

## When Opacified Allophony Creates Variable Derived-Environment Effects: Sanskrit Velar-Palatal Alternations

Ryan Sandell (ryan.sandell@lrz.uni-muenchen.de) & Hang Liu (hang.liu@campus.lmu.de), LMU München

This paper investigates the relationship between phonologization, restructuring, and the pertinacity of opacified phonological processes through a large-scale quantitative analysis of alternations between palatal and velar obstruents in root-final position in Sanskrit. We contend that the synchronically observable alternations [k]~[c] and [g]~[j] at the root + affix boundary are attributable to different root- and affix-specific propensities to select — and even productively generate — a given root allomorph. Sanskrit data in (1) suggest that different roots exhibit different patterns in the context of the same word-formation affixes (see Whitney 1885, Werba 1997; glosses after Whitney 1885; see Wackernagel and Debrunner 1954 on Sanskrit word-formation affixes). How can such velar-palatal alternations be modeled in a synchronic phonological grammar, and what relation does that grammar bear to the historical developments that gave rise to it?

### (1) Velar–Palatal Allomorphy across Word-formation Suffixes in Sanskrit

		Word-formation Suffixes					
Root	Gloss	[-ə-]	[-ənə-]	[-mə-]	[-mən-]	[-rə-]	Other
1. <i>sak</i>	[çək-] ‘be able’	[çákə-]	—	[çəgmá-]	[çékmən-]	[çékré-]	[çéca-i-]
2. <i>ruc</i>	[ruc-] ‘shine’	[ró:kə-]	[ro:cəná-]	[rukrmá-]	—	—	[ruc-a-]
3. <i>arc</i>	[ərc-] ‘shine’	[r̥cə-]/[ərká-]	[ərcənə-]	—	—	—	[rk-vá-]
4. <i>vij</i>	[vij-] ‘tremble’	[vé:ga-]	[ve:jənə-]	—	—	[vigrá-]	[ve:j-əkə-]
5. <i>vaj</i>	[vəj-] ‘be strong’	[vəjə-]	[vəjənə-]	—	[o:jmán-]	[ugrá-]	[ó:j-əs-]
6. <i>aj</i>	[əj-] ‘drive’	[əjá-]	[əjənə-]	[əjmá-]	[ájmən-]	[éjrə-]/[égrə-]	[əj-vin-]

The sound changes responsible for producing the state of affairs underlying the data exemplified in (1) are well known (see, i.a., Wackernagel 1896, Kobayashi 2004, Lubotsky 2018): in Proto-Indo-Iranian (PIIrr.), velar stops underwent palatalization preceding [+front] vocoids (\*/e(:), i(:), j/); this process was subsequently counteracted by the merger of [-high] vowels as short [ə] and long [a:], leading to an unpredictable distribution of velars and palatalized velars (> Skt. palatals [c] and [j]) preceding non-high vowels. A further confound in Sanskrit is the fact that the voiced PIIrr. palato-alveolar affricate \*/j/, distinct from the PIIrr. palatalized velar, likewise yields a palatal stop [j] preceding [+sonorant] segments (see 6. *aj* in (1)). To better describe the patterning and distribution of palatal and velar root allomorphs, we collected all nominal and adjectival derivatives given in Whitney 1885 in which the leftmost segment of the derivational suffix is a [+sonorant] segment, for all roots given with a final palatal or velar segment that attest velar-palatal allomorphy ( $N = 697$ ). A binomial Bayesian logistic regression model (Gelman et al. 2009, Gelman et al. 2013) with the categorical predictor variables ROOT and SUFFIX and response variable FINAL\_SEGMENT (palatal = 1, velar = 0) was generated. Results indicate that palatals represent the default outcome before sonorants: 534/697 (~76.6%) of all derivatives contain a root-final palatal, and the INTERCEPT in the model thus significantly prefers a palatal outcome. Meanwhile, 12 suffixes, representing ~55% of all types in the data, exhibit statistically significant propensities (nine towards a velar outcome). The affix /-ə-/ (< \*/-o-;/; 117 tokens) exhibits a strong velar propensity in accord with its historical origin, so that novel velar allomorphs may appear with this suffix to roots that otherwise consistently show a palatal (e.g., *yāg-a-* to *yaj*; see von Böhlingk and Roth 1855: s. v. *yāga*). These conclusions imply that many Sanskrit roots are subject to a process of variable PALATAL VELARIZATION in the context of certain word-formation suffixes; this would constitute a species of rule inversion (Vennemann 1972) vis-à-vis the Indo-Iranian process of velar palatalization. Furthermore, since there is no general process of velarization preceding [+sonorant] segments, velar vs. palatal allomorph selection/generation in Sanskrit may be characterized as a (variable and affix-specific) Derived-Environment Effect (DEE; Kiparsky 1973, Mascaró 1978): the same phonological context internal to a root or stem may condition a different outcome across a morpheme boundary. The Sanskrit situation thus parallels the variable velar palatalization triggered by suffixes in Slovenian (Jurgec 2016) or *rendaku* in Japanese (Ito and Mester 2003).

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