

## Kluge's Law: chronology, limits on co-articulation, geminate fortition

Roland Noske

Lille 3 University / STL

Kluge's Law (KL) of Proto-Germanic (PGmc) is traditionally described as the total assimilation of a pretonic nasal to a preceding voiced obstruent. It chronologically follows acts 1 and 3 of Grimm's Law (GL; spirantization of plain stops and de-aspiration of voiced aspirates, respectively), as well as Verner's Law (VL), and precedes Occlusivization and act 2 of GL. Table (1) (adapted from Kroonen 2011:50) illustrates the derivations from Proto-Indo-European (PIE) to PGmc for the combinations of plain stop + *n*, voiced aspirate + *n* and voiced stops + *n* (the three types of stop in PIE) respectively:

(1)	Dutch <i>wit</i>	English <i>bottom</i>	Middle High German <i>stutzen</i>
PIE	* <i>kuit-nó-</i>	* <i>b<sup>h</sup>ud<sup>h</sup>-nó-</i>	* <i>stud- néh<sub>2</sub>-</i>
GL, acts 1 & 3	* <i>hwiθ-ná-</i>	* <i>bud-ná-</i>	N.A.
VL	* <i>hwið-ná-</i>	* <i>buð-ná-</i>	N.A.
KL	* <i>hwiðða-</i>	* <i>buðða-</i>	* <i>studdō-</i>
Occlusivization	* <i>hwidda-</i>	* <i>budda-</i>	N.A.
GL, act 2	* <i>hwitta-</i>	* <i>butta-</i>	* <i>stuttō-</i>
PGmc	* <i>hwitta-</i>	* <i>butta-</i>	* <i>stuttō-</i>

These traditional derivations are problematic, because:

- (i) acts 1 and 3 of GL are chronologically separated from act 2, although GL is widely seen as a chain shift;
- (ii) there is a complicated detour via spirantization, voicing, occlusivization and devoicing (*tn>θn>ðn>ðð>dd>tn>tt* instead of *tn>tt*);
- (iii) in practice, *n* **only** assimilates to preceding **voiced** stops, whereas phonetic research shows that voiced geminates (especially voiced fricative geminates as in \**hwiðða-*) encounter aerodynamic difficulties (Dmitreeva 2012, Hayes & Steriade 2004, Jaeger 1978, Ohala 1983, Westbury & Keating 1986);
- (iv) original PIE sibilants do not assimilate to preceding obstruents and do not occlusivize either; this puts into question the validity of the fricative detour in the derivations of \**hwitta-* and \**butta-*.

Kortlandt (1988, 1991) presents an analysis of KL under the Glottalic Theory of PIE (where *T*, *D<sup>h</sup>*, *D* have been replaced by *T*, *D*, *T<sup>ʀ</sup>* respectively (upper case characters generalize over place of articulation)). In Kortlandt's analysis, KL precedes GL but follows VL. For the PIE > PGmc derivation of \**hwitta-*, there is no more a detour via spirantization and occlusivization, but there still is one via voicing and devoicing. Furthermore, problem (iii) remains. Because of the postulated order VL>KL>GL, Kortlandt's analysis is also incompatible with the recent insight that under Glottalic Theory, VL and GL can be analyzed as a **single process** (GVL; Perridon 2007, 2008; Noske 2009, 2012).

I will present here arguments in favour of the chronology: KL > GVL instead of the order VL > KL > GL as proposed by Kortlandt. The upshot is that all four problems mentioned above then disappear. I will also show that KL was not really an assimilation conditioned by the fact that a following vowel is stressed, but by fact that a **preceding vowel is unstressed**, and thus has the same conditioning as Verner's Law. This conditioning can be grounded in phonetic research, e.g. by De Jong et al. (1993), showing that co-articulation effects are reduced or blocked in (post-)stress environments. This view can be formally captured in a view of phonological processes as being output-driven, where constraints are separated from the processes they determine.

Under Glottalic Theory, the PIE forms in table (1) are: \**kuit-nó-*, \**bud-nó-* and \**stut<sup>h</sup>-néh<sub>2</sub>-*. Because act 2 of GL (D > T) no longer exists under the same theory, a separate process of geminate fortition needs to be postulated for the derivation PIE \**bud-nó-* > \**budda* > PGmc \**butta-*. Such a process is straightforward and present in many languages (e.g. Japanese, Kawahara 2006) .

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