

Chapter 11

What (else) depends on phonology?

Larry M. Hyman

University of California, Berkeley

To construct phonology so that it mimics syntax is to miss a major result of the work of the last twenty years, namely, that syntax and phonology are essentially different.

(Bromberger & Halle 1989: 69)

1 Is phonology different?

In Hyman (2007) I asked, “Where’s phonology in typology?” While phonology turned out to be well represented at the Ardennes workshop and this volume of proceedings, it is typically underrepresented, even ignored by some typologists. I considered three reasons:

- (i) Phonology is different (cf. the above Bromberger & Halle quote).
- (ii) Phonological typology may seem uninteresting to typologists, particularly if defined as follows:

“[. . .] it is possible to classify languages according to the phonemes they contain.... Typology is the study of structural features across languages. Phonological typology involves comparing languages according to the number or type of sounds they contain.” (Vajda 2001)

- (iii) Phonology is disconnected from the rest (e.g. from morphosyntactic typology).

As evidence that phonology is underrepresented, I noted that there is no coverage in Whaley’s (1997) textbook, *Introduction to Typology*. The more recent *Oxford Handbook of Linguistic Typology* (Song 2011) provides confirmation of the above assessment:



- (i) Phonology is *underrepresented*: there is only one chapter on phonology out of thirty (= 1/30) constituting 13 out of 665 pages (= 2%)
- (ii) Phonology is seen as *different*: Why isn't Chapter 24 entitled "Phonological Typology", parallel with the other chapters?
 Chapter 21: Syntactic typology (Lindsay Whaley)
 Chapter 22: Morphological typology (Dunstan Brown)
 Chapter 23: Semantic typology (Nicholas Evans)
 BUT: Chapter 24: Typology of phonological systems (Ian Maddieson)
- (iii) Phonology is *ignored*: There is no mention of phonology in Chapter 10 "Implicational Hierarchies" (Greville Corbett), which has sections on syntactic (§3.1), morphosyntactic (§3.2) and lexical (§3.3) hierarchies. As a phonological example the chapter could easily have cited and illustrated the sonority hierarchy (Clements 1990) and the claim that if a lower sonority segment can function as the nucleus of a syllable, then a higher sonority segment in a column to its right also can; see Table 1.

Table 1: The sonority hierarchy: An implicational hierarchy in phonological typology

Obstruent	< Nasal	< Liquid	< Glide	< Vowel	
-	-	-	-	+	syllabic
-	-	-	+	+	vocoid
-	-	+	+	+	approximant
-	+	+	+	+	sonorant
0	1	2	3	4	<i>rank (degree of sonority)</i>

There are of course exceptions to the above: *WALS Online* (Dryer & Haspelmath 2013) includes 19 chapters on phonology out of 144 (or 13.2%). There also are several phonological databases and typological projects which are concerned with how phonology interfaces with the rest of grammar, e.g. Bickel, Hildebrandt & Schiering (2009), based on the Autotyp project (Bickel & Nichols 2016). Still, phonology is at best incidental or an afterthought in much of typological work. This stands in marked contrast with the work of Joseph Greenberg, the father of modern linguistic typology, whose foundational work on typology and universals touched on virtually all aspects of phonology, e.g. syllable structure (Greenberg 1962; 1978b), distinctive features (Greenberg, Jenkins & Foss 1967), vowel

harmony (Greenberg 1963), nasalized vowels (Greenberg 1966; 1978a), glottalized consonants (Greenberg 1970), word prosody (Greenberg & Kashube 1976). Note also that one full volume out of the four volumes of Greenberg, Ferguson & Moravcsik (1978) was dedicated to phonology!

There are at least two reasons why phonological typology, properly conducted, can be relevant to scholars outside of phonology. First, there are lessons to be learned that are clearest in phonology, e.g. concerning dependencies, the central issue of this volume. Second, there have been claims that grammatical typology can be dependent on phonology. I take these both up in the following two sections.

2 Dependencies require analysis (which requires theory)

It is interesting that Greenberg typically cited phonological examples to make the didactic point that any property found in a language can be stated as an implicans on an absolute universal implicatum:

We have the unrestricted universal that all languages have oral vowels and the implicational universal that the presence of nasal vowels in a language implies the presence of oral vowels, but not vice-versa. (Greenberg 1966: 509)

Of course, where an unrestricted universal holds, any statement may figure as implicans. For example, if a language has a case system, it has oral vowels. (Greenberg 1966: 509)

However, phonology teaches us two additional lessons: (i) Dependencies are themselves highly dependent on the level of analysis. (ii) The analysis however varies according to the theory adopted. To illustrate the first point, let us stay with the example of nasality which, in different languages, may be underlyingly contrastive (Table 2).

A problem arises when we attempt to typologize on the basis of languages which have vs. do not have underlying nasal consonants. The class of languages lacking underlying nasal consonants is not coherent, as this includes three different situations: languages like Ebrié (iii) which contrast nasality only on vowels; languages like Barasana (iv) which have nasal prosodies, e.g. /bada/^N [mãnã]; languages like Doutai (v) which lack nasality altogether.

While (v) represents an observable (“measurable”) fact, assuming that there is also no nasality on the surface, (iii) and (iv) represent linguistic analyses designed

Table 2: A typology of nasal contrasts (cf. Cohn 1993; Clements & Osu 2005)

(i)	on consonants only:	/m, n, ŋ/	e.g. Iban
(ii)	on vowels and consonants:	/ĩ, ã, ã, m, n, ŋ/	e.g. Bambara
(iii)	on vowels only:	/ĩ, ã, ã/	e.g. Ebrié
(iv)	on whole morphemes:	/CVC/ ^N	e.g. Barasana
(v)	absent entirely:	-----	e.g. Doutai

to factor out the surface nasality by assigning the oral/nasal contrast either to vowels or to whole morphemes – ignoring the fact that these language have output nasal consonants. To appreciate the fact that languages with contrastive nasality on vowels only (iii) always have surface phonetic nasal consonants, consider the case of Ebrié, a Kwa language of Ivory Coast:

... nous considérons que l'ébrié ne possède aucune consonne nasale phonologique et que [m], [n] et [ŋ] sont les allophones respectifs de /b/, /d/ et /y/ [before nasalized vowels] (Dumestre 1970: 25)

In this language, /ba, da, ya/ are realized [ba, da, ya], while /bã, dã, yã/ are realized [mã, nã, ã]. This analysis is possible because there are no sequences of *[bã, dã, yã] or *[ma, na, ã]. Since contrasts such as /ta/ vs. /tã/ independently require a [+nasal] specification on vowels, the structure-sensitive phonologist cannot resist generalizing: only vowels carry an underlying [+nasal] specification to which a preceding /b, d, y/ assimilate.

The Ebrié example neatly illustrates the fact that there is no language which has SURFACE nasality only on vowels. This raises the question of what level of representation is appropriate for typological purposes: underlying (phonemic) or surface (allophonic)? While Hockett (1963: 24) once noted that “phonemes are not fruitful universals,” since they are subject to the individual linguist’s interpretation of “the facts”, the question is whether the same applies to typological generalizations. As I like to put it, we aim to typologize the linguistic properties, not the linguists. At the Ardennes workshop Martin Haspelmath argued forcefully that observable “surface” properties are the facts and that they should serve as input to typology. If so, we must then address the question of what to do about vowel nasalization in English. As often pointed out, a word like *can't* is often pronounced [kænt] or even [kæ̃t], in contrast with *cat* [kæt]. The usual assumption is that such variations should be attributed to phonetic implementation

(Cohn 1993), i.e. a third level. While this raises the possibility of a different kind of typology based on surface phonetic contrasts, however they may be obtained, thereby blurring the difference between phonetics and phonology, I argue instead for a phonological typology based more strictly on a more structural level of representation. English thereby falls into category (i) in the above typology.¹

A related question is how we should state the dependency. In an earlier paper I tried to capture the dependency by referring to both levels:

- (1) Vocalic Universal #6: A vowel system can be contrastive for nasality only if there are output nasal consonants [i.e. surface phonetic nasal consonants] (Hyman 2008: 99)

To rephrase this: If a vowel system is underlyingly contrastive for nasality, there will always be output nasal consonants, as in Ebrié. However, it appears that this is not general enough: the underlying nasality on vowels may be irrelevant, given systems with prosodic nasality such as Barasana. An alternative is:

- (2) Consonantal Universal: A phonological system can be contrastive for nasality only if there are output nasal consonants (i.e. independent of whether the consonant nasality is underlying or derived, and whether nasality is underlyingly segmental or prosodic)

This is true of all four of the systems (i)-(iv) which have contrastive nasality. Thus, the implicans can be either the underlying vowel system or the whole phonological system. We thus are able to relate the dependencies about observable “facts” with our (interesting) analyses of them. The same point can be made concerning vertical vowel systems: Systems such as Kabardian or Marshallese are often analyzed as /i, ə, a/, /i, a/ etc., but always have output [i] and [u] (cf. Vocalic Universal #5 in Hyman 2008: 98).

Above I cited Greenberg’s absolute universal “all languages have oral vowels” as a universally available implicatum (“if a language has a case system, it has oral vowels”). What about an implicans that is extremely rare? The velar implosive [ɠ] is very rare in languages:

¹ As this volume was going to press I received Kiparsky (2017) which also addresses this question. Concerned with universals and UG, Kiparsky proposes that phonological typology should not be based on the phonemic level, rather what he terms the “lexical level” which contains salient redundancies. At this level Ebrié would have a nasal contrast on both consonants and vowels thereby allowing the universalist to claim that a language which contrasts nasalized vowels also has nasal consonants.

The velar implosive is a very infrequent sound and... always seems to imply the presence of bilabial, apical, and palatal members of the series. (Greenberg 1970: 128)

What then can be predicted from its presence? Note first that implosives occur in 53 out of the 451 languages in the UPSID database (Maddieson & Precoda 1990). A bilabial implosive occurs in 50 of these 53 languages, while an apical (dental or alveolar) implosive occurs in 42 languages. In stark contrast, a velar implosive occurs in only five of the 53 languages. In Table 3 I attempt to establish dependencies “if *ǰ*, then X” again to determine the role of analysis in establishing implicational universals.

Table 3: Possible implicational universality based on the presence of contrastive /ǰ/

		<i>Chadic</i>	<i>Omotic</i>	<i>East Sudanic</i>		
		Tera	Hamer	Ik	Maasai	Nyangi
other implosive consonants:	if /ǰ/, then /b, d/	✓	✓	✓	✓	✓
basic voiceless consonants:	if /ǰ/, then /p, t, k/	✓	✓	✓	✓	✓
voiced non-implosives?	if /ǰ/, then /b, d, g/	✓	✓	✓	*	*

As seen, if a language has /ǰ/ we can predict that the other two implosives will be present, as well as voiceless stops. While Maasai and Nyangi appear to falsify the implication “if [b, d, ǰ], then [b, d, g]”, it can be saved if we re-analyze [b, d, ǰ] as /b, d, g/, which are lacking in the two systems. I would argue against this as a valid move, but it again underscores the problem of level of analysis, which provides us with two different kinds of claims:

- (i) a descriptive claim: if a language has [b, d, ǰ], it will have contrastive /b, d, g/
- (ii) an analytic claim: if a language has [b, d, ǰ] it will have /b, d, g/ (either contrastively or not)

The above summarizes a bit of what we face in phonology. What about grammar depending on phonology?

3 Non-arbitrary ≠ predictive

In this section I begin by considering the empirical bases in establishing a dependency. Specific implicans-implicatum of dependencies are arrived at in a number of ways, combining degrees of inductive observation and deductive reasoning. In this section I consider two types of dependencies which appear to be “non-arbitrary”: (i) those which depend on (claimed) absolute universals; (ii) those which depend on historically linked events. To begin with the first, ultimately false claims may at first appear to be based on what the proposer considers to have an external (e.g. physical phonetic) basis:

“Since sequences containing only pure consonants, such as [kptčsm] or [rftlks], cannot be pronounced, all words must include at least one vowel or vowel-like (vocalic, syllabic) sound segment”,

hence:

“In all languages, all words must include at least one vocalic segment.”
(Moravcsik 2013: 153)

This statement contains the dependency, “If X is a word, then it contains at least one vocalic segment,” which however is false, as seen in the following Bella Coola voiceless obstruent utterance (Nater 1984: 5, cited by Shaw 2002: 1):

(3) xłp'χ^włłpłłs k^wc'

‘then he had had in his possession a bunchberry plant’

In this case there was an extra-linguistic basis to the claim—languages can't have words that are universally unpronounceable. On the other hand, linguists have been known to make arbitrary “universal stabs in the dark” which have no obvious linguistic or extra-linguistic basis, e.g. “No language uses tone to mark case” (Presidential Address, 2004 Annual Linguistic Society of America Meeting, Boston). Stated as a dependency:

(i) If a language has tone, it will not be used to mark case.

(ii) If a language has case, it won't be marked by tone.

Table 4: Case marking by tone in Maasai

	nominative	accusative		nom. vs. acc. tone patterns
class I:	è̀òkònyá	è̀ókónyá	‘head’	L ⁿ -H vs. L-H ⁿ
	è̀ncòmàtá	è̀ncómátá	‘horse’	
class II:	è̀ndèròni	è̀ndèróni	‘rat’	H on σ_1 vs. σ_2
	è̀nkòlòpà	è̀nkòlópà	‘centipede’	
class III:	ò̀lmérégèsh	ò̀lmérègèsh	‘ram’	H on σ_2 & σ_3 vs. on σ_2 only
	ò̀lósówuàn	ò̀lósòwùàn	‘buffalo’	
class IV:	ò̀mótònyî	ò̀mótònyî	‘bird’	identical tones
	ò̀sínkirrî	ò̀sínkirrî	‘fish’	

But consider Table 4 from Maasai (Tucker & Mpaayei 1955: 177–184), where the acute (´) marks H(igh) tone, while the grave (`) accent marks L(ow) tone:

In reality, if tone can be a morpheme (which is uncontroversial), it can do anything that a morpheme can do! What innate or functional principle would block tone from marking case?

The above examples reveal a temptation to claim a non-arbitrary relation between certain aspects of grammar and phonology. Recently there has been renewed interest in pursuing a centuries-old “intuition” that certain aspects of syntax and morphology are not only interdependent, but also dependent on phonology. The standard reference is Plank (1998), who attributes the following positions to:

Encyclopaedia Britannica (1771): “Words tend to be longer than one syllable in transpositive [free word order] languages and to be monosyllabic in analogous [rigid word order] languages.” (Plank 1998: 198)

W. Radloff (1882): “(a) If vowel assimilation is progressive (= vowel harmony), then the morphology will be agglutinative (and indeed suffixing), but not vice versa.... (b) if the morphology is flecive, then if there are vowel assimilations they will be regressive (= umlaut), but not vice-versa....” (Plank 1998: 202)

Rev. James Byrne (1885): “Unlimited consonant clustering correlates with VS order, limitations on consonant clustering correlate with SV order.”
(Plank 1998: 200)

Georg von der Gabelentz (1901): Languages with anticipatory phonological assimilation should have anticipatory grammatical agreement (e.g. from N to A in an A-N order), while languages with perseverative phonological assimilation should have perseverative grammatical agreement (e.g. from N to A in an N-A order). (my paraphrasing of Plank 1998: 197); also Bally (1944): *Séquence Progressive* vs. *Séquence Anticipatrice* (Plank 1998: 211)

Interestingly, Greenberg did not buy into this. Grammar does appear in examples involving the universality of oral vowels, which was didactically exploited as an implicatum to show that any arbitrary implicans follows – grammatical ones are typically cited (Greenberg 1966; 1978a):

- (i) If a language has case, it also has oral vowels (repeated from above)
- (ii) If a language has sex-based gender, it also has oral vowels
- (iii) If a language doesn't have oral vowels, the language doesn't have sex-based gender (or maybe it does)

What this reveals is that there is a world of difference between correlation and causation. Noone would ever claim that the presence of oral vowels has something to do with any of the above grammatical properties. As Plank (1998) put it:

“Although these implications all happen to be true, their typological value is nil.” (Plank 1998: 223)

The last century has seen a proliferation of proposals to distinguish language “types” which identify various phonological properties with grammatical ones, either as non-directional correlations ($P \leftrightarrow G$) or with one dependent on the other ($P \rightarrow G$, $G \rightarrow P$), e.g.

- anticipatory vs. progressive languages
- iambic vs. trochaic languages
- stress-timed vs. syllable-timed vs. mora-timed languages

- syllable vs. word languages
- word vs. phrase languages

(See especially proposals of Bally, Skalička, Lehmann, Dressler, Donegan & Stampe, Dauer, Gil, Auer, all in Plank 1998.) As an example, consider the following two languages types from Lehmann (1973 et seq), as summarized by Plank (1998: 208) (Table 5).

Table 5: Lehmann’s Holistic Typology of Languages

<i>“think Turkish or Japanese”</i>	<i>“think Germanic”</i>
<ul style="list-style-type: none"> • dependent-head (OV, AN etc.) • suffixes • agglutination (exponents = loosely bound affixes) • no agreement • vowel harmony (progressive, root triggers) • few morphophonological rules (mostly progressive) • syllable structure simple • pitch accent 	<ul style="list-style-type: none"> • head-dependent (VO, NA etc.) • prefixes • flection (exponents = tightly fused with stem) • agreement • umlaut (= regressive, suffix triggers) • many morphophonological rules (mostly regressive) • syllable structure complex • stress accent + unstressed vowel reduction • syllable-counting

While such grammar-phonology dependencies have not generally caught on in typological or in phonological circles, there is renewed interest in statistical correlations between phonological properties and OV vs. VO syntax (Nespor, Shukla & Mehler 2011; Tokizaki 2010; Tokizaki & Kuwana 2012) (cf. Cinque 1993) as well as word class, e.g. noun vs. verb, transitive vs. intransitive verbs (Smith 2011; Dingemanse et al. 2015; Fullwood 2014).

Concerning the latter, Fullwood demonstrates a statistical correlation between verb transitivity and stress on English bisyllabic verbs (Table 6). Although the absolute number of verbs having one vs. the other stress patterns is reasonably close (1090 trochaic, 1227 iambic), the smallest group by far are obligatorily intransitive iambic verbs such as *desíst*. Here we can see the consequence of stress to avoid final position—and to especially avoid the “weak” utterance-final position where declarative intonation would normally realize a high to low falling

Table 6: Stress Placement on Verbs in English

	trochaic		iambic	
obligatorily transitive	506	(39%)	804	(61%)
ambitransitive	357	(55%)	293	(45%)
obligatorily intransitive	227	(64%)	130	(36%)

pitch (Hyman 1977: 45). Being utterance-internal is quite different. As Fullwood (2014) puts it:

Words that frequently occur phrase-finally are more likely to retract stress from their final syllable, while other words that rarely occur in phrase-final position are quite happy to accommodate a final stress. (Fullwood 2014: 130)

Similar proposals have been offered of a relation between word order and stress, but one of causation has not been widely accepted, whether based on universal tendencies or historically linked events.

A case of the latter does come from Foley & Olson (1985: 50-51), who offer “an interesting list of shared properties”, some phonological, some grammatical, among languages with valence-increasing serial verbs, particularly in West Africa and Southeast Asia:

- (i) phonemic tone
- (ii) many monosyllabic words
- (iii) isolating morphological typology
- (iv) verb medial word order (SVO)

They go on to explain:

This cluster of properties is not accidental: they are all interrelated. Phonological attrition causes syncope of segments or syllables, with the result that phonemic tone or complex vowel systems develop to compensate for phonemic distinctions being lost. On the grammatical side, phonological attrition causes gradual loss of the bound morphemes.... At this verbal morphology is lost, a new device for valence adjustment must be found. Verb serialization begins to be used in this function, *provided serial constructions already exist in the language*. (Foley & Olson 1985: 51) [my emphasis]

Foley & Olson suggest that the development of serial verbs proceeds in the following order:

- (4) motion/directional verbs > postural verbs > stative/process verbs > valence

Crucially, it is only the last (valence) stage that correlates with the above properties (vs. Crowley 2002 re Oceanic serial verbs which do not meet these criteria). It is the loss of head-marking on verbs (benefactive, instrumental applicatives etc), which was due to the introduction of prosodic size conditions on verb stems in NW Bantu (Hyman 2004), that feeds into verb serialization. Thus there is a *non-arbitrary* relation between the phonological development, the loss of head-marking morphology, and the extended development of an analytical structure with serial verbs.

However, the cause-and-effect is not *predictive*: Neither the synchronic nor diachronic interpretation of these dependencies holds true for all cases:

- synchronic dependency: if valence-marking serial verbs, then tone, tendency towards monosyllabicity, isolating morphology, SVO (but Ijo = SOV)
- diachronic dependency: if serial verbs + phonological attrition, then valence-marking serial verbs, tone etc. (but some serial verb languages do not employ serial verbs to mark valence)

The diachronic alternative for marking benefactives, instruments etc. is with adpositions. Nzadi is a Narrow Bantu language spoken in the Democratic Republic of Congo which has broken down the Bantu agglutinative structure to become analytic and largely monosyllabic. Serial verbs have not been introduced to replace lost verbal suffixes (Crane, Hyman & Tukumu 2011):

- (5) a. *bɔ ó túŋ ndzɔ sám 'é báàr*
they PAST build house reason of people
'they built a house for the people'
- b. *ndé ó wɛɛ mbùm tí ntáp òté*
he PAST pick fruit with branch tree
'he picked fruit with a stick'

The serial structures '*they built house give people' and '*he take stick pick fruit' are not used in Nzadi, which is spoken outside the West African serial verb zone.

“Holistic” typologies such as the one from Lehmann presented above are still only “hopeful” (Plank 1998), based to a large extent on the feeling that clustering of properties across phonology, morphology and syntax is non-arbitrary (e.g. Indo-European and Semitic vs. Uralic and Altaic; West Africa and Southeast Asia vs. Athabaskan, Bantu). But whatever links one can find between the cited properties, these effects are non-predictive. Still, linguists hold strong feelings on such interdependencies, and I’m guilty too. Thus, as my own observation (hope) I offer the following as a concluding proposal.

The highly agglutinative Bantu languages contrast only two tone heights, H and L (often analyzed as privative /H/ vs. Ø). A third M(id) tone height is only present in languages which have broken down the morphology (thereby creating more tonal contrasts on the remaining tone-bearing units). Thus compare the H vs. L agglutinative structure in the Luganda utterance in (6a) with the H vs. M vs. L isolating structure in (6b) of Fe’fe’-Bamileke, a Grassfields Bantu language of Cameroon:

- (6) a. Luganda
à-bá-tá-lí-kí-gúl-ír-àgàn-à
 AUG-they-NEG-FUT-it-buy-APPL-RECIP-FV
 ‘they who will not buy it for each other’ (AUG = augment; FV = inflectional final vowel)
- b. Fe’fe’-Bamileke
à kà lách piε náh ncwēe mbòò hā mūū
 he PAST take knife take cut meat give child
 ‘he cut the meat with a knife for the child’ (´ = Mid tone)

The morphological structure of words in polyagglutinative languages like Luganda is highly syntagmatic. This is most compatible with a tone system with privative /H/ vs. Ø, where the Hs are assigned to specific positions. (Although they don’t have a M tone, some Bantu languages allow ´H, as tonal downstep is also syntagmatic.) A full contrast of /H, M, L/ on every tone-bearing unit would produce a huge number of tone patterns (3 x 3 x 3 etc.), so one should at best expect the /H, M, L/ contrast to occur only on prominent positions (e.g. the root syllable). /H, M, L/ is thus more compatible with languages like Fe’fe’-Bamileke, where words are short, with little morphology. Languages with shorter words often have more paradigmatic contrasts in general (more consonants, vowels—and tones). This may again be non-arbitrary, as the greater paradigmatic contrasts make up for the lost syllables of longer words. But it is not predictive.

Acknowledgements

I would like to thank Nick Enfield for inviting me to the Ardennes workshop at which I also received several helpful responses. I am particularly indebted to Mark Dingemans for his detailed review of an earlier version of this paper which has helped me clarify some of the points that I wanted to make.

References

- Bally, Charles. 1944. *Linguistique générale et linguistique française*. 2nd edition. Berne: Francke.
- Bickel, Balthasar, Kristine Hildebrandt & René Schiering. 2009. The distribution of phonological word domains: A probabilistic typology. In Janet Grijzenhout & Bariş Kabak (eds.), *Phonological domains: Universals and deviations*, 47–75. Berlin: Mouton de Gruyter.
- Bickel, Balthasar & Johanna Nichols. 2016. *Autotyp*. <http://www.autotyp.uzh.ch/>.
- Bromberger, Sylvain & Morris Halle. 1989. Why phonology is different. *Linguistic Inquiry* 20. 51–70.
- Byrne, James. 1885. *General principles of the structure of language*. 2nd edition, 1892. London: Trübner.
- Cinque, Guglielmo. 1993. A null theory of phrase and compound stress. *Linguistic Inquiry* 24. 239–294.
- Clements, George Nick. 1990. The role of the sonority cycle in core syllabification. In John Kingston & Mary E. Beckman (eds.), *Papers in laboratory phonology I: Between the grammar and physics of speech*, 283–333. Cambridge: Cambridge University Press.
- Clements, George Nick & Sylvester Osu. 2005. Nasal harmony in Ikwere, a language with no phonemic nasal consonants. *Journal of African Languages and Linguistics* 26. 165–200.
- Cohn, Abigail. 1993. A survey of the phonology of the feature [+nasal]. *Working Papers of the Cornell Phonetics Laboratory* 8. Ithaca: Cornell University, 141–203.
- Crane, Thera Marie, Larry M. Hyman & Simon Nsielanga Tukumu. 2011. *A grammar of Nzadi [B865]* (University of California Publications in Linguistics 147). Oakland: University of California Press.
- Crowley, Terry. 2002. *Serial verbs in Oceanic: A descriptive typology*. Oxford: Oxford University Press.

- Dingemanse, Mark, Damián E. Blasi, Gary Lupyan, Morten H. Christiansen & Padraic Monaghan. 2015. Arbitrariness, iconicity and systematicity in language. *Trends in Cognitive Sciences* 19. 603–615.
- Dryer, Matthew S. & Martin Haspelmath (eds.). 2013. *WALS online*. Leipzig: Max Planck Institute for Evolutionary Anthropology. <http://wals.info/>.
- Dumestre, Gaston. 1970. *Atlas linguistique de Côte d'Ivoire*. Abidjan: Institut de Linguistique Appliquée XI, Université d'Abidjan.
- Foley, William A. & Mike Olson. 1985. Clausehood and verb serialization. In Johanna Nichols & Anthony C. Woodbury (eds.), *Grammar inside and outside the clause*, 17–60. Cambridge: Cambridge University Press.
- Fullwood, Michelle A. 2014. Asymmetric correlations between English verb transitivity and stress. *Proceedings of the 40th Annual Meeting of the Berkeley Linguistic Society* 40. 125–138.
- Gabelentz, Georg van der. 1901. *Die Sprachwissenschaft: Ihre Aufgaben, Methoden und bisherigen Ergebnisse*. 2nd edition. Leipzig: Tauchnitz.
- Greenberg, Joseph H. 1962. Is the vowel-consonant dichotomy universal? *Word* 18. 73–81.
- Greenberg, Joseph H. 1963. Vowel harmony in African languages. *Actes du Second Colloque Internationale de Linguistique Négro-Africaine* 1. Dakar: Université de Dakar, West African Languages Survey, 33–38.
- Greenberg, Joseph H. 1966. Synchronic and diachronic universals in phonology. *Language* 42. 508–17.
- Greenberg, Joseph H. 1970. Some generalizations concerning glottalic consonants, especially implosives. *International Journal of American Linguistics* 36. 123–45.
- Greenberg, Joseph H. 1978a. Diachrony, synchrony and language universals. In Joseph H. Greenberg, Charles A. Ferguson & Edith A. Moravcsik (eds.), *Universals of human language, volume 1*, 61–91. Cambridge, MA: MIT Press.
- Greenberg, Joseph H. 1978b. Some generalizations concerning initial and final consonant clusters. *Linguistics* 18. 5–34.
- Greenberg, Joseph H., Charles A. Ferguson & Edith A. Moravcsik (eds.). 1978. *Universals of human language*. Stanford: Stanford University Press.
- Greenberg, Joseph H., James J. Jenkins & Donald J. Foss. 1967. Phonological distinctive features as cues in learning. *Journal of Experimental Psychology* 77. 200–205.
- Greenberg, Joseph H. & Dorothy Kashube. 1976. Word prosodic systems: A preliminary report. *Working Papers in Language Universals* 20. Stanford University, 1–18.

- Hockett, Charles F. 1963. The problem of universals in language. In Joseph H. Greenberg (ed.), *Universals of language*, 1–29. Cambridge, MA: MIT Press.
- Hyman, Larry M. 1977. The nature of linguistic stress. In Larry M. Hyman (ed.), *Studies in stress and accent* (Southern California Occasional Papers in Linguistics 4), 37–83. Los Angeles: Department of Linguistics, University of Southern California.
- Hyman, Larry M. 2004. How to become a Kwa verb. *Journal of West African Languages* 30. 69–88.
- Hyman, Larry M. 2007. Where's phonology in typology? *Linguistic Typology* 11. 265–271.
- Hyman, Larry M. 2008. Universals in phonology. *The Linguistic Review* 25. 81–135.
- Kiparsky, Paul. 2017. Formal and empirical issues in phonological typology. In Larry M. Hyman & Frans Plank (eds.), *Phonological typology*.
- Lehmann, Winfred P. 1973. A structural principle of language and its implications. *Language* 49. 47–66.
- Maddieson, Ian & Kristin Precoda. 1990. Updating UPSID. *UCLA Working Papers in Phonetics* 74. 104–111.
- Moravcsik, Edith. 2013. *Introducing language typology*. New York: Cambridge University Press.
- Nater, Hank F. 1984. *The Bella Coola language* (National Museum of Man Mercury Series. Canadian Ethnology Service Paper 92). Ottawa: National Museums of Canada.
- Nespor, Marina, Mohinish Shukla & Jacques Mehler. 2011. Stress-timed vs. syllable-timed languages. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell companion to phonology*, Blackwell Reference Online. 31 July 2012. Blackwell Publishing.
- Plank, Frans. 1998. The co-variation of phonology with morphology and syntax: A hopeful history. *Linguistic Typology* 2. 195–230.
- Radloff, Vasily. 1882. *Vergleichende Grammatik der nördlichen Türksprachen, erster Theil: Phonetik der nördlichen Türksprachen*. Leipzig: Weigel.
- Shaw, Patricia. 2002. On the edge: Obstruent clusters in Salish. In *Proceedings of the Workshop on the Structure and Constituency of the Languages of the Americas (WSCLA 7)*. University of British Columbia Working Papers in Linguistics 10. Vancouver: University of British Columbia.
- Smith, Jennifer L. 2011. Category-specific effects. In, Blackwell Online, 31 July 2012.

11 *What (else) depends on phonology?*

- Song, Jae Jung (ed.). 2011. *The Oxford handbook of linguistic typology*. Oxford: Oxford University Press.
- Tokizaki, Hisao. 2010. Syllable structure, stress location and head-complement order. *Phonological Studies: The Phonological Society of Japan* 13. 135–136.
- Tokizaki, Hisao & Yasutomo Kuwana. 2012. Limited consonant clusters in OV languages. In Phil Hoole et al (ed.), *Consonant clusters and structural complexity*, 71–91. Berlin: Mouton de Gruyter.
- Tucker, Archibald Norman & J. Tompo Ole Mpaayei. 1955. *A Maasai grammar with vocabulary*. London: Longmans, Green & Company.
- Vajda, Edward. 2001. *Test materials dated August 17, 2001*.
- Whaley, Lindsay J. 1997. *Introduction to typology*. Thousand Oaks, Cal: Sage.

