The Paradigm as a Radial Category
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CLEAR group: Cognitive Linguistics – Empirical Approaches to Russian

(1) Suffix shift: Ongoing language change whereby Russian verbs replace the non-productive suffix -a by the productive -aj. The verb kapat’ ‘drip’ has both -a suffixed forms like kaplju and innovative -aj suffixed forms like kapaju.

(2) Slezy kaplju odna za drugoj na klaviši. (Gončarov 1859, with -a suffix)¹
‘The tears drip one after another onto the keyboard.’

(3) Slezy v šči kapajut. (Bitov 1969, with -aj suffix)
‘The tears drip into the cabbage soup.’

(4) Forms of kapat’ ‘drip’ with original -a suffix and innovative -aj suffix

<table>
<thead>
<tr>
<th>Verb Form</th>
<th>-a suffix</th>
<th>-aj suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Past 1sg</td>
<td>kaplju</td>
<td>kapaju</td>
</tr>
<tr>
<td>Non-Past 2sg</td>
<td>kapleš’</td>
<td>kapaes’</td>
</tr>
<tr>
<td>Non-Past 3sg</td>
<td>kaplet</td>
<td>kapaet</td>
</tr>
<tr>
<td>Non-Past 1pl</td>
<td>kaplem</td>
<td>kapaem</td>
</tr>
<tr>
<td>Non-Past 2pl</td>
<td>kaplete</td>
<td>kapaete</td>
</tr>
<tr>
<td>Non-Past 3pl</td>
<td>kaplju</td>
<td>kapajut</td>
</tr>
<tr>
<td>Present Active Participle</td>
<td>kapluščij</td>
<td>kajuščij</td>
</tr>
<tr>
<td>Imperative</td>
<td>kaplji(te)</td>
<td>kapaji(te)</td>
</tr>
<tr>
<td>Gerund</td>
<td>kaplja</td>
<td>kapaja</td>
</tr>
<tr>
<td>Infinitive</td>
<td>kapat</td>
<td>kapat</td>
</tr>
<tr>
<td>Past masc sg</td>
<td>kapal</td>
<td>kapal</td>
</tr>
<tr>
<td>Past fem sg</td>
<td>kapala</td>
<td>kapala</td>
</tr>
<tr>
<td>Past neut sg</td>
<td>kapalo</td>
<td>kapalo</td>
</tr>
<tr>
<td>Past pl</td>
<td>kapali</td>
<td>kapali</td>
</tr>
</tbody>
</table>


(6) Verbs undergoing suffix shift (to different degrees):²

<table>
<thead>
<tr>
<th>Verb</th>
<th>#a</th>
<th>#aj</th>
<th>#Total</th>
<th>%aj</th>
</tr>
</thead>
<tbody>
<tr>
<td>alkat’ ‘hunger’</td>
<td>123</td>
<td>10</td>
<td>133</td>
<td>8</td>
</tr>
<tr>
<td>blistat’ ‘shine’</td>
<td>249</td>
<td>272</td>
<td>521</td>
<td>52</td>
</tr>
<tr>
<td>bryzgat’ ‘spatter’</td>
<td>222</td>
<td>119</td>
<td>341</td>
<td>35</td>
</tr>
<tr>
<td>vnimat’ ‘perceive’</td>
<td>95</td>
<td>273</td>
<td>368</td>
<td>74</td>
</tr>
<tr>
<td>glodat’ ‘gnaw’</td>
<td>158</td>
<td>6</td>
<td>164</td>
<td>4</td>
</tr>
<tr>
<td>dremat’ ‘slumber’</td>
<td>492</td>
<td>1</td>
<td>493</td>
<td>0.2</td>
</tr>
<tr>
<td>dvigat’ ‘move’</td>
<td>1093</td>
<td>479</td>
<td>1572</td>
<td>30</td>
</tr>
<tr>
<td>šaždat’ ‘thirst’</td>
<td>1239</td>
<td>16</td>
<td>1255</td>
<td>1</td>
</tr>
<tr>
<td>kapat’ ‘drip’</td>
<td>78</td>
<td>106</td>
<td>184</td>
<td>58</td>
</tr>
<tr>
<td>klepat’ ‘slander’</td>
<td>15</td>
<td>15</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>klikat’ ‘call’</td>
<td>184</td>
<td>11</td>
<td>195</td>
<td>6</td>
</tr>
</tbody>
</table>

¹ Examples (2) and (3) are from the Russian National Corpus: www.ruscorpora.ru.
² The table includes only simplex verbs (unprefixed verbs without reflexive postfix –sja).
Two alternative approaches to paradigms

a. Aristotelian category: A paradigm is a list of the inflected forms of a lexeme. The list lacks internal structure—all forms have the same status. Ex: The Word and Paradigm model (Matthews 1972), Optimal paradigms (McCarthy 2005)


Language change: Empirical predictions

a. Aristotelian category: If we assume that paradigms lack internal structure, we expect all forms to be equally affected by language change.

b. Radial category: If we assume that paradigms have internal structure, we expect different forms to be affected by language change to different degree. Peripheral forms are expected to be most innovative.

Method: Statistical analysis by means of Logistic Mixed Effects Modeling, a method that facilitates analysis of the impact of a number of relevant factors.³

Hierarchy: Forms ranked according to prototypicality

3 sg > 3 pl > 1 & 2 person > imperative > participle/gerund

Predictions:

a. 3 sg is the most conservative form (least affected by suffix shift)

b. Participle and gerund are the most innovative forms (most affected by suffix shift)

³ We would like to thank R. Harald Baayen for help with the statistical analysis.
(12) Results

(13) Interpretation of results:
   a. Results suggest that the predictions are correct.
   b. However, the participle is a problem, insofar as it behaves like a finite form with regard to suffix shift.

(14) Hypothesis about the active participle:
   Relationships of form override prototypicality. The fact that the participle behaves like a finite form is motivated by its formal resemblance of finite forms (the 3 pl). Particiles represent a so-called parasitic formation from the 3 pl in the sense that the participle “borrows” the vowel from the 3 pl ending (cf. čitajut – čitajušće, govorjav – govorjašće).

(15) Frequency – an alternative hypothesis about suffix shift: The least frequent forms are most prone to undergo suffix shift.

(16) Frequency yields incorrect predictions for the gerund
   a. Prototypicality: 3 sg > 3 pl > 1 & 2 pers > imp > gerund
   b. Frequency: 3 sg > 3 pl > gerund > 1 & 2 pers > imp

(17) Frequency – written vs. spoken language:
   Maybe the high frequency of the gerunds is due to the fact that spoken language is underrepresented in the corpus (and hence in our database)? If gerunds are less frequent in spoken Russian, maybe the frequency hypothesis can be saved?

(18) Gerund frequencies in written and spoken Russian:

<table>
<thead>
<tr>
<th></th>
<th># lemmas</th>
<th># gerunds</th>
<th>% gerunds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole corpus</td>
<td>13581979</td>
<td>501036</td>
<td>3.7</td>
</tr>
<tr>
<td>Spoken corpus</td>
<td>135326</td>
<td>1522</td>
<td>1.1</td>
</tr>
</tbody>
</table>

The difference between written and spoken language is statistically significant (p<2.2e-16), but the effect size is less than “small” (Cramer’s V = 0.01). This suggests that the frequency difference has minimal impact. It is nevertheless impossible to exclude that frequency is relevant for suffix shift.
(19) Summing up
a. Suffix shift is sensitive to morphosyntactic features insofar as different forms are affected to different degrees: 3 sg is the most conservative form, while the gerund is most innovative.
b. Paradigm structure: Our results are compatible with the hypothesis that paradigms are radial categories with internal structure.
c. Frequency: It is possible, but not very likely that frequency is of decisive importance.

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