Back to the root – and away again!

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1. Pāṇinian morphology

2. Roots in phonology
   - Root constraints
   - Roots as domains for phonological processes

3. Roots in morphology

Pāṇini: morph-based, constructive morphology

- construction rules
- $d^{ñ}$ātupāṭ^{h}a with anuband^{ñ}as as assembly instructions
- gaṇapāṭ^{h}a and u^{ṇ}-ādisūtras, both of later origin

And elsewhere?

> *One cannot help but be struck by the fact that the vast majority of grammatical traditions associated with morphologically complex languages are word based. (Blevins 2003: 758)*

types of morphological analysis

- morpheme-based vs. realization-based
- morph-based vs. word-based
- constructive vs. implicative (for the term see Stump 2016: 257)
- procedural vs. declarative
- late vs. early insertion

So, why roots?

- Roots never show up in actual speech.
  - Every root actually occuring is at the same time a word (or a stem).
- Roots are not necessarily formally uniform (on the surface and underlyingly).
- Roots do not necessarily have an identifiable denotational semantics.
- Roots do not have a unique linguistic function.
- The mental lexicon is structured around words (and assonances), not roots (Hay and Baayen 2005).

Why introduce an additional entity to linguistic description?

Because it is of empirical value!
Or is it?

The programme

The Sanskrit grammarians invented the root.

So, test the concept of the root in the language it was designed for!
plus: add some remarks on PIE along the way...

- Is the root a domain for phonological constraints / processes?
- Is the root a plausible part of the knowledge of native speakers of Vedic?
  - Is it necessary for capturing relations in morphology?
  - Is it identifiable?

Roots in phonology

- Are there any phonotactic wellformedness constraints on roots?
  Alternatives:
  - constraints on syllables?
  - chance?
- Are there any phonological processes targeting the root or root edges?
  Alternatives:
  - syllables as domains?
  - pure phonotactics?

Root constraints

in Vedic:

- constraints on complex root-edges are constraints on syllable edges (Keydana 2004, Cooper 2014, Byrd 2015).
- the constraint against two aspirates in one root is a simple OCP-effect (as is Grassmann's Law), see Kobayashi (2004: 114-6) with literature

in PIE

- constraints on syllables as in Vedic
- similarity avoidance: OCP
  - no two voiced stops: of no statistical significance, see now Cooper (2009; 2011)
- no voiceless stop + media aspirata: again low O/E value (Cooper 2009: 58). Cf. also Iverson and Salmons (1992: 310)

Bartholomae

Kobayashi (2004: 119-121) treats Bartholomae's law as an instance of root-suffix asymmetry:

/bud^{ɦ} + tá-/	LICENSE(lar)	MAXRT[sg]	LINEARITY	IDENTAFF(lar)	MAXRT[vcd]
bud^{ɦ}tá-	∗!				
☞ budd^{ɦ}á-				∗	
bud^{ɦ}dá-	∗!			∗	
butt^{h}á-				∗	∗!
buttá-		∗!			∗
b^{ɦ}uttá-			∗!	∗	∗

Bartholomae without MAXROOT: The premises

- Aspiration is the result of maximal glottal aperture.
  → feature: [spread glottis]
- Breathy voice is the result of "the most open setting of the vocal folds in which vibration will occur" (Ladefoged and Maddieson 1997: 49).
  → feature: [murmur]
  - Empirical evidence for the difference in features comes from aspiration throwback, cf. /búd^{ɦ}–b^{ɦ}is/ → *b^{ɦ}údb^{ɦ}iḥ* vs. /á-bud^{ɦ}-t^{h}ās/ → *ábudd^{ɦ}āḥ*.
  - Loss of both /^{ɦ}/ and /^{h}/ in reduplicants is no evidence for identity (*pace* Borowsky and Mester 1983: 62), rather triggered by a constraint against complex segments dominating IDENTBR.
- COHESIVECLOSURE (Kobayashi 2004: 28) is undominated.

Bartholomae without MAXROOT: The consequences

- [murmur] necessarily implies [+ voice], thus “voice assimilation” is not an assimilation, but simply the only way to instantiate [murmur] in environments satisfying COHESIVECLOSURE.
- Highly ranked IDENTIO$_{[murmur]}$ forces the realization of [murmur]. Its shift to the final C of the cluster is a result of cohesive closure (parasitic licensing, Kobayashi 2004: 121,fn.27).
- Thus, no need for root-constraints!

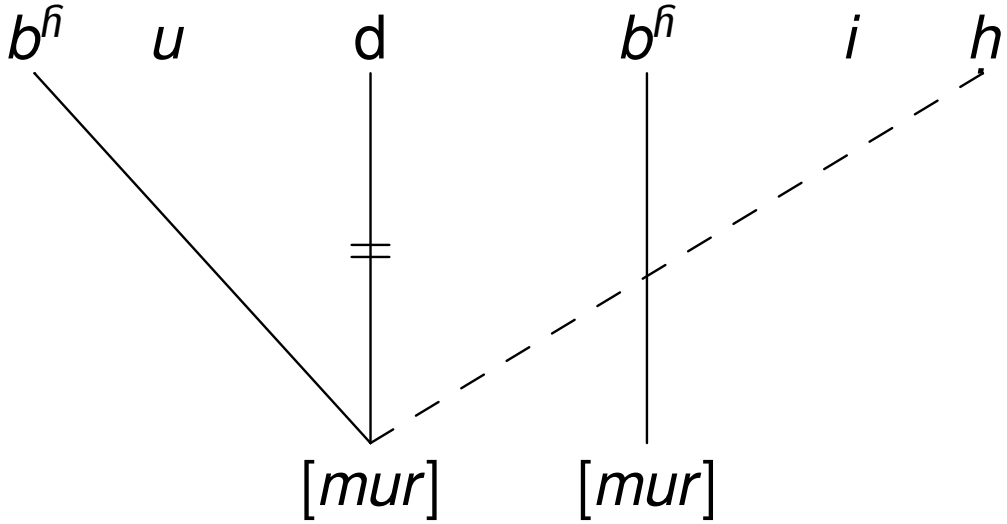
The grammar

/bud^{ɦ} + tá-/	CohesiveClosure	Ident-IO$_{[murmur]}$	Linearity-IO	Ident-IO$_{[voice]}$
bud^{ɦ}tá-	∗!			
☞ budd^{ɦ}á-				∗
bud^{ɦ}dá-	∗!			
butt^{h}á-		∗!		∗
buttá-		∗!		∗
b^{ɦ}uttá-			∗!	∗

Aspiration throwback

According to Kobayashi (2004: 124) another case of MAXROOT$_{[\text{spread glottis}]}$.
But:

- COHESIVECLOSURE turns [murmur] into a floating autosegment,
- high-ranked IDENTIO$_{[\text{murmur}]}$ ensures anchoring of [murmur],
- no-crossing-constraint blocks anchoring on *ḥ*,
- IDENTIO$_{[\text{murmur}]} \gg$ IDENTIO$_{[\text{spread glottis}]}$ ensures *ábudd^{ɦ}āḥ* etc.



rt / *rk* at right word edges: only if root internal?

Wackernagel (1896: 304): "*r* + folgendem Verschlusslaut. . . überhaupt in allen solchen Formen, deren Verschlusslaut wurzelhaft ist. . . Suffixaler Verschlusslaut. . . hielt sich in der Regel nicht."
But:

- RV 1.174.2, 6.27.5 *dar-t*, cf. Wackernagel (1896: 304): "Vielleicht lauteten alle gleichartig gebildeten Formen v. ursprünglich auf *-art* aus."
- metrically restored *rt* improves the cadence in RV 7.75.1, 9.92.5, 10.69.10 (Oldenberg 1888: 424,fn.1, Wackernagel 1896: 304). "Stellen, die für die Kürze zeugten, stehen nicht entgegen" (Oldenberg 1888: 424,fn.1).
- *-r(t)*-forms more frequent in metric positions where heavy syllables are preferred (thanks to Dieter Gunkel for his help!)

Liquid metathesis: only in roots?

Wechsel zwischen sonantischer und konsonantischer Aussprache verbunden mit Metathesis zeigt sich in der Ersetzung von vr̥ durch ru . Unleugbar ist solche bei den Wurzeln dhr̥ "beugen" und hvr̥ "schief gehen" . . . (Wackernagel 1896: 206)

- *víhruta-*, *víhruṇāti* vs. *áparihvr̥ta-* (: *hvárate*) etc. (Hoffmann 1980).
- restriction to roots a natural consequence of the distribution of *vr̥*-sequences.
- in PIE clearly not restricted to roots, e.g. PIE */*su̯ekʷurh$_2$/ > */*su̯ekʷruh$_2$/, ved. *śvaśrū-* besides *śváśura-*, (Mayrhofer 1986: 162)

What is a root?

6.2 A simple form is a root. 6.3 A derived form consists of one or more underlying forms to which a process has been applied. (Hockett 1954: 227-8)

. . . a root is merely what remains when one abstracts away from the exponents that distinguish the inflected forms of a paradigm. (Blevins 2003: 756)

. . . roots – the most deeply embedded morphemes in the open class, content vocabulary such as nouns and verbs. (Bobaljik 2015: 23)

And in Vedic?

Verbal roots

are the common denominator of verb forms and derivatives thereof, monosyllabic, with one underlying phonological exponence[?] and a constant underlying semantics[?].

But what about nouns?

súvar-	*púmāṁs-*	*yákar-*
páti-	*áhi-*	*púruṣa-*

Phonological exponence?

> *Allomorphs are predictable in terms of the environments in which it [sc. the morpheme] occurs. (Hockett 1954: 215).*

Take *vah* as an example:

3.sg.prs. *váh-a-ti* 3.sg.s-aor. *á-vāṭ*
ppp. *ūḍʰá-*

Or take *han*:

3.sg.prs. *hán-ti* 3.pl.prs. *gʰn-ánti* ipv. *ja-hí*
3.sg.prf. *ja-gʰnắn-a* ppp. *ha-tá-*

to make things worse, cf. suppletive aorist *vádʰiṣ-* (García Ramón 1998: 149)

So, what *is* a root formally?

Common semantics?

vid[1] 'know' vs. *vid*[2] 'find'	one formal exponence (both from PIE **u̯eid̯-*), but different semantics
púṣ(yati)	intransitive 'prosper', transitive 'make thrive' (Kulikov 1999: 233-40, Kümmel 2000: 315-6): one formal exponence, but different subcategorization frames
tap	'burn', 'make burn'; 'suffer', 'torture' (Gotō 1987: 159-160 with fn.253): different semantics and different subcategorization frames

Das Wurzelmorphem ist damit auch nicht "Träger der lexikalischen Bedeutung" eines "Verbs" (pace Werba (1997: 127). (Pooth 2014: 100)

Morphonology and fuzzy denotational semantics aside: Are roots morphemes?

Morphemes are form-classes with distinct (and uniform) properties or meanings (cf. Hockett 1947).
But:

han in *hán* etc.	strike′ + [imperf] (ignore the 3.sg.inj.): cannot be infered: *han* is an achievement verb, no iterative meaning in Vedic (*pace* García Ramón 1998: 147)
han in *hántavái* etc.	strike′
han in *vr̥trahan* etc.	slayer′ with [+N, -V] , [masc] (Scarlata 1999: 691-3) (ignore the voc.)
gā in *gā́t* etc.	go′ + [perf]: cannot be infered: synchronically clearly an activity reading, cf. Hoffmann (1967: 275)
gā in *gītá-*	go′

Roots as building blocks for morphological processes

- affixation (even infixation) is best described as a relation between words
- ablaut affects roots and affixes alike, can be described in terms of syllables
- stress and stress shift can be described in terms of syllables
- (note that accent and ablaut patterns have always been defined over stems!)

Roots don't predict possible morphological forms.

Anuband[ɲ]as demonstrate this failure of a constructive, root-based analysis, are "symptoms of overextraction" (Blevins 2006: 553).

Forms alone 'may exhibit patterns of interpredictability' (Blevins 2003: 756).

- weak stems predict strong stems: from *gʰnanti*, *hanti* can be deduced (not vice versa!)
- *-áya*-causatives predict reduplicated aorists (Jamison 1983: 216)
- seṭ is synchronically only predictable from verb forms. Even information about the root itself cannot be deduced from the root!
- the ppp is the only verb form derived directly from the root. But is it predictable?
  - *-tá-* and *-ná-* compete in a non-predictable fashion,
  - the root shape in *-tá*-participles, too, is not necessarily predictable, cf. *dattá-* (: *dā*), *krāntá-* (: *kram*), *patitá-* (: *pat*; even if from PIE **peth*$_1$, synchronically clearly aniṭ)
- derivation is clearly word/stem-based in cases like e.g. the *cakrí*-type (Grestenberger 2013)

More on interpredictability

> *[T]he special diagnostic value of principal parts turns out, on the examination of complex morphological systems, to be a property shared to some degree by all forms in paradigms. (Ackerman and Malouf 2013: 453)*

Recent work in PIE has made extensive use of interpredictability of forms:

- case forms predict accent/ablaut stems
- internal derivation is stem/word based
- hypostasis is *per definitionem* word based
- the Caland system is stem/word based

Analogy as evidence for word based morphology

Analogy is a result of pattern recognition, i.e. it is based on the retrieval of information from memory.

Thus, analogy presupposes *formes de fondation* or *mots-bases* (Kuryłowicz 1949), i.e. exemplars (Hay and Baayen 2005: 344) stored in the lexicon.

Ved. *sacāná-* ‘accompanied’ as an example

- ‘aorist participle’ *sacāná-* (RV 6.20.2), but isolated in the averbo.
- looks like a root aorist, but
  - shows imperfective reading, functionally equivalent to *sácamāna-*, e.g. RV 9.74.5, cf. Lowe 2015: 208)
  - no root aorist attested in Early Vedic (*sacīmahi* post-RV innovation according to Narten 1964: 262). Av. 3.pl. ipv. *scaṇtū*) confirms root aorist for Iranian, but clearly with a non-durative meaning (Kümmel 2000: 540).
- patterns in formation and imperfective semantics with *pra-sahāná-*, *prat^{h}āná-*, etc., “on which it must be based” (Lowe 2015: 247).
- note: The pattern overrides categorial constraints on word formation!

So, what does remain of roots?

- Roots are convenient tools for reconstruction and analysis.
- But roots hardly have linguistic reality:
  - roots lack predictive value,
  - roots are not ‘units of storage’ (Blevins 2003: 742),
  - roots are epiphenomena of a constructive item-and-arrangement model,
  - roots reflect the (misleading) Pāṇinian premise that morphology is in essence agglutinative.

[A] speaker’s lexical knowledge corresponds more to a large relational database than to a generalpurpose grammar or automaton in which lexical storage is in some sense more ‘costly’ than computational operations. (Blevins 2006: 570)

References I

Ackerman, F. and Malouf, R. (2013). Morphological organization: The low conditional entropy conjecture. *Language*, 89:429–464.

Blevins, J. (2003). Stems and paradigms. *Language*, 79(4):737–767.

Blevins, J. P. (2006). Word-based morphology. *Journal of Linguistics*, 42:531–573.

Bobaljik, J. D. (2015). Distributed morphology. Encyclopedia chapter, to appear.

Borowsky, T. and Mester, R.-A. (1983). Aspiration to roots: Remarks on the Sanskrit diaspirates. In *CLS 19: Papers from the Nineteenth Regional Meeting*, 52–63. Chicago Linguistic Society, Chicago.

Byrd, A. M. (2015). *The Indo-European Syllable*. Brill, Leiden; Boston.

Cooper, A. I. (2009). Similarity avoidance in the Proto-Indo-European root. *University of Pennsilvania Working Papers in Linguistics*, 15(1):55–64.

Cooper, A. I. (2011). Stop co-occurence in the PIE root: A new perspective. In Lima, S., Mullin, K., and Smith, B., eds., *NELS 39: Proceedings of the 39th Meeting of the North East Linguistic Society, Vol. 1*, 217–226, Amherst, Mass. GLSA.

Cooper, A. I. (2014). *Reconciling Indo-European Syllabification*. Brill, Leiden; Boston.

García Ramón, J.-L. (1998). Indogermanisch *$g^{\underset{\sim}{u}h}$*en-* '(wiederholt) schlagen, töten'. In Jasanoff, J. H., Melchert, H. C., and Oliver, L., eds., *Mír Curad. Studies in honor of Calvert Watkins*, 139–154. Institut für Sprachwissenschaft, Innsbruck.

Gotō, T. (1987). *Die „I. Präsensklasse" im Vedischen. Untersuchung der vollstufigen thematischen Wurzelpräsentia*. Österr. Akademie der Wissenschaften, Wien.

Grestenberger, L. (2013). The Indo-Iranian *cakrí*-type. *Journal of the American Oriental Society*, 133(2):269–293.

Hay, J. B. and Baayen, R. H. (2005). Shifting paradigms: gradient structure in morphology. *Trends in Cognitive Sciences*, 9(7):342–348.

Hockett, C. F. (1947). Problems of morphemic analysis. *Language*, 23:321–343.

Hockett, C. F. (1954). Two models of grammatical description. *Word*, 10:210–231.

Hoffmann, K. (1967). *Der Injunktiv im Veda. Eine synchronische Funktionsuntersuchung*. Winter, Heidelberg.

References II

Hoffmann, K. (1980). Das Verbaladjektiv von *hvṛ* bei Pāṇini. *Studien zur Indologie und Iranistik*, 5/6:87–98.

Iverson, G. K. and Salmons, J. C. (1992). The phonology of the Proto-Indo-European root structure constraints. *Lingua*, 87:293–320.

Jamison, S. W. (1983). *Function and Form in the -áya-Formations of the Rig Veda and Atharva Veda*. Vandenhoeck & Ruprecht, Göttingen.

Keydana, G. (2004). Silbenstruktur und Phonotaktik im Indogermanischen. In Kozianka, M., Lühr, R., and Zeilfelder, S., eds., *Indogermanistik – Germanistik – Linguistik*, 163–192, Hamburg. Indogermanische Gesellschaft, Kovač.

Kobayashi, M. (2004). *Historical Phonology of Old Indo-Aryan Consonants*. Research Institute for Languages and Cultures of Asia and Africa. Tokyo University of Foreign Studies, Tokyo.

Kulikov, L. (1999). May he prosper in offspring and wealth. a few jubilee remarks on the typology of labile verbs and sanskrit *púṣyati* 'prospers; makes prosper'. In Rakhilina, E. V. and Testelets, Y. G., eds., *Typology and Linguistic Theory. From description to explanation. For the 60th birthday of Alexandr E. Kibrik*, 224–244. Languages of Russian Culture, Moscow.

Kümmel, M. J. (2000). *Das Perfekt im Indoiranischen. Eine Untersuchung der Form und Funktion einer ererbten Kategorie des Verbums und ihrer Weiterentwicklung in den altindoiranischen Sprachen*. Reichert, Wiesbaden.

Kuryłowicz, J. (1949). La nature des procès dits 'analogiques'. *Acta Linguistica*, 5:121–138.

Ladefoged, P. and Maddieson, I. (1997). *The sounds of the world's languages*. Blackwell, Oxford.

Lowe, J. J. (2015). *Participles in Rigvedic Sanskrit*. Oxford University Press, Oxford.

Mayrhofer, M. (1986). *Lautlehre. Segmentale Phonologie des Indogermanischen*. Winter, Heidelberg.

Narten, J. (1964). *Die sigmatischen Aoriste im Veda*. Harrassowitz, Wiesbaden.

Oldenberg, H. (1888). *Die Hymnen des Rigveda. Bd. 1: Metrische und textgeschichtliche Prolegomena*. Hertz, Berlin.

Pooth, R. A. (2014). *Die Diathesen Aktiv vs. Medium und die Verbsemantik im Vedischen der Ṛgveda-Saṃhitā*. PhD thesis, Universiteit Leiden.

Scarlata, S. (1999). *Die Wurzelkomposita im Ṛg-Veda*. Reichert, Wiesbaden.

Stump, G. (2016). *Inflectional Paradigms. Content and Form at the Sytax-Morphology Interface*. Cambridge University Press, Cambridge UK.

Wackernagel, J. (1896). *Altindische Grammatik. Band 1. Lautlehre*. Vandenhoeck & Ruprecht, Göttingen.

Werba, C. H. (1997). *Verba Indoarica: die primären und sekundären Wurzeln der Sanskrit-Sprache. Pars I: Radices Primariae*. Verlag der Österreichischen Akademie der Wissenschaften, Wien.

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