCeCo. First test (which
could be a word in this language?) against vocalic frames, then against C1=C2 vs. C1=C3.

Then, they reversed consonants and vowels. Frame was formed by consonants (mVkVfV or bVsVrV), V1=V2, second test was V1=V2 vs. V1=V3.

Results: C1=C2/3

Results: V1=V2/3

3 Esperanto

Esperanto

Esperanto is an artificial language, created by L. L. Zamenhof at the end of the nineteenth century. Etc.
According to Bergen’s (2001) review, about 350 documented cases of children being taught Esperanto as an L1 (in a bilingual setting).

Bergen (2001) looks at a few properties of native Esperanto, and finds that it differs from Standard Esperanto in a couple of ways. Here’s one that he discusses.

Tense/aspect in SE

SE uses compound verb+participle constructions to express tense and aspect. Aspect is marked with affixes.

(7) Gi estas/estis/estos konstruanta/konstruata/konstruinta
It is/was/will be constructing/constructed/been constructing

(8) a. plori ‘to cry’
   b. ekplori ‘to cry (punc.)/to start to cry’
   c. plorigi ‘to start to cry’
   d. ploradi ‘to keep crying’
   e. replori ‘to cry again’
   f. elplori ‘to cry [telic]’

NE

Bergen (2001) reports that there was not a single compound form in the two hours of NE speech he analyzed, and one child, once, used ek- in ekploris. (8 NE children, ages 6, 9, 9, 10, 13, 11, 11, 14.)

So, whatever is going on in SE, this suggests that it is not “natural”—perhaps it is making distinctions that are not needed for some other reason, or they don’t map naturally onto the conceptual structures. Esperanto was based heavily on Romance languages, but something is different—Italian children learn the Italian compound forms.

References


