

No reference to precedence in English affixation

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ABSTRACT. This paper employs the Precedence-free Phonology (PfP) model to explore how the linearisation of affixed forms is achieved without referring to precedence relations between base and affix. This process is assumed to take place at the AP interface by translating asymmetric relations between constituents in a given hierarchical structure into a linear order of constituents. In the case of English, which follows one form of *the principle of phonetic linearisation* (Nasukawa et al. 2019, Nasukawa 2020), the affix which is most deeply embedded phonetically manifests itself first ('prefix'), while the affix located at the top of a structure is phonetically realised last ('suffix'). In this approach, the labels 'prefix' and 'suffix' are treated merely as descriptive terms which refer to the phonetic outcome of the process which determines the linearization of phonological hierarchical structure.*

Keywords: Precedence-free Phonology, affixation, hierarchical structure, no precedence, externalization

1. Introduction

In syntax it is widely claimed that a syntactic object, where no precedence attributes are specified, is phonetically linearised on the basis of hierarchical structure (Haider 1992, 2013; Kayne 1994; Cinque 1993; Kural 2005; et passim). On the other hand, in phonology and morphology it is assumed that precedence relations are formally specified between segments and morphemes, respectively, to determine linear ordering within phonological and morphological forms (Bromberger and Halle 1989, Raimy 2000, et passim). In the context of evolinguistics, it has to be investigated why these two different types of linearization are used when linguistic structure is externalised.

* Part of an earlier version of this paper was presented at the 11th workshop on the phonological externalization of morphosyntactic structure held online on 13 February 2021. Although the present paper is a revised and extended version of that presentation, it is still a work in progress. My thanks go to the workshop organiser Hisao Tokizaki for giving me an opportunity to give the presentation, to the workshop participants for their constructive comments, and to Phillip Backley for discussion and corrections of an earlier draft. This work was supported by the following MEXT/JSPS KAKENHI grants: Grant-in-Aid for Scientific Research on Innovative Areas #4903 (Evolinguistics) Grant Number JP18H05081, Grant-in-Aid for Scientific Research (S) Grant Number JP19H05589 and Grant-in-Aid for Scientific Research (A) Grant Number JP19H00532.

One possible response to the issue is found in the Precedence-free Phonology approach to phonological representation (PfP: Nasukawa 2014, 2015, 2017abc, 2020; Nasukawa and Backley 2017, 2019; Backley and Nasukawa 2020), which investigates the possibility of omitting from phonological representations all reference to precedence relations between units. In PfP, it is not only syntactic structure but also phonological structure which is thought to be linearised by referring to hierarchical structure rather than to precedence properties (which are not present in PfP structures). On this basis, there is no need to address the question stated above, as it turns out that the same mechanism of linearization is used in morphology and phonology as it is in syntax.

In fact, PfP is a program which aims at developing a unified approach to syntactic and phonological structures: any formal linguistic structure must be constructed by repeatedly merging linguistic units, where no precedence relations between units are encoded, either in syntax or in phonology. In this way, the sequential order of units is regarded as a consequence of reading a given hierarchical structure constructed by asymmetric (head-dependency) relations between units. PfP has made explicit the mechanism responsible for the linearisation of morpheme-internal phonological structure. Until now, however, no attempt has been made to explore the mechanism responsible for linearising affixed forms without referring to precedence relations between base and affixes (*prefixes* and *suffixes*), although some aspects of this issue are addressed in Nasukawa (2020). This paper, therefore, argues how the linearisation of affixed forms takes place in the context of PfP, using examples of affixation in English.

The paper is structured as follows. First, section 2 briefly reviews how phonological structure at domains corresponding to ‘syllable’ and ‘foot’ are phonetically linearised in PfP. Then section 3 argues how affixation takes place without referring to precedence. The same section also discusses the linearisation mechanism of affixed forms which consist of hierarchical phonological structure. Section 4 concludes the discussion.

2. Linearisation in Precedence-free Phonology

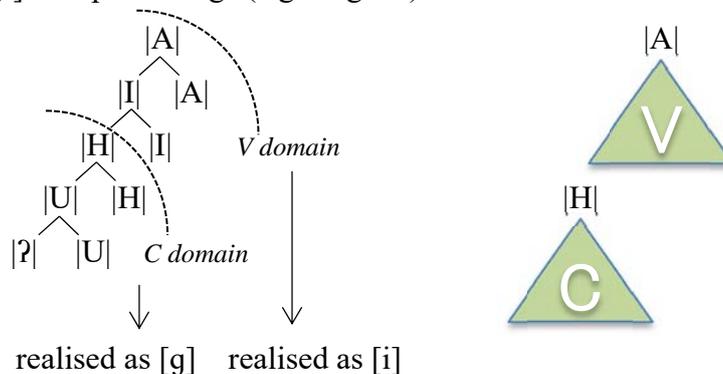
2.1 A domain corresponding to ‘syllable’

Precedence-free Phonology (PfP) represents structure without referring to precedence relations between units such as CV units, X slots, Root nodes, or elements; it does this in order to limit representational redundancy and to enhance theoretical restrictiveness. In this model, the only permitted structural units are the monovalent primes called *elements*, which are given below.

- (1) Elements (Backley and Nasukawa 2020: 86–87; Harris 1994, 2005; Harris and Lindsey 1995, 2000; Backley 2011, references therein)
- a. Resonance elements
 - |I| low F1 with high spectral peak (F2–F3 convergence)
 - |U| low spectral peak (lowering of all formants)
 - |A| energy mass in centre of frequency range (F1–F2 convergence)
 - b. Source/laryngeal elements
 - |ʔ| abrupt and sustained drop in energy
 - |H| aperiodicity, noise
 - |L| periodicity, murmur

A melodic structure is formed by combining elements recursively to create complex structures comprising several levels of structure. And when elements combine, they do so by forming asymmetric relations. Since structure consists exclusively of element combinations, there is no need for prosodic constituents such as nucleus, mora, rhyme, syllable and foot, as exemplified in (2a). For a detailed discussion on element structure (which is beyond the scope of this paper), refer to Nasukawa (2014, 2015, 2017abc, 2020), Nasukawa and Backley (2017, 2019) and Backley and Nasukawa (2020).

- (2) CV-sized structure in English
- a. [gi] in aspiration lgs (e.g. English)
 - b. CV

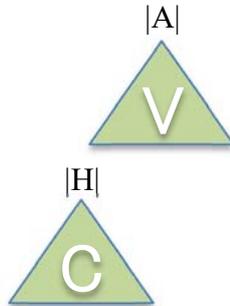


The structure in (2a) is a syllable-sized (CV) structure, where the V-domain is headed by the resonance element |A|. In turn, the V-domain dominates a C-domain which is headed by |H| or |ʔ| (Nasukawa et al. 2019). The asymmetric relation between a |H|-head (or |ʔ|-head) domain (C-domain) and a |A|-head domain (V-domain) forms the optimal configuration for expressing melodic contrasts which maximizes differences in modulation size (Nasukawa 2017bc, Nasukawa and Backley 2018: 44). Since this paper focuses on affixation rather than segmental structure, the structure in (2b) is used henceforth as an abbreviated form of a structure such as (2a).

Given that no precedence properties are encoded in PFP structure, the structures in (3a) and in (3b) are representationally the same: the C-domain is dominated by the V-domain. Thus, ‘precedence’ is derived as a result of the phonetic interpretation of asymmetric structure.

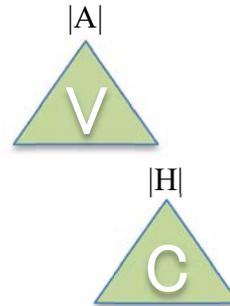
(3) CV-sized structure corresponding to ‘syllable’ structure

a.



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b.



In terms of phonology-phonetics mapping, the dependent C-domain is phonetically realised *before* the V-domain which dominates it. Nasukawa et al. (2019: 634–635) claims that this outcome is determined by a phonetic interpretation mechanism which conforms to the following Type A (general) principle of precedence.

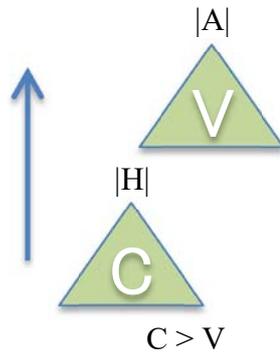
(4) Type A precedence (Nasukawa et al. 2019: 634, Nasukawa 2020: 253–254)

A domain located at a lower level is phonetically realised *before* a domain located at a higher level.

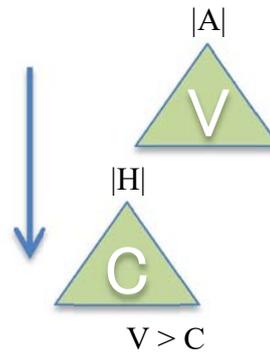
In terms of the size of carrier signal modulation (Ohala 1992, Ohala and Kawasaki-Fukumori 1997; Traunmüller 1994, 2005; Harris 2009; Nasukawa 2017bc), the structure concerned with the greater degree of modulation (the C-domain) is phonetically realised *before* the structure with the lesser degree of modulation (the V-domain). This principle is followed in the majority of languages. An example of this linearisation mechanism is given in (5a).

(5) Externalisation of ‘syllable’ structure

a. Type A



b. Type B



Assuming that the principle in (4) is a valid one, then we might naturally expect that the reverse pattern of linearisation is also encountered, in which the structure displaying the greater degree of modulation (the C-domain) is phonetically realised *after* the structure with the lesser degree of modulation (the V-domain). This VC linearisation is shown in (5b) and is stated as the Type B principle of precedence in (6).

(6) Type B precedence (Nasukawa et al. 2019: 635, Nasukawa 2020: 253–254)

A domain located at a lower level is phonetically realised *after* a domain located at a higher level.

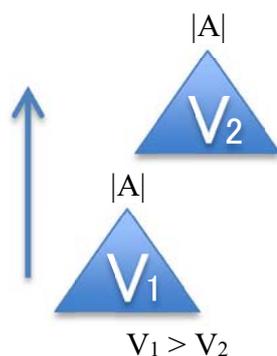
Although this pattern is less common cross-linguistically, it is observed in languages such as Kaqchikel (Nasukawa et al. 2019) and Arrernte (cf. Tabain, Breen and Butcher 2004).

2.2 A domain corresponding to ‘foot’

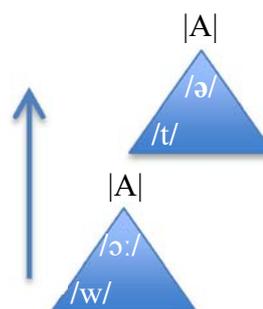
In PfP, a ‘foot’-sized structure is formed by combining two ‘syllable’-sized (CV) structures of the kind in (5). A simplified representation of a ‘foot’-sized structure is depicted in (7a), where the numbers of each ‘V’ are informally subscripted for the sake of clarity.

(7) Externalisation of ‘foot’ structure

a. Type A



b. /'wɔ:tə/ ‘water’ in English

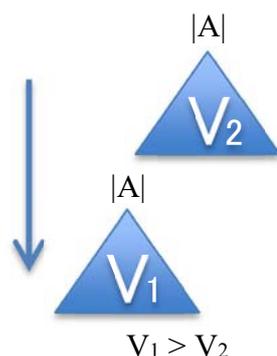


The V-domain which dominates the other V-domain is informally represented as V₂, while the V-domain dominated by the other V-domain is marked as V₁. Typical examples which employ this structure include words such as /'wɔ:tə/ ‘water’, the foot structure of which is given in (7b). (Readers may refer to Nasukawa and Backley 2015 for the motivation for this structure.) The structure in (7a) conforms to the Type A (general) principle of precedence, where V₁ (dependent) is phonetically realised before V₂ (head).

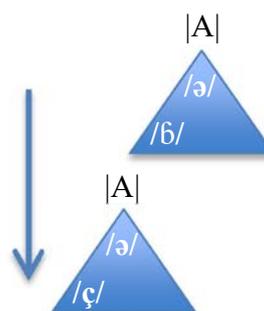
As noted in section 2.1, it is natural to assume that the reverse linearisation pattern also exists at the ‘foot’ level. An example from Kaqchikel is provided in (8b), where the highest ‘syllable’-sized domain is phonetically realised *before* the domain it dominates.

(8) Externalisation of ‘foot’ structure

a. Type B



b. /əbəç/ <ab'äj> ‘stone’



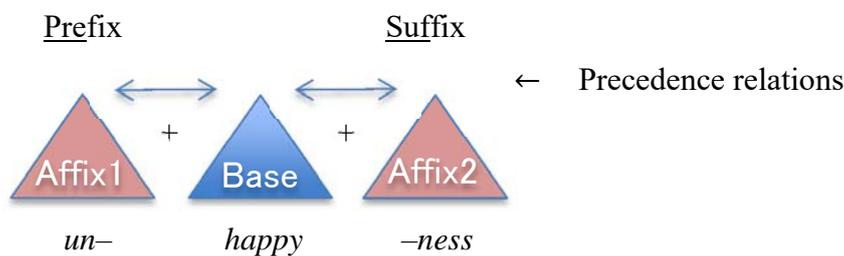
Furthermore, it may be assumed that the same (parametric) linearisation mechanism operates in larger/higher domains formed by morphological operations within the context of PFP. The following section presents a discussion of English affixation which is typically described by referring to precedence relations between base and affixes (and which, accordingly, uses the terms ‘*prefix*’ and ‘*suffix*’).

3. Affixation in the spirit of Precedence-free Phonology

3.1 Precedence in affixation

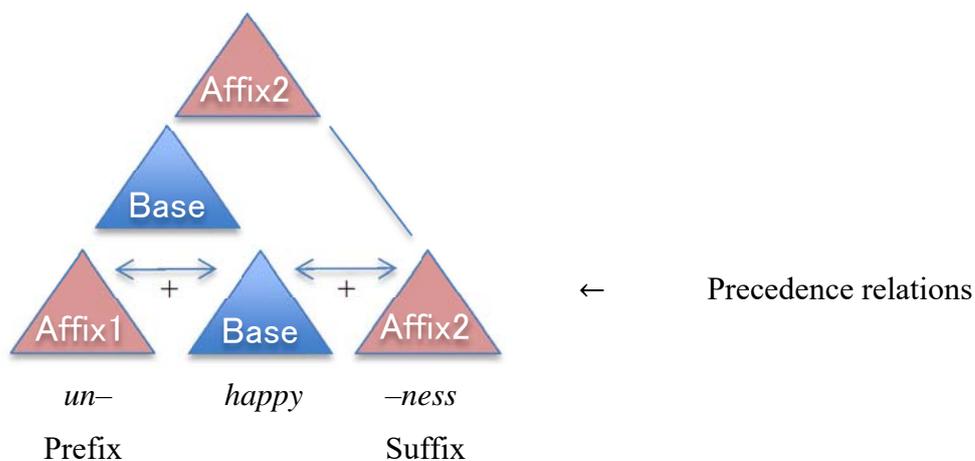
The usual assumption is that word formation processes refer to precedence relations between base and affix. Moreover, the terminology implies this: the name ‘*prefix*’ suggests that a unit has the intrinsic property of attaching itself to the first part of a base in a linear fashion, while the name ‘*suffix*’ indicates that a unit must attach to the end of a base. This is exemplified in (9), where *un-* and *-ness* are affixed to the base *happy*, the former to the beginning of the base and the latter to the end of the base.

(9) Precedence in affixation



Word formations such as this are believed to apply one at a time rather than simultaneously. To construct *unhappiness*, the affix *un-* and the base *happy* are combined first, then *-ness* is added to the derived form *unhappy*. The reverse order of word construction is undesirable since both of the affixes must be attached to an adjective. That is, if *happiness* is formed before *un-* is added to *happy*, *un-* cannot attach to *happiness* because it is a noun rather than an adjective. Based on this derivational path (cycle), the affixed form *unhappiness* can be represented as follows.

(10) The morphological hierarchical structure of *unhappiness* with precedence



Thus, it is commonly assumed that affixation involves both (i) precedence relations between base and affixes and (ii) hierarchical structure (i.e. the relative ordering of morpheme

combination). As discussed in Nasukawa (2011, 2020), however, employing both of these properties leads to representational redundancy. The following section therefore analyses affixation without referring to precedence relations between base and affixes.

3.2 The linear order of morphemes in affixation

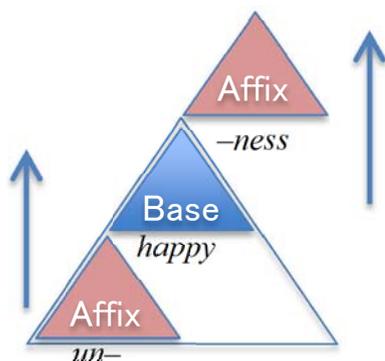
In order to analyse the word formation in question without referring to precedence, it is first necessary to explain the lexical properties of *un-* and *-ness*. In terms of head-dependency, each has a different morphological role. On the one hand, a ‘suffix’ like *-ness* is regarded as the head of an affixed form since it not only affects the meaning of its base but can also determine the syntactic category of the resulting form (e.g. *happy*_{ADJ} + *-ness*_{SN} → *happiness*_{SN}, *work*_V + *-ing*_N → *working*_N). Since suffixes typically determine the syntactic category of the resulting complex structure, they may be regarded as the head of the domain.

(11) Two affix types in English

- a. affixes such as *-ness* and *-ing*: head of a given construct
- b. affixes such as *un-* and *mis-*: dependent of a given construct

By contrast, the majority of ‘prefixes’ only change or add to the meaning of the base—they do not determine the syntactic category of the complex form.¹ Therefore, a prefix cannot be a head. Rather, this is the function of the base, so a prefix must be regarded as its dependent. On this basis, the structure of *unhappiness* may be illustrated in the spirit of PFP, as follows.

(12) The morphological hierarchical structure of *unhappiness* without precedence

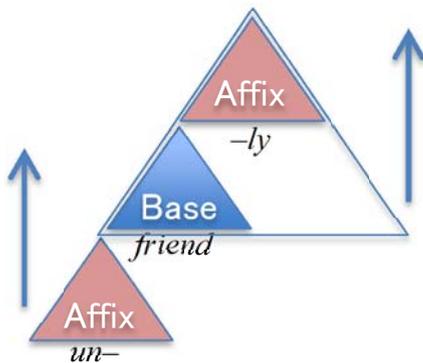


On the first cycle, *un-* (affix attached to adjective) and *happy* (adjective base) are combined such that the intrinsically dependent affix is dominated by the base. Then the affixed adjective form *unhappy* is combined with *-ness* (affix which turns an adjective into a noun) to create

¹ There are prefixes which not only change or add to the meaning of the base, but also determine the syntactic category of the resulting form (e.g., *en-*: e.g., *rich*_{ADJ} → *enrich*_V and *dis-*: e.g., *arm*_N → *disarm*_V). This will be discussed in section 3.3.

unhappiness. The resulting form has the hierarchical structure in (12), in which *un-* and *-ness* are structurally the most deeply embedded affix and the highest affix, respectively. Note that this structure does not specify any precedence relations between base and affixes. Moreover, the same linearisation mechanism functions even when the order of word construction is different. This is illustrated in (13), where *friend* (noun base) and *-ly* (head affix attached to noun) combine first, and then the combined form *friendly* (adjective) and *un-* (dependent affix attached to adjective) are combined.

(13) The morphological hierarchical structure of *unfriendly* without precedence



As these examples demonstrate, the terms *prefix* and *suffix* are merely labels which refer to the position where an affix appears when a complex word structure is linearised for the purposes of phonetic realisation. In the case of (12), following the Type A principle of precedence, the domain located at a lower level (*friend*) is phonetically realised *before* a domain located at a higher level (*-ly*). Then, this phonetic outcome (*friendly*) is phonetically preceded by the realised form of the further lower domain which is the most deeply embedded domain in the structure in (13).

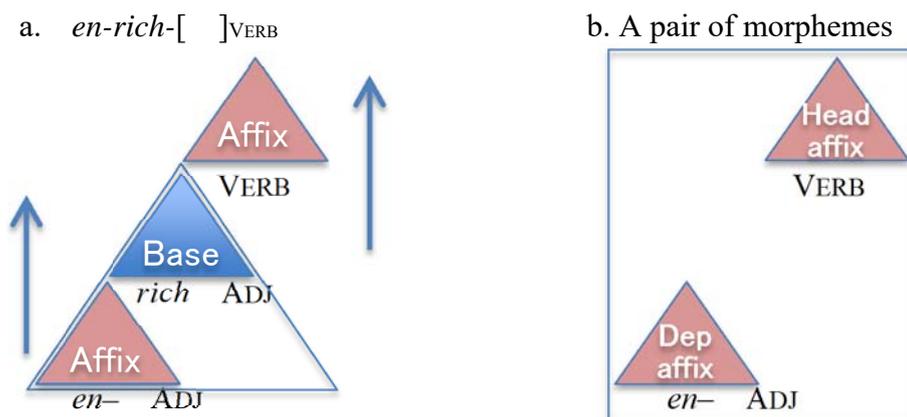
3.3 Affixes located at a lower level ('prefixes') which determine syntactic category

There are some 'prefixes' which, like 'suffixes', determine the syntactic category of the resulting form, as exemplified below.

(14) Prefixes which determine syntactic category in English²

en-: *en-* + *rich* _{ADJ} → *enrich* _V
 en- + *danger* _{ADJ} → *endanger* _V

Finally, there is the question of an apparent inconsistency between (i) the assumption that affixes (which are phonetically realised before their base, i.e. ‘prefixes’) are low in the hierarchical structure and (ii) the ability of those affixes to determine the syntactic category of a resulting complex form. One way of addressing this point is to assume that the markedness of these ‘prefixes’ is related to their representational complexity. I claim that this type of affix is the phonetically realised form of a pair of two affixes: one which is inherently a dependent, as in the majority of ‘prefixes’, and another which is inherently a head (category determiner) but which has no phonological properties. This is exemplified in (15b) where the two affixes form a pair and are both involved in affixation together.

(15) The morphological hierarchical structure of *enrich* without precedence

This type of pair affix may correspond to adverbial expressions that derive from prepositional phrases: e.g., *in this way* > *this way* (as an adverb, not a noun phrase), where the preposition *in* is structurally in front of *this way* but has lost its phonological properties. A corresponding example is a proper noun which is, in structural terms, the complement of a determiner (head)

² There are two distinct types of prefixes: (i) prefixes which determine the resulting category by changing the category of the base, e.g. *en-* (*endanger*, *enrich*, *enrage*, *encircle*, *empower*...), and (ii) prefixes which result in a prefixed form which has the same category as the base, e.g. *co-* is added to a verbal base (*cooperate*, *cohabit*, *coexist*...), *re-* (*reassign*, *reinstate*, *reinterpret*, *rearrange*...) and *micro-* (*microscope*, *microfilm*, *microwave*, *microeconomics*, *microbiology*...). English has numerous examples of the type (ii) prefix but few examples of the type (i) prefix. This suggests that there may be no need to analyse type (i) prefixes synchronically as affixes: rather, they may be treated as historical relics, in which case those words which contain a type (i) prefix could be seen as underived words (cf. Harris 1994).

which has no phonological properties: e.g., the proper noun *John* may be analysed as [D Ø [N John]].

4. Summary

This paper has discussed a PffP-driven mechanism for linearising affixed forms without referring to precedence relations between base and affix. It works at the AP interface by parsing head-dependency relations between the units in a structure. Following Type A of *the principle of phonetic linearisation* (Nasukawa et al. 2019, Nasukawa 2020), an affix which is at a lower level of structure phonetically manifests itself before one at a higher level. This is the pattern observed in English. Under this mechanism, the labels *prefix* and *suffix* are no more than convenient descriptions based on the phonetic outcome of phonological structure.

To strengthen the validity of the analysis described here, other types of word formation such as compounding and infixation in other languages will need to be analysed in future research. Also, it will be necessary to determine whether the same mechanism operates in languages which follow the Type B *principle of phonetic linearisation*.

References

- Backley, Phillip. 2011. *An introduction to Element Theory*. Edinburgh: Edinburgh University Press.
- Backley, Phillip and Kuniya Nasukawa. 2020. Recursion in melodic-prosodic structure. *Morpheme-internal recursion in phonology*, ed. by Kuniya Nasukawa, 11–35. Boston and Berlin: Mouton de Gruyter.
- Bromberger, Sylvain and Morris Halle. 1989. Why phonology is different. *Linguistic Inquiry* 20, 51–70.
- Cinque, Guglielmo. 1996. The ‘antisymmetric’ programme: Theoretical and typological implications. *Journal of Linguistics* 32(2), 447–464.
- Haider, Hubert. 1992. Branching and Discharge. *Working Papers of the SFB 340*, #23. University of Stuttgart and Tübingen and IBM Heidelberg.
- Haider, Hubert. 2013. *Symmetry breaking in syntax*. Cambridge: Cambridge University Press.
- Harris, John. 1994. *English sound structure*. Oxford: Blackwell.
- Harris, John. 2005. Vowel reduction as information loss. *Headhood, elements, specification and contrastivity*, ed. by Philip Carr, Jacques Durand and Colin J. Ewen, 119–132. . Amsterdam: John Benjamins.
- Harris, John. 2009. Why final devoicing is weakening. *Strength relations in phonology*, ed. by Kuniya Nasukawa and Phillip Backley, 9–46. Berlin and New York: Mouton de Gruyter.

- Harris, John and Geoff Lindsey. 1995. The elements of phonological representation. *Frontiers of phonology: Atoms, structures, derivations*, ed. by Jacques Durand and Francis Katamba, 34–79. Harlow, Essex: Longman.
- Harris, John and Geoff Lindsey. 2000. Vowel patterns in mind and sound. *Phonological knowledge: Conceptual and empirical issues*, ed. by Noel Burton-Roberts, Philip Carr and Gerard Docherty, 185–205. Oxford: Oxford University Press.
- Kayne, Richard S. 1994. *The antisymmetry of syntax*. Cambridge, MA: MIT Press.
- Kural, Murat. 2005. Tree traversal and word order. *Linguistic Inquiry* 36, 367–387.
- Nasukawa, Kuniya. 2011. Representing phonology without precedence relations. *English Linguistics* 28, 278–300.
- Nasukawa, Kuniya. 2014. Features and recursive structure. *Nordlyd* 41(1), *Special issue on features*, ed. by Martin Krämer, Sandra-Iulia Ronai and Peter Svenonius, 1–19.
- Nasukawa, Kuniya. 2015. Recursion in the lexical structure of morphemes. *Representing structure in phonology and syntax*, ed. by Marc van Oostendorp and Henk van Riemsdijk, 211–238. Berlin and Boston: Mouton de Gruyter.
- Nasukawa, Kuniya. 2017a. Extending the application of Merge to elements in phonological representations. *Journal of the Phonetic Society of Japan* 21, 59–70.
- Nasukawa, Kuniya. 2017b. The phonetic salience of phonological head-dependent structure in a modulated-carrier model of speech. *Beyond markedness in formal phonology*, ed. by Bridget Samuels, 121–152. Amsterdam: John Benjamins.
- Nasukawa, Kuniya. 2017c. The relative salience of consonant nasality and true obstruent voicing. *Sonic signatures*, ed. by Geoff Lindsey and Andrew Nevins, 145–162. Amsterdam: John Benjamins.
- Nasukawa, Kuniya. 2020. Linearisation and stress assignment in Precedence-free Phonology: The case of English. *Radical: A Journal of Phonology* 1, 239–291.
- Nasukawa, Kuniya and Phillip Backley. 2015. Heads and complements in phonology: A case of role reversal? *Phonological Studies* 18, 67–74.
- Nasukawa, Kuniya and Phillip Backley. 2017. Representing moraicity in Precedence-free Phonology. *Phonological Studies* 20, 55–62.
- Nasukawa, Kuniya and Phillip Backley. 2018. |H| and |L| have unequal status. *Phonological Studies* 21, 41–48.
- Nasukawa, Kuniya and Phillip Backley. 2019. Phonological evidence for segmental structure: Insights from vowel reduction. *Phonological Studies* 22, 51–58.

- Nasukawa, Kuniya, Phillip Backley, Yoshiho Yasugi and Masatoshi Koizumi. 2019. Challenging universal typology: Right-edge consonantal prominence in Kaqchikel. *Journal of Linguistics* 55(3), 611–641. <https://doi.org/10.1017/S0022226718000488>
- Ohala, John J. 1992. Alternatives to the sonority hierarchy for explaining segmental sequential constraints. *CLS: Papers from the parasession on the syllable*, 319–338.
- Ohala, John J. and Haruko Kawasaki-Fukumori. 1997. Alternatives to the sonority hierarchy for explaining segmental sequential constraints. *Language and its ecology: Essays in memory of Einar Haugen* (Trends in Linguistics. Studies and Monographs, Vol. 100), ed. by Stig Eliasson and Ernst Hakon Jahr, 343–365. Berlin: Mouton de Gruyter.
- Raimy, Eric. 2000. *The phonology and morphology of reduplication*. Berlin and New York: Mouton de Gruyter.
- Tabain, Marija, Gavan Breen and Andrew Butcher. 2004. VC vs. CV syllables: A comparison of Aboriginal languages with English. *Journal of the International Phonetic Association* 34, 175–200.
- Trautmüller, Hartmut. 1994. Conventional, biological, and environmental factors in speech communication: A modulation theory. *Phonetica* 51, 170–183.
- Trautmüller, Hartmut. 2005. Speech considered as modulated voice. Ms., Stockholm University.