



PROJECT MUSE®

What kind of phonological change do we see in sign languages? Response to Law, Power, and Quinto-Pozos

Harry van der Hulst

Language, Volume 101, Number 3, September 2025, pp. e261-e273 (Article)

LANGUAGE
A JOURNAL OF THE LINGUISTIC
SOCIETY OF AMERICA

ARTICLE	PAGES
Harry van der Hulst, What kind of phonological change do we see in sign languages? Response to Law, Power, and Quinto-Pozos	e261-e273
Other articles in this issue	
Editorial	
Book Reviews	
Index	

Published by Linguistic Society of America

DOI: <https://doi.org/10.1353/lan.2025.a969629>

➔ *For additional information about this article*

<https://muse.jhu.edu/article/969629>

PERSPECTIVES

What kind of phonological change DO we see in sign languages? Response to Law, Power, and Quinto-Pozos

HARRY VAN DER HULST

University of Connecticut

In this response to the target article by Law, Power, and Quinto-Pozos, I draw attention to the fact that ‘sound change’ in sign languages does not seem to follow the Neogrammarian regularity principle and that, as a consequence, synchronic phonologies of sign languages do not have productive, obligatory phonological rules (whether allophonic or allomorphic rules). For example, the sound change that introduced aspiration for voiceless stops at the beginning of stressed syllables (when not preceded by /s/) is reflected as a regular, so-called allophonic rule in the synchronic phonological grammar of Modern English. Sign languages do not appear to have such regular allophonic rules or regular allomorphic rules.

Keywords: rule typology, allophonic rule, allomorphic rule, lexicalization, fast speech rule, suppletion, sound change, symmetry condition, compound, paradigmatic, syntagmatic

1. INTRODUCTION. The target article (Law, Power, & Quinto-Pozos 2025) rightly calls for including sign languages when studying and theorizing about the subject of ‘sound’ change, highlighting the important issues that this endeavor faces (see also Power 2022). In this response, I draw attention to the fact that ‘sound’ change in sign languages does not seem to follow the Neogrammarian REGULARITY PRINCIPLE and that, as a consequence, synchronic phonologies of sign languages do not have productive, obligatory phonological rules (whether ALLOPHONIC RULES OR ALLOMORPHIC RULES). For example, the sound change that introduced aspiration for voiceless stops at the beginning of stressed syllables (when not preceded by /s/), which must have occurred at some point in the history of English, is reflected as a so-called allophonic rule in the synchronic phonological grammar of Modern English. This sound change can be called regular because its synchronic reflex applies to ALL voiceless stops in the relevant context.

In van der Hulst & van der Kooij 2021, it was claimed that sign languages do not show evidence for another type of phonological rule, namely allomorphy rules, which convert phonemes into other phonemes, rather than specifying varying realizations of phonemes, like allophonic rules do. The absence of both rule types is not a coincidence if allomorphic rules originate from allophonic rules, the transition reflecting a type of phonological change. In this paper, rather than focusing only on sound change (or its sign language equivalent), I propose to broaden the discussion to change in the phonological system of a language, which includes both sound change (which I define as a change in the PHONETIC IMPLEMENTATION SYSTEM) and changes in the status of rules in the synchronic phonological module.

2. RULE TYPOLOGY AND THE LIFE CYCLE OF ‘PHONOLOGICAL’ RULES. When we want to understand what ‘sound change’ in sign languages could mean, as well as what we mean by ‘phonological rules’ in the synchronic study of sign languages, we cannot, in my view, be nonspecific about the kinds of synchronic effects that phonological changes have or about the different ways in which phonological change in sign languages unfolds. Are we talking about fast speech rules, obligatory allophonic rules, phonological rules proper (i.e. allomorphic rules), or about MORPHOLEXICAL rules?

Here I side with the common idea that phonological regularities have a ‘life cycle’, which can be formalized as follows.¹

- (1) *universal phonetic processes* > language-specific exaggeration (*allophonic rule*) > reanalyses as *phonological rule proper* (*allomorphic rule*) > morphologicalization as a *morpholexical rule* > morphologization as a *morphological rule*

Language-specific phonological regularities enter the language as ‘exaggerations’ (or ‘enhancements’) of universal phonetic processes, which are especially prevalent in fast or casual speech (giving rise to FAST SPEECH RULES). They then eventually stabilize in all registers as language-specific, obligatory allophonic rules that account for different realizations of phonemes in all registers of the language. Such rules can develop into ‘phonological rules proper’ (i.e. they PHONOLOGIZE; Hyman 1976, 2008, Kiparsky 2015a) when they have become NEUTRALIZING (due to further ‘exaggeration’), which means that they can be analyzed (by the learner and the linguist) as rules that change a phoneme A into another phoneme B (in some context), rather than accounting for a specific realization of a phoneme A. In this case the rule regards a property of phonemes that is contrastive in the relevant language.²

There are several notable differences between the rule types.³ While often (and perhaps always) allophonic rules regard gradient properties, phonological rules proper are categorial, which means that they regard a difference between the ‘+’ or ‘–’ specification of features (or absence vs. presence of a monovalent feature).⁴ The different status of phonological rules proper can also be revealed by their being sensitive to morphological factors and lexical exceptions. In comparison, allophonic rules do not have exceptions; they apply automatically, being blind to nonphonological information.⁵ When allophonic rules have become neutralizing (at least from a perceptual viewpoint), a learner could analyze their effect as involving a phonemic rather than allophonic change (i.e. as a phonological rule proper), but when such rules are fully ‘automatic’ and blind to the lexical identity of words, I would still analyze them as allophonic or implementational (which is often supported when the outcome is not actually identical to another phoneme).⁶ An issue of importance is that the blindness of implementation rules does

¹ See Hyman 1976, 2008, van der Hulst 1980, and Bermúdez-Otero 2007, 2013. The idea of a life cycle and the implied rule typology has a long history and originates in the works of the founders of phonology (such as Mikołaj Kuszewski and Jan Baudouin de Courtenay; see Radwańska-Williams 2022), only to be abandoned in Chomsky & Halle 1968. Anderson 1975 restores the three-way typology, as do, in one way or another, other theories that responded to the Chomsky & Halle 1968 model; see van der Hulst 1979 for a discussion of these developments.

² Phonologization can also result when the phonological context of a process is lost or obscured, which gives rise to a new phonemic contrast. This is often called SECONDARY SPLIT.

³ The distinction between allomorphy rules and allophonic rules is like the distinction between lexical and postlexical rules in Kiparsky’s lexical phonology model (see Kiparsky 1982, 1985).

⁴ Arguably this holds for the aspiration rule, but aspiration is actually gradient since primary and nonprimary stress condition different degrees of aspiration. Gradience in this case is expected, given that what is called aspiration involves a temporal property of VOICE ONSET TIME.

⁵ When apparent allophonic rules appear to be sensitive to morphological domains, this is a reason for analyzing them as QUASI-PHONEMES; for relevant cases see Harris 1987.

⁶ A case in point is final devoicing in Dutch, which neutralizes a contrast between voiced and voiceless obstruents in syllable-final position. This rule is fully automatic and exceptionless, which means that in my view it qualifies as a (perceptually) neutralizing allophonic rule (i.e. a phonetic implementation rule); see van der Hulst 2014 for discussion and references.

not seem to preclude their apparent sensitivity to word frequency and iconicity. I do not think there is a conflict here, but space limitations prevent me from elaborating on this issue.⁷

Summarizing, proper phonological rules do not account for the specific realization of phonemes. Instead, they account for PHONEMIC ALTERNATIONS that cause ALLOMORPHY. Henceforth, I therefore refer to such rules as ALLOMORPHY RULES.⁸ While an allophony rule takes as input a phoneme and outputs an allophone (i.e. a specific realization of the phoneme), an allomorphy rule has phonemes as inputs and as outputs. A typical example of an allomorphy rule is VOWEL HARMONY (VH) in Hungarian, where suffix vowels alternate between a front and back variant depending on the last vowel of the root (see van der Hulst 2018:181ff.).⁹

(2) öröm-nek 'joy-DAT'	va:roš-nak 'city-DAT'
öröm-ne:l 'joy-ADE'	va:roš-na:l 'city-ADE'

The alternating vowels are phonemes in their own right that occur contrastively in roots. Despite being a 'natural' rule that likely originates in allophonic (implementational) vowel-to-vowel coarticulation, VH is clearly not an allophonic rule.¹⁰ Despite its productivity in accounting for allomorphic variants of suffixes, roots (usually loans) can violate the VH constraint internally, although they still condition vowel harmony in suffixes that alternate in frontness depending on the last vowel of the root.

As shown in 1, a further phase in the life cycle of phonological rules is that the phonemic change can no longer be analyzed as being conditioned by the phonological context, because it specifies a phonemic change that occurs as a by-product of morphological operations; such rules are sometimes called MORPHOLEXICAL RULES, which can be completely morphologized or lost due to analogical leveling.

The sequence of rule types in 1 is of course rather crude. Universal phonetic processes are dependent on physical and psychological properties of speakers and on factors such as rate of speech and register, as well as many other Labovian variables. Fast speech rules are abundant in spoken languages (Kaisse 1985) (and also, as I argue, in sign languages), but they are not language-specific obligatory allophonic rules that apply in all registers of speech.

I assume that fast speech rules and language-specific obligatory allophonic rules (i.e. exaggerations or enhancements of universal phonetic processes) can be placed in the implementation module of the phonological system, which also takes care of the universal phonetic effects that have given rise to them. This view follows proposals in Pierrehumbert 1980 and is also defended in Liberman 2018. It is a terminological decision to refer to ALL phonetic implementation processes as allophonic rules or to restrict this term to obligatory, language-specific 'realization' rules, which I believe is a common practice and one that I follow here.

⁷ A proposal for the interplay between iconicity and implementation rules is offered in van der Hulst & van der Kooij 2006. The impact of frequency (as empirically supported in Bybee 2002a,b) can be explained in an exemplar-based model in which the increase of novel exemplars can cause lexical restructuring of the phonological representation of words (see Pierrehumbert 2016).

⁸ Sometimes linguists use the term MORPHOPHONEMIC RULE or simply PHONEMIC RULE in this sense.

⁹ Abbreviations: ADE: adessive, DAT: dative.

¹⁰ Here I stay neutral on how allomorphic alternations are analyzed. The most common view is that the allomorphy can be derived from a shared underlying form that somehow encodes the alternating phonemes, in which case the VH rule determines which phoneme occurs, based on the phonological context.

3. WHY BOTHER WITH RULE TYPOLOGY? In van der Hulst & van der Kooij 2021 we claimed that sign languages do not appear to show evidence for productive allomorphy rules. This claim has been challenged. I here mention a case (there are more) which suggests that phonological allomorphy DOES occur in sign languages, the case being pluralization of nouns in NGT/SLN (Nederlandse Gebarentaal/Sign Language of the Netherlands). As shown in van Boven, Hamann, & Pfau 2023, there are various phonological manifestations of pluralization, but all (except when pluralization is phonologically unmarked, i.e. zero-marked, which is possible for all nouns) involve REDUPLICATION (i.e. in-situ repetition of the sign¹¹). The choice between the zero option and reduplication can be called SUPPLETIVE. There are no reasons for saying that a feature [repeat] (which is the phonological representation of the plural morpheme) is deleted in such cases. The authors imply that the various overt manifestations of a reduplicative morpheme are PHONOLOGICAL ALLOMORPHS because, as they suggest, the choice of how reduplication is phonetically executed is dependent on phonological properties of the noun. Inspecting the examples, I come to a different conclusion. Yes, the differences are entirely determined by the phonological shape of noun signs, but, in each case, there simply is no other way that the phonological feature [repeat] could be phonetically implemented. It seems to me that the only ‘real’ phonological variation is that, in a small number of cases, signs that have a one-handed lateral articulation become two-handed, with both hands displaying reduplication. We could say that making a one-handed sign two-handed in such cases is a form of ICONIC ENHANCEMENT, given that two-handedness is often similarly iconic in other signs generally (see Lepic et al. 2016). Therefore, in this case, I would say that this allomorphy involving handedness is not phonologically but iconically motivated.

The claim that sign languages do not have allomorphy rules was never meant to exclude suppletive allomorphy, which does occur. It was specifically meant to be about phonologically conditioned allomorphy (although we did not say that explicitly in van der Hulst & van der Kooij).¹² I reserve the term ‘phonological allomorphy’ for cases in which a morpheme has phonologically related allomorphs that can be derived from a shared underlying form, such as the different forms of suffixes in Hungarian.¹³

Van der Hulst & van der Kooij 2021 did not claim that sign languages do not have phonological rules at all. However, given the rule typology here suggested, we have to ask what kinds of phonological rules sign languages then have if they do not have phonologically conditioned allomorphic rules. We do not have much to choose from. If we disregard morpholexical rules for the moment (which I think also do not occur in sign languages), all phonological rules would have to be implementational rules. However, this is not specific enough. I have suggested that implementational rules range from universal phonetic processes, subject to many factors such as rate of speech, to productive, obligatory, language-specific processes that, while being fully ‘automatic’,

¹¹ Pluralization can also be expressed by referring to multiple locations in the signing space, an option (perhaps to be called PERIPHRASTIC) that is not included in the analysis.

¹² We have to bear in mind that in certain theories (such the DISTRIBUTED MORPHOLOGY approach; see Halle & Marantz 1993) the term ‘allomorph’ is reserved for cases in which unrelated phonological forms express the same meaning. For example, English *-en* in *oxen* and *-s* in *cats* are called allomorphs. This is comparable to the alternation in NGT between [repeat] and the zero option. I call this ‘suppletive allomorphy’, even when the choice for suppletive allomorphs is phonologically conditioned (see Nevins 2011).

¹³ It is questionable whether the different realizations of, for example, the English plural /-s/—as [s], [z], and [əz]—count as phonological allomorphs or whether this variation can be accounted for by neutralizing allophony rules (located in the phonetic implementation submodule). The automaticity of the rules involved suggests the latter. Perhaps the insertion of the vowel [ə] is allomorphic, while the voicing adjustments are allophonic.

specify phonetic properties that enhance universal effects in all registers. The prototypical example in spoken languages is here again the English aspiration rule. I now claim that sign languages do not have such productive, obligatory allophonic rules. (Given the life cycle of phonological rules, this would then necessarily entail that sign languages do not have phonological allomorphy rules, assuming that rules cannot jump the line.) It seems to me that reports about ‘phonological rules’ in sign languages are always about fast speech rules.¹⁴ There are numerous reports about phonetic variation, often reported to be subject to sociolinguistic variables (see Woodward 1976, Ann 1991, Cheek 2001, Mauk 2003, Lucas & Bayley 2011, Bayley, Schembri, & Lucas 2015). I would argue that this kind of variation results from implementation rules that reflect ‘sound’ change in progress when their phonetic effect increases from generation to generation. The work of William Labov (e.g. Labov 1994, 2007) has shown that such changes in spoken languages can play out over long periods of time.

Often-discussed processes such as LOWERING and CENTERING must be regarded as resulting from fast speech processes (see Kevin, Wilkinson, & Janzen 2011, Tyrone & Mauk 2012). Lowering targets individual signs that are articulated near the forehead, which tend to lower their place of articulation, sometimes with a neutralizing effect (when the new location is a contrastive property of other signs). Centering involves changing the location of a sign from a lateral location to a central location on the chest (see Frishberg 1975, 1976, Friedman 1976, 1977). The motivation for both lowering and centering is ARTICULATORY EASE (which in the case of lowering involves the effect of gravity), while perceptual ease also plays a role because sign locations are moved toward the center of the visual field, thus serving VISUAL ACUITY (Siple 1978).¹⁵ The changes involved may be very common, but they are not obligatory, which is not to deny that they can be lexicalized for specific signs. As I argue, LEXICALIZATION, apart from changes in the implementation system, is another type of phonological change that involves restructuring of the phonological representation of words. We thus need an understanding of how lexicalization ‘works’.¹⁶

Needless to say, whatever the status of phonological regularities in sign languages, all studies that carefully document and analyze the attested processes are of the utmost importance, in their own right, but also as accounts of sound change in progress. We need to explain why these changes in progress have not made it to completion in the form of obligatory allophonic rules or, subsequently, allomorphic rules.

4. COMPOUNDS. Sign researchers have often said or assumed that sign languages do not have a lot of phonological rules (of whatever kind) because such rules require sequential, syntagmatic context.¹⁷ In the earliest work on sign phonology, Stokoe (1960) argued that monomorphemic signs do not display sequential segments as spoken

¹⁴ This conclusion has independently been stated in §4.10 (written by Nathan Sanders) in Anderson et al. 2022.

¹⁵ Fast speech rules can take whole phrases as their domain or target individual signs with certain properties. For example, consecutive signs with different hand orientations and different locations are bound to display coarticulation. The phrasal level also displays hand spreading, which I also attribute to fast speech. What suggests that this process is more than that is that it can be used to mark specific syntactic parts of the utterance (see Nespor & Sandler 1999).

¹⁶ An account would need to rely on an EXEMPLAR-BASED APPROACH, but for reasons of space I cannot elaborate on this point (see Bybee 2002a,b, Pierrehumbert 2016, and Todd, Pierrehumbert, & Hay 2019).

¹⁷ A broader discussion of phonological variation that is due to fast speech rules would have to include other sequential structures involving, for example, reduplication (see Fischer 1973, Berent, Dupuis, & Brentari 2014) and words formed by fingerspelling (see Jerde, Soechting, & Flanders 2003, Wager 2012, Keana 2014).

languages do.¹⁸ The same holds for morphologically complex signs that involve non-concatenative morphological processes. There are not a lot of affixes. It has been said that, for the same reason, isolating spoken languages, such as Mandarin Chinese, do not show much evidence for phonological rules either. Therefore, in looking for phonological rules, sign researchers have usually turned their attention to compounds that involve sequencing of signs.¹⁹ I (stubbornly) maintain that in sign languages there are no regular, language-specific allophonic rules—let alone productive allophonic or allomorphic rules, not even in the case of compounds—that apply whenever a compound is made. For comparison, in spoken language, we can find examples of productive allomorphic rules that apply in compounding. For example, the *RENDAKU* rule in Japanese regularly changes an initial voiceless obstruent in the second member of a compound to a voiced obstruent (unless that word already contains a voiced obstruent): for example, *ori* + *kami* > *origami* ‘paper folding’.²⁰

I suggest that phonological changes in compounds have three underlying causes. First, they involve fast speech rules. Second, what reinforces the idea that the processes involved are proper phonological rules is that their effects are often *LEXICALIZED*. Related to the second point, a third factor that motivates the changes in compounds—being words—is that we see the tendency to reduce their phonological shape to the shape that is virtually mandatory for monomorphemic words. Bringing new words in line with *PHONOTACTIC CONSTRAINTS* is a type of change that should be distinguished from sound change and change in the status of rules. This is a third type of phonological change, next to change in progress and lexicalization.²¹

5. ARE WE LOOKING IN THE RIGHT PLACES? Sequential structure is not required for phonological rules because changes can be conditioned by simultaneous, paradigmatic properties. Paradigmatically conditioned rules are more expected in sign languages than in spoken languages, given that the internal, simultaneous structure of signs is much richer than the simultaneous structure of segments in spoken languages.²²

The literature on sign phonology provides numerous examples of phonetic variation in the realization of features or feature groups within the sign segment that are dependent on the simultaneous cooccurrence with other features or feature groups. Stokoe already noted cases of allophonic variation in handshapes (which he called *ALLOCHERIC*²³ variation), but he did not specify the conditions; he proposed only one ‘phonemic’

¹⁸ Here I ignore the arguments that have been made for sequential ‘syllable’ templates (see Liddell & Johnson 1989, Sandler 1987, 1989, Perlmutter 1993, van der Hulst 1993, Brentari 2019).

¹⁹ For a recent discussion of compounding in sign languages, see Lepic 2023.

²⁰ For *rendaku*, see Vance 2017.

²¹ It is my impression that the lexicalization literature usually does not focus on phonological restructuring (Brinton & Traugott 2005).

²² Stokoe (1960) proposed that there are three major phonological units in sign (handshape, location, and movement properties) and that these units are co-temporal (paradigmatic). This led him to declare that whereas phonemes in spoken language words are sequential, they are co-temporal in signed words. In this statement it is implied that Stokoe refers to these co-temporal units of signs as phonemes. In van der Hulst 1993 I pointed out that it is misleading to refer to handshape, location, and movement as phonemes. The correct analogy is to compare these units to the equally co-temporal *CLASS NODES* in spoken language segments, such as the laryngeal, manner, and place-of-articulation nodes (see Clements 1985). In van der Hulst 1993 I proposed that the structure of simplex signs and signs that involve nonconcatenative morphology be referred to as *MONOSEGMENTAL* (also see van der Hulst 1995, Channon 2002, van der Kooij 2002, van der Hulst & van der Kooij 2021). For a historical review of sign language phonology, see van der Hulst 2022.

²³ Stokoe’s attempt to develop a new terminology to refer to the perceptual side of sign language (*cherology*, *chereme*, *allocheric*) failed.

transcription symbol for the variants. However, Friedman 1976 (especially Ch. 2, §2.24) and Mandel 1981 go into more detail.²⁴ Many more relevant references to allocheric variation could be cited.

To answer the question of whether these cases of variation require phonological rules of some kind, we need to establish whether the variation goes beyond the (possibly exaggerated) effects of universal implementational processes, subject to rate-of-speech factors. But more importantly, for the purposes of this response, we also need to know whether the observed form variation is due to obligatory, regular, and productive allophonic rules. My impression is that this is not the case, even though the effects can be lexicalized in specific signs, as we also see in compounds.

Morphologically complex signs that involve nonconcatenative morphology create additional room for paradigmatically conditioned variation in the form of units of signs that are morphemes. Once more, I suspect that it will be difficult to find relevant examples that involve obligatory rules.

I conclude (albeit with hesitation): all form variation in signs is due to implementation rules that mostly favor ease of articulation (and implicitly block impossible articulations), subject to fast speech conditions and other Labovian variables. The claim here is that these processes have not acquired the status of obligatory allophonic rules that apply in all registers (hence are not subject to rate-of-speech effects or other sociolinguistic variables), let alone the status of phonological rules that create allomorphy. This does not mean that sign languages are not subject to phonological change.²⁵

6. PHONOLOGICAL CHANGE IN SIGN LANGUAGES. Summarizing, I would like to distinguish three kinds of phonological change that occur in sign languages over time.

First, given that sign languages show a wide variety of fast speech processes, we could argue that these processes are sound changes in progress when we see that the implementation rules exaggerate their effects over time, for example, from generation to generation. What we have not observed is the second stage of phonological change, which occurs when implementation processes become obligatory allophonic rules and such rules subsequently give rise to allomorphic rules.

Second, the effects of sound changes in progress can be lexicalized. Lexicalization involves a restructuring of the phonological representation of words that is due to an increase in the frequency of new pronunciations, the so-called exemplars that are stored, alongside a discrete phonological representation.

There is a third kind of change, which brings us the general phonotactic constraints that seem to apply to all sign languages, such as the SYMMETRY CONDITION (Battison 1978). The groundbreaking work of Nancy Frishberg has shown that sign languages are subject to phonological change (Frishberg 1975, 1976, Supalla 2013). The target article by Law et al., together with Fischer 2015 and Power, Quinto-Pozos, & Law 2022, also provides examples of diachronic changes in the phonological shape of individual signs. These publications show that both phonological and visual constraints conspire to make two-handed signs be performed more symmetrically or signs in general more centrally.

²⁴ Friedman shows that handshape variation can have neutralizing effects, such as when an H-handshape varies with another realization that could be analyzed as an independent, contrastive handshape.

²⁵ An important addendum to the regularity principle was introduced by the notion of LEXICAL DIFFUSION (Wang 1969), which refers to the idea that a change from a phoneme A to phoneme B (context-free or conditioned) does not instantaneously affect all occurrences of A in the lexicon. Labov (2007) and Kiparsky (1995, 2015b) separate sound change from lexical diffusion. Space limitations prevent me from including lexical diffusion in the present discussion. For a general discussion, see Phillips 2015.

While trends are discernible and some of the observed changes seem to involve fast speech processes that reveal sound changes in progress, we also see changes that do not fit the bill of sound changes in progress, let alone an emergence of obligatory allophonic rules or a transition from those to allomorphic rules.

Frishberg (1975:711) takes note of the fact that the early stages of ASL reflect a language in *statu nascendi*, that is, a language that, at the phonological level, does not comply with the phonotactic constraints that all 'mature' sign languages which have been studied to date largely comply with. This leads one to expect that signs in emerging sign languages will tend to change the phonological form when they violate these constraints. Such changes remove gestural aspects and aspects that are alien to sign language phonology (such as using a table as the place of articulation). They also try to remove iconic aspects, although iconic properties that can function as major clues to the meaning of signs tend to survive. Changes of this kind can be compared with the changes we see in spoken languages of loanwords that violate phonotactic constraints being 'repaired' so that they become phonologically well-formed. As Frishberg and others have shown, in sign languages, repairs are likely to occur when signs that are gestural or iconic display properties that violate phonotactic constraints. Such repairs, which thus constitute a third type of phonological change, also apply to fingerspelled words (which in a sense are loanwords), which apart from showing effects of rapid speech, also gravitate toward the canonical structure of proper signs. The compression of compounds that is motivated by complying with the phonotactic template of monomorphemic signs also falls into this category.

7. CONCLUSIONS. In this commentary I have tried to emphasize that we need to be very precise about what kind of rules phonological systems can contain. Not only must we distinguish various types of phonological rules, but we must also separate syntagmatically and paradigmatically conditioned rules from one another. I think that this is necessary in order to appreciate how phonological change can be reflected in the synchronic phonology of languages. The paucity of concatenative morphology in sign languages suggests a smaller role for syntagmatically conditioned rules other than those that have been observed in compounds. But the rich paradigmatic structure of signs, whether monomorphemic or polymorphemic, suggests that paradigmatic effects are more pervasive in sign languages. Nevertheless, both syntagmatic effects (in compounds) and paradigmatic effects are such that they do not seem to give rise to regular, productive phonological rules that go beyond the enhancement of universal phonetic processes in the form of fast speech rules.

As noted by Law et al., if regular synchronic rules are reflexes of sound changes, it stands to reason that such changes need time to establish themselves as productive, obligatory rules. Labov has shown that sound changes can be ongoing over many generations, and this could mean that sign languages, given their youth, have not yet had that time.²⁶ Also, the youth factor explains why many changes involve bringing sign languages into alignment with phonotactic constraints that can be widely observed in mature sign languages.

I have argued that sign languages definitely are subject to various types of phonological change. While in some distant future, we may be able to compare different stages

²⁶ But here, as also noted by Law et al., the nature of the transgenerational passing on of sign language, being very different from what we see in spoken language communities, is likely another reason why implementational processes do not show the same patterns of changes across generations.

of mature sign languages and study correspondences between them from which we can infer processes of phonological change, it would seem that currently, we can only observe (a) sound changes in progress, manifested in fast speech rules, (b) instances of lexicalization (notably in compounds), and (c) changes that involve molding sign languages into being phonologically well behaved.²⁷

REFERENCES

- ANDERSON, CATHERINE; BRONWYN BJORKMAN; DEREK DENIS; JULIANNE DONER; MARGARET GRANT; NATHAN SANDERS; and AI TANIGUCHI (eds.) 2022. *Essentials of linguistics*. 2nd edn. Hamilton: eCampusOntario. Online: <https://ecampusontario.pressbooks.pub/essentialsoflinguistics2/>.
- ANDERSON, STEPHEN. 1975. On the interaction of phonological rules of various types. *Journal of Linguistics* 11(1).39–62. DOI: 10.1017/S0022226700004266.
- ANN, JEAN. 1991. Phonetic variation in sign language handshapes: Evidence from Taiwan Sign Language and American Sign Language. *Proceedings of the second meeting of the Formal Linguistics Society of Mid-America (FLSM 2)*, Ann Arbor, ed. by Matthew Alexander and Monika Dressler, 311–26.
- BATTISON, ROBBIN. 1978. *Lexical borrowing in American Sign Language*. Silver Spring, MD: Linstok.
- BAYLEY, ROBERT; ADAM C. SCHEMBRI; and CEIL LUCAS. 2015. Variation and change in sign languages. *Sociolinguistics and deaf communities*, ed. by Adam C. Schembri and Ceil Lucas, 61–94. Cambridge: Cambridge University Press. DOI: 10.1017/CBO9781107280298.004.
- BERENT, IRIS; AMANDA DUPUIS; and DIANE BRENTARI. 2014. Phonological reduplication in sign language: Rules rule. *Frontiers in Psychology* 5:560. DOI: 10.3389/fpsyg.2014.00560.
- BERMÚDEZ-OTERO, RICARDO. 2007. Diachronic phonology. *The Cambridge handbook of phonology*, ed. by Paul de Lacy, 497–518. Cambridge: Cambridge University Press. DOI: 10.1017/CBO9780511486371.022.
- BERMÚDEZ-OTERO, RICARDO. 2013. Amphichronic explanation and the life cycle of phonological processes. In *Honeybone & Salmons*, 374–99. DOI: 10.1093/oxfordhb/9780199232819.013.014.
- BRENTARI, DIANE. 2019. *Sign language phonology*. Cambridge: Cambridge University Press. DOI: 10.1017/9781316286401.
- BRINTON, LAUREL J., and ELIZABETH CLOSS TRAUOGOTT. 2005. *Lexicalization and language change*. Cambridge: Cambridge University Press. DOI: 10.1017/CBO9780511615962.
- BYBEE, JOAN. 2002a. Word frequency and context of use in the lexical diffusion of phonetically conditioned sound change. *Language Variation and Change* 14(3).261–90. DOI: 10.1017/S0954394502143018.
- BYBEE, JOAN. 2002b. Lexical diffusion in regular sound change. *Sounds and systems: Studies in structure and change: A festschrift for Theo Vennemann* (Trends in linguistics 141), ed. by David Restle and Dietmar Zaefferer, 59–74. Berlin: Mouton de Gruyter. DOI: 10.1515/9783110894653.59.
- CHANNON, RACHEL. 2002. *Signs are single segments: Phonological representations and temporal sequencing in ASL and other sign languages*. Baltimore: University of Maryland dissertation.

²⁷ Taking a different perspective on phonotactic constraints, Ferrara & Napoli 2019 and Napoli & Ferrara 2021 provide an example of an iconically-motivated phonotactic constraint that captures the specific choice for a phonological property of signs in terms of properties of the object that is being depicted. They establish a LEXICAL DRAWING PRINCIPLE, which says, here paraphrased, that the edges of a two-dimensional, symmetrical shape that has no curves (like a square) tend to be iconically outlined with two moving hands, whereas only one hand is used otherwise, such as for outlining curved two-dimensional shapes (even when symmetrical, like a circle). The mapping from conceptual structure to iconic forms may cause the emergence of mandatory, iconically driven phonological properties of signs that we may see as a kind of phonological change.

- CHEEK, DAVINA ADRIANNE. 2001. *The phonetics and phonology of handshape in American Sign Language*. Austin: University of Texas dissertation.
- CHOMSKY, NOAM, and MORRIS HALLE. 1968. *The sound pattern of English*. New York: Harper and Row.
- CLEMENTS, GEORGE N. 1985. The geometry of phonological features. *Phonology Yearbook* 2.225–52. DOI: 10.1017/S0952675700000440.
- FERRARA, CASEY, and DONNA JO NAPOLI. 2019. Manual movement in sign languages: One hand versus two in communicating shapes. *Cognitive Science* 43(9):12741. DOI: 10.1111/cogs.12741.
- FISCHER, SUSAN D. 1973. Two processes of reduplication in the American Sign Language. *Foundations of Language* 9(4):469–80. Online: <https://www.jstor.org/stable/25000693>.
- FISCHER, SUSAN D. 2015. Sign languages in their historical context. *The Routledge handbook of historical linguistics*, ed. by Claire Bowerman and Bethwyn Evans, 442–65. London: Routledge.
- FRIEDMAN, LYNN A. 1976. *Phonology of a soundless language: Phonological structure of the American Sign Language*. Berkeley: University of California dissertation. Online: <https://escholarship.org/uc/item/4zw7p9qg>.
- FRIEDMAN, LYNN A. 1977. Formational properties of American Sign Language. *On the other hand: New perspectives in American Sign Language*, ed. by Lynn A. Friedman, 13–56. New York: Academic Press.
- FRISHBERG, NANCY. 1975. Arbitrariness and iconicity: Historical change in American Sign Language. *Language* 51(3):696–719. DOI: 10.2307/412894.
- FRISHBERG, NANCY. 1976. *Some aspects of the historical development of signs in ASL*. San Diego: University of California dissertation.
- HALLE, MORRIS, and ALEC MARANTZ. 1993. Distributed morphology and the pieces of inflection. *The view from Building 20: Essays in linguistics in honor of Sylvain Bromberger*, ed. by Kenneth L. Hale and Samuel J. Keyser, 111–76. Cambridge, MA: MIT Press.
- HARRIS, JOHN. 1987. Non-structure preserving rules in lexical phonology: Southeastern Bantu harmony. *Lingua* 72(4):255–92. DOI: 10.1016/0024-3841(87)90048-9.
- HONEYBONE, PATRICK, and JOSEPH SALMONS (eds.) 2015. *The Oxford handbook of historical phonology*. Oxford: Oxford University Press. DOI: 10.1093/oxfordhb/9780199232819.001.0001.
- HYMAN, LARRY. 1976. Phonologization. *Linguistic studies presented to Joseph H. Greenberg*, vol. 4, ed. by Alphonse Juillard, 407–18. Saratoga, CA: Anma Libri.
- HYMAN, LARRY. 2008. Enlarging the scope of phonologization. *UC Berkeley PhonLab Annual Report* 4:382–409. DOI: 10.5070/P73zm91694.
- JERDE, THOMAS E.; JOHN F. SOECHTING; and MARTHA FLANDERS. 2003. Coarticulation in fluent fingerspelling. *Journal of Neuroscience* 23:2383–93. DOI: 10.1523/JNEUROSCI.23-06-02383.2003.
- KAISSE, ELLEN M. 1985. *Connected speech: The interaction of syntax and phonology*. Orlando: Academic Press.
- KEANA, JONATHAN. 2014. *Towards an articulatory model of handshape: What fingerspelling tells us about the phonetics and phonology of handshape in American Sign Language*. Chicago: University of Chicago dissertation.
- KEVIN, RUSSELL; ERIN WILKINSON; and TERRY JANZEN. 2011. ASL sign lowering as undershoot: A corpus study. *Laboratory Phonology* 2(2):403–22. DOI: 10.1515/labphon.2011.015.
- KIPARSKY, PAUL. 1982. From cyclic phonology to lexical phonology. *The structure of phonological representations*, ed. by Harry van der Hulst and Norval Smith, 131–77. Dordrecht: Foris. DOI: 10.1515/9783112328088-008.
- KIPARSKY, PAUL. 1985. Some consequences of lexical phonology. *Phonology Yearbook* 2.85–139. DOI: 10.1017/S0952675700000397.
- KIPARSKY, PAUL. 1995. The phonological basis of sound change. *The handbook of generative phonology*, ed. by John Goldsmith, 640–70. Oxford: Blackwell. [Reprinted, *The handbook of historical linguistics*, ed. by Brian D. Joseph and Richard D. Janda, 311–42. Oxford: Blackwell, 2003. DOI: 10.1002/9780470756393.ch6.]

- KIPARSKY, PAUL. 2015a. Phonologization. In Honeybone & Salmons, 563–80. DOI: 10.1093/oxfordhb/9780199232819.013.017.
- KIPARSKY, PAUL. 2015b. New perspectives in historical linguistics. *The Routledge handbook of historical linguistics*, ed. by Claire Bowerman, 64–102. New York: Routledge.
- LABOV, WILLIAM. 1994. *Principles of language change, vol. 1: Internal factors*. Oxford: Blackwell.
- LABOV, WILLIAM. 2007. Transmission and diffusion. *Language* 83(2).344–87. DOI: 10.1353/lan.2007.0082.
- LAW, DANNY; JUSTIN M. POWER; and DAVID QUINTO-POZOS. 2025. Bringing signed languages into the study of regular sound change. *Language* 101(3).e166–e201.
- LEPIC, RYAN. 2023. Identifying ASL compounds: A functionalist approach. *Sign Language Studies* 23(4).461–99. DOI: 10.1353/sls.2023.a905536.
- LEPIC, RYAN; CARL BÖRSTELL; GAL BELSITZMAN; and WENDY SANDLER. 2016. Taking meaning in hand: Iconic motivations in two-handed signs. *Sign Language & Linguistics* 19(1).37–81. DOI: 10.1075/sll.19.1.02lep.
- LIBERMAN, MARK. 2018. Toward progress in theories of language sound structure. *Shaping phonology*, ed. by Diane Brentari and Jackson L. Lee, 201–22. Chicago: University of Chicago Press. DOI: 10.7208/chicago/9780226562599.003.0009.
- LIDDELL, SCOTT, and ROBERT E. JOHNSON. 1989. American Sign Language: The phonological base. *Sign Language Studies* 64.195–278. DOI: 10.1353/sls.1989.0027.
- LUCAS, CEIL, and ROBERT BAYLEY. 2011. Variation in sign languages: Recent research on ASL and beyond. *Language and Linguistics Compass* 5(9).677–90. DOI: 10.1111/j.1749-818X.2011.00304.x.
- MANDEL, MARK ALAN. 1981. *Phonotactics and morphophonology in American Sign Language*. Berkeley: University of California dissertation.
- MAUK, CLAUDE E. 2003. *Undershoot in two modalities: Evidence from fast speech and fast signing*. Austin: University of Texas dissertation. Online: <http://hdl.handle.net/2152/762>.
- NAPOLI, DONNA JO, and CASEY FERRARA. 2021. Correlations between handshape and movement in sign languages. *Cognitive Science* 45:e12944. DOI: 10.1111/cogs.12944.
- NESPOR, MARINA, and WENDY SANDLER. 1999. Prosody in Israeli Sign Language. *Language and Speech* 42(2–3).143–76. DOI: 10.1177/00238309990420020201.
- NEVINS, ANDREW. 2011. Phonologically-conditioned allomorph selection. *The Blackwell companion to phonology, vol. 4: Phonological interfaces*, ed. by Colin Ewen, Elizabeth Hume, Marc van Oostendorp, and Keren Rice, 2357–82. Oxford: Blackwell. DOI: 10.1002/9781444335262.wbctp0099.
- PERLMUTTER, DAVID M. 1993. Sonority and syllable structure in American Sign Language. *Phonetics and phonology: Current issues in ASL phonology*, ed. by Geoffrey R. Coulter, 227–59. New York: Academic Press.
- PHILLIPS, BETTY S. 2015. Lexical diffusion in historical phonology. In Honeybone & Salmons, 359–73. DOI: 10.1093/oxfordhb/9780199232819.013.015.
- PIERREHUMBERT, JANET. 1980. *The phonology and phonetics of English intonation*. Cambridge, MA: MIT dissertation. Online: <http://hdl.handle.net/1721.1/16065>.
- PIERREHUMBERT, JANET. 2016. Phonological representation: Beyond abstract versus episodic. *Annual Review of Linguistics* 2.33–52. DOI: 10.1146/annurev-linguistics-030514-125050.
- POWER, JUSTIN M. 2022. Historical linguistics of sign languages: Progress and problems. *Frontiers in Psychology* 13:818753. DOI: 10.3389/fpsyg.2022.818753.
- POWER, JUSTIN M.; DAVID QUINTO-POZOS; and DANNY LAW. 2022. Adjacency in time and space: An investigation of assimilatory diachronic changes in American Sign Language. Paper presented at the 96th annual meeting of the Linguistic Society of America, Washington, DC.
- RADWAŃSKA-WILLIAMS, JOANNA. 2022. The Kazan School: Jan Baudouin de Courtenay and Mikołaj Kruszewski. *The Oxford history of phonology*, ed. by B. Elan Dresher and Harry van der Hulst, 284–306. Oxford: Oxford University Press. DOI: 10.1093/oso/9780198796800.003.0009.
- SANDLER, WENDY. 1987. *Sequentiality and simultaneity in American Sign Language phonology*. Austin: University of Texas dissertation.

- SANDLER, WENDY. 1989. *Phonological representation of the sign: Linearity and nonlinearity in ASL phonology*. Dordrecht: Foris. DOI: 10.1515/9783110250473.
- SIPLE, PATRICIA. 1978. Visual constraints for sign language communication. *Sign Language Studies* 19.95–110. DOI: 10.1353/sls.1978.0010.
- STOKOE, WILLIAM C. 1960. *Sign language structure: An outline of the visual communication systems of the American deaf*. (Studies in Linguistics: Occasional papers 8.) Buffalo, NY: University of Buffalo.
- SUPALLA, TED. 2013. The role of historical research in building a model of sign language typology, variation and change. *Historical linguistics 2011: Selected papers from the 20th International Conference on Historical Linguistics*, ed. by Ritsuko Kikusawa and Lawrence Reid, 15–42. Amsterdam: John Benjamins. DOI: 10.1075/cilt.326.04sup.
- TODD, SIMON; JANET B. PIERREHUMBERT; and JENNIFER HAY. 2019. Word frequency effects in sound change as a consequence of perceptual asymmetries: An exemplar-based model. *Cognition* 185.1–20. DOI: 10.1016/j.cognition.2019.01.004.
- TYRONE, MARTHA E., and CLAUDE E. MAUK. 2012. Phonetic reduction and variation in American Sign Language: A quantitative study of sign lowering. *Laboratory Phonology* 3(2).425–53. DOI: 10.1515/lp-2012-0019.
- VAN BOVEN, CINDY; SILKE HAMANN; and ROLAND PFAU. 2023. Nominal plurals in Sign Language of the Netherlands: Accounting for allomorphy and variation. *Glossa: a journal of general linguistics* 8(1). DOI: 10.16995/glossa.9686.
- VAN DER HULST, HARRY. 1979. Recent developments in phonological theory: Review of *An introduction to natural generative phonology*, by J. B. Hooper. *Lingua* 49(2–3).207–38. DOI: 10.1016/0024-3841(79)90024-X.
- VAN DER HULST, HARRY. 1980. Towards a lexical theory of phonological change. *Linguistics in the Netherlands 1977–79*, ed. by Wim Zonneveld and Frits Weerman, 170–82. Dordrecht: Foris. DOI: 10.1515/9783110860023-014.
- VAN DER HULST, HARRY. 1993. Units in the analysis of signs. *Phonology* 10(2).209–41. DOI: 10.1017/S095267570000004X.
- VAN DER HULST, HARRY. 1995. Dependency relations in the phonological representation of signs. *Sign Language Research 1994: Proceedings of the Fourth European Congress on Sign Language Research*, ed. by Heleen F. Bos and Gertrude M. Schermer, 11–38. Hamburg: Signum.
- VAN DER HULST, HARRY. 2014. The laryngeal class in RcvP and voice phenomena in Dutch. *Above and beyond the segments: Experimental linguistics and phonetics*, ed. by Johanneke Caspers, Yiya Chen, Willemijn Heeren, Jos Pacilly, Niels O. Schiller, and Ellen van Zanten, 323–49. Amsterdam: John Benjamins. DOI: 10.1075/z.189.26hul.
- VAN DER HULST, HARRY. 2018. *Asymmetries in vowel harmony: A representational account*. Oxford: Oxford University Press. DOI: 10.1093/oso/9780198813576.001.0001.
- VAN DER HULST, HARRY. 2022. The (early) history of sign language phonology. *The Oxford history of phonology*, ed. by B. Elan Dresher and Harry van der Hulst, 284–306. Oxford: Oxford University Press. DOI: 10.1093/oso/9780198796800.003.0014.
- VAN DER HULST, HARRY, and ELS VAN DER KOIJ. 2006. Phonetic implementation and phonetic pre-specification in sign language phonology. *Laboratory phonology 8*, ed. by Louis Goldstein, D. H. Whalen, and Catherine T. Best, 265–86. Berlin: Mouton de Gruyter. DOI: 10.1515/9783110197211.1.265.
- VAN DER HULST, HARRY, and ELS VAN DER KOIJ. 2021. Phonological structure of signs—Theoretical perspectives. *The Routledge handbook of theoretical and experimental sign language research*, ed. by Josep Quer Villanueva, Roland Pfau, and Annika Herrmann, 1–33. London: Routledge.
- VAN DER KOIJ, ELS. 2002. *Phonological categories in Sign Language of the Netherlands: The role of phonetic implementation and iconicity*. Leiden: Universiteit Leiden dissertation. Online: <https://www.lotpublications.nl/phonological-categories-in-sign-language-of-the-netherlands-phonological-categories-in-sign-language-of-the-netherlands-the-role-of-phonetic-implementation-and-iconicity>.
- VANCE, TIMOTHY J. 2017. Rendaku or sequential voicing in Japanese phonology. *Oxford research encyclopedia of linguistics*. DOI: 10.1093/acrefore/9780199384655.013.280.

- WAGER, DEBORAH S. 2012. *Fingerspelling in American Sign Language: A case study of styles and reduction*. Salt Lake City: University of Utah dissertation.
- WANG, WILLIAM S.-Y. 1969. Competing changes as a cause of residue. *Language* 45(1). 9–25. DOI: 10.2307/411748.
- WOODWARD, JAMES C. 1976. Signs of change: Historical variation in American Sign Language. *Sign Language Studies* 10(1).81–94. DOI: 10.1353/sls.1976.0003.

[harry.van.der.hulst@uconn.edu]

[Received 14 April 2025;
revision invited 9 May 2025;
revision received 12 May 2025;
accepted 30 May 2025]