# Metathesis

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**Abstract:**

Metathesis is often loosely defined as the sequential reordering of one or more segments or features. For decades, broad definitions of metathesis have often resulted in the reconstruction of any kind of segmental transposition, but not all metatheses are equally probable, with some specific segmental displacements being unattested as sound changes and others being asymmetric, i.e. only observed in one direction.

This chapter presents a state of the art of the typological and phonetically grounded studies on metathesis, both as a historical change as well as an ongoing sound change in progress. It focuses on the articulatory and perceptual factors that might condition metathesis, as well as on its potential relationship to speech errors.

Although metathesis has often been regarded as irregular, apparent-time studies show that local regular metathesis can develop through intermediate (non-phonologized) incremental stages, which can be analyzed within frameworks of sound change based on perceptual cue re-weighting. Irregular metathesis is also widely attested, and it might be better accounted for by error-based models of sound change, including those grounded on perceptual mistakes as well as those based on speech errors, given that in both models words are targeted instead of phonological contexts. The observation that local metathesis is more often regular than distant metathesis is also discussed, with a case-study suggesting that non-local perceptually-based metathesis can be pervasive to the point of mimicking regularity. It is also suggested that speech error-based reciprocal metathesis may represent an example of both distant metathesis and direct transposition, both of which have been claimed to be nonexistent.

In short, metathesis is far from a monolithic sound change, but a cover term for many different types of synchronic and diachronic changes.

**Keywords:** Metathesis; Sound Change; Regularity; Irregularity; Perception; Speech Errors.

## 1-Introduction

Metathesis is often very generally defined as the sequential reordering of one or more segments or features. It can be divided in adjacent or local metathesis —when the affected segments are in contact, as in Proto-West Germanic *hross* > Old English *hors* 'horse'— and distant or non-local metathesis —when the process occurs across at least one segment not involved in it, as in Standard English *relevant* > colloquial English *revelant*. Nonetheless, metathesis is far from a monolithic sound change. More in line with labels such as *lenition* or *fortition*, metathesis is a loosely defined concept for many different types of synchronic and diachronic changes. This lack of precision in its definition might explain why metathesis has been described as both sporadic (Lehmann 1962; Webb 1974; Stonham 1990) and irregular (Sievers 1881, 212) as well as potentially systematic under the right conditions (Grammont 1950; Ultan 1978; Hock 1985; Blevins and Garrett 1998, 2004; Hume 2001, 2004), and both descriptions might be correct for different processes that have been labeled as *metathesis* (see Canfield 2016; Hume 2023; and Mooney 2023 for metathesis surveys, and Hume and Seyfarth

2019 for a general overview with extensive references). In addition, metathesis (or *pseudo-metathesis*, Blevins and Garrett 1998), has oftentimes been observed to be a sequential telescoping of a series of changes including feature copy/spread and subsequent deletion (see Mooney in press). The term metathesis is also used in morphology, where it describes the encoding of a morphological class through segmental transposition (Thompson and Thompson 1969; Becker 2000). Other mechanisms that can yield metathesis-like results beyond sound change include some loanword adaptation patterns and analogical morphophonology (Garrett and Blevins 2009).

One of the often-noted characteristics of metathesis is that it is not as common as other sound changes. This has led to a dismissive view of this process, being referred to as a type of speech or performance error with marginal character (by Spencer 1996, 68; Crystal 1997, 240; see Hume 2001). It has been argued that the low frequency of metathesis might be because metathesis disrupts word recognition much more than other processes such as assimilation (Mielke and Hume 2000). If this were the case, one would expect a lowest incidence of the especially disrupting word-initial metathesis, due to the highest informativity of this position, but this possibility has not been empirically tested. Metathesis has also been problematic for phonological models that aim to integrate phonetic naturalness, often considering it less natural than other processes. It is possible that metathesis has been considered to be unnatural because its phonetic origins have been too infrequently investigated (Blevins and Garrett 1998 being one of the first such studies).

Metathesis is often considered structure-preserving because its output conforms to existing structures in the language (Grammont 1950; Ultan 1978; Kiparsky 1995, 655). However, multiple instances of metathesis show that this is not necessarily so (such as the Cayuga [cayu1261] laryngeal metathesis in Blevins and Garrett 1998, 519–20 or the Andalusian Spanish case discussed in Section 2). It has also been considered an optimizing sound change (e.g. Grammont 1923) that repairs suboptimal sound sequences. Nonetheless, many of the observations that are consistent with this view could also be accounted for in terms of perceptual ambiguities being resolved in favor of the sequences of sounds most frequently found in the language (Blevins and Garrett 2004). Finally, Ultan (1978, 373) highlights that metathesis is conservative because it preserves phonological elements that would have been lost due to the effect of other forces (such as sound change).

Typologies of metathesis have historically focused on describing the superficial structure of this sound change. As noted by Powell (1985, 106), "[m]etathesis has generally been treated as a minor sound change. Sporadic and irregular, examples of metathesis are often treated as if labeling it were explaining it". Starting with the first proposals, Grammont's (1950) classification distinguished between local and distant metathesis (*interversion* and *métathèse*, respectively), while Ultan (1978) based his classification on the target of the transposition —which could be any pair of syntactic constituents, syllables, sounds, suprasegmental features, or phonological features— and its interaction with four parameters: voluntariness, systematicity, permanence, and motivation (1978, 370).

A simple descriptive typology of segmental metathesis that emerges from the linguistic literature includes CV metathesis for the exchange between a consonant and a vowel, CC metathesis for the transposition of two consonants, and VV metathesis for the rarer exchange between two vowels, which has been argued to be non-existent (McCarthy 2000). While these usually refer to adjacent segments, they are sometimes used for distant exchanges as well, although some of these non-local cases of metathesis

have been argued to involve multiple instances of local metathesis instead (see Mielke and Hume 2000; Hume 2001 for the case of Fur). To this list we can add changes involving individual features rather than segments. This might refer to the movement of a phonological feature as well as of a suprasegmental feature. In the former case, the phonological feature usually migrates from one segment to another (as in Table 1), but it could also detach from a given segment and result in a new one (Marathi *õʈʰ > hõʈ* 'lip'), or it could involve a segment losing its segmental status after becoming part of a nearby segment (Andalusian Spanish [ehte] > [etʰe] 'this'). In the latter case we find examples such as the change in the placement of the stress within a word, or the rare cases of tonal metathesis. Feature metatheses would also include quantitative metathesis, where length is interchanged between two vowels or two consonants. These changes are represented in Table 1.

| Metathesis | Language | Unmetathesized form | Metathesized form | Gloss | Reference |
|---|---|---|---|---|---|
| CV | Mpalitʸaɲ (mpal1238) | *kuta > *uta *ŋula > *ula | /twa/ /lwa/ | 'dog' 'finally' | Dixon (1980, 203) |
| CC | Late West Saxon (west2922) | Old Eng. *frosk* Old Eng. *aske* | *froks* *akse* | 'frog' 'ash' | Blevins and Garrett (2004: 139) |
| VV | Latvian (latv1249) | *skrǣi + n + a* *daeu + d + a* | *skrien* *duod* | 'he runs' 'he gives' | Halle and Zepps (1966, 108) |
| Feature | Roncalese Basque (ronc1236) | *arĩã* *gaztã́* | *ã́ria* *gã́zta* | 'sand' 'cheese' | Egurtzegi (2014, 197) |
| Tonal | Dangme (adan1247) | *yē* 'to eat' *dò* 'to dance' | *yé* *dōó* | 'eat!' 'dance!' | Holscher et al. (1991, 121) |
| Quantitative | Attic Greek (atti1240) Ionic Greek (ioni1244) | /hippέː(w)os/ /teθnɛː(w)ótes/ | /hippéoːs/ /teθnɛóːtes/ | 'horseman (gen. sg.)' 'the dead' | Ultan (1978, 380) |

Table 1: Kinds of metathesis classified by superficial description.

While some examples in Table 1 are straightforward, others deserve further comment. In the Paman language Mpalitʸaɲ, a metathesis of the word-initial vowel follows the systematic loss of the (previously) word-initial consonant. The results are diverse, but high vowels move to the following nucleus as glides. The Basque examples contain two kinds of feature metathesis: first, the stress shifts to the penultimate syllable to conform to the default stress pattern of Roncalese Basque after the reduction of the number of syllables due to diphthongization (Latin *arēna* >> *areh̃a > *aré̃.ã > *arĩ́ã > *árĩã > *ã́ria* 'sand') and simplification of the hiatuses (*gaztana > *gaztah̃a > *gaztã́.ã > *gaztã́ > *gáztã > *gã́zta* 'cheese'), and then contrastive nasalization moves to the stressed syllable (its domain in this variety). In Dangme, the potential marker is a floating H tone that associates leftwards when any segments precede the verb stem. According to Holscher et al. (1991), the H tone undergoes metathesis to a different position in utterance-initial imperatives. Vowel lengthening and a tonal assimilation follow tone metathesis in the second example (Holscher et al. 1991, 124). In the Greek quantitative metathesis examples, weight to stress can be argued for the Ionic example, but not for the Attic one, where length moves from the stressed to the unstressed vowel (*hippέː(w)os > hippéoːs* 'horseman (gen. sg.)').

Recent classification proposals aim for an explanation of surface patterns that reflects a typology of causes (Garrett and Johnson 2013, 54). A typology based on the potential phonetic triggers of the different kinds of metathesis is put forward in the work

by Blevins and Garrett (1998, 2004), who propose four kinds of regular metathesis. At least two other categories of metathesis, which are unlikely to be regular, can be added to these four. Table 2 shows this classification of metathesis based on a typology of causes.

|    | Metathesis type | Proposed phonetic trigger | Reference |
|----|-----------------|---------------------------|-----------|
| i | Perceptual metathesis | Elongated phonetic cues | Blevins & Garrett (1998) |
| ii | Compensatory metathesis | Stress-induced temporal shifts | Blevins & Garrett (1998) |
| iii | Coarticulatory metathesis | CC coarticulation | Blevins & Garrett (2004) |
| iv | Auditory metathesis | Auditory-stream decoupling | Blevins & Garrett (2004) |
| v | Reciprocal metathesis | Motor plan exchange | Egurtzegi (in prep.) |
| vi | "Cluster" metathesis | Motor plan anticipation | Garrett & Johnson (2013) |

Table 2: A classification of metathesis by its hypothesized phonetic trigger.

In all cases, multiple components of speech play a role in the different stages of each of the processes in Table 2, not only the one that names them. In this chapter, I will suggest that there is overlap between categories and a bit of diversity within some of them, so that other categorizations may also be possible within an explanatory framework. Individual instances of these metatheses will be discussed and contextualized in the remainder of this paper.


## 2-The phonetic bases of metathesis: Regularity and gradualness in local metathesis

Early accounts of sound change in the Neogrammarian tradition (Paul 1880) disregarded metathesis (alongside dissimilation) as a 'minor' sound change (or *Lautwechsel*), as opposed to 'major' sound changes (or *Lautgesetze*). This dichotomy was based on two premises: 1) that major sound changes were more frequently encountered than minor ones and 2) that minor sound changes were not phonetically natural and did not follow the *regularity principle*, i.e. they did not develop in a gradual way, systematically affecting all words that included the relevant phonological context for each sound change. While major types of sound change were assumed to originate from articulatory reduction or variability, minor types were attributed a psychological origin. In this section, I will show that some kinds of metathesis can also be "phonetically gradual, imperceptible while under way, and regular" (Garrett and Johnson 2013, 54), as we expect of any major sound change.

  Some cases of systematic dissimilation —i.e. in which all segments in the relevant context are affected— can be found in early references (such as Grassmann's Law in Greek), and some cases of gradual dissimilation in more recent work (see Jatteau and Hejná 2018). However, there is much less evidence that metathesis —the other main process in the minor sound change category, which often involves similar segments such as liquids or /h/— could also be systematic and gradual. The first accounts of regular metathesis severely limited the situations where this could occur: according to Hock (1985, 2003) and Kiparsky (1995), metathesis (and dissimilation) can behave as regular sound changes if they implement phonotactic constraints, requiring "a general phonological motivation to become regular" (Hock 2003, 457). However, in this section we will discuss some examples of regular metathesis where no clear phonotactic constraint is implemented.

  By now, an increasing number of systematic processes of metathesis can be found in the literature (Hock 1985; Hume 1998, 2001; Blevins and Garrett 1998, 2004).

However, not all kinds of metathesis have been documented as systematic processes. A first observation found in the literature is that non-local metathesis tends to be less systematic than contact metathesis (Ultan 1978). This can be related to the systematic coarticulatory patterns that surface in the concatenation of specific segments. These patterns can be cross-linguistic, language-specific, or even restricted to a community or to individual speakers (Section 4).

Recent synchronic studies of productive regular metathesis have brought evidence in line with the proposal that these processes involve incremental gestural overlap rather than direct segmental transposition (Parrell 2012; Cronenberg et al. 2020; Gilbert 2022, 48–9; Mooney in press). One of the best-studied cases of gradual CC-metathesis is that of pre-to-post-aspiration in Andalusian Spanish (Parrell 2012; Ruch and Harrington 2014; Cronenberg et al. 2020).

In Andalusian Spanish (anda1279), coda /s/ debuccalization (s > h /V_$) has been the norm for many generations, in contrast to the Standard variety of Spanish, where coda /s/ is maintained. In the last decades, younger speakers of Andalusian Spanish have been observed to gradually shift the pre-aspiration of [hT] sequences (historically /sT/, T a voiceless stop /p, t, k/) into post-aspiration (i.e., [Tʰ]), as in *pasta* 'pasta, paste', standard Spanish /pasta/; which in Andalusian Spanish is produced as [pahta] → [patʰa]. This change can be phonologically described as a local (feature) metathesis of the aspiration, but has been observed to develop in a gradual manner, including intermediate stages with simultaneous pre- and post-aspiration and late stages with strong post-aspiration and even affrication in the case of voiceless dental stops. Example (1) shows a step-by-step sequence of many of the intermediate phases / related sound changes observed in current acoustic data, with their distribution in Table 3 (adapted from Egurtzegi et al. in prep.).

(1)    Evolution of /s.t/ clusters in Andalusian Spanish

/s.t/    [ht]    >    [ʰt]    >    [ʰtʰ]    >    [tʰ]    >    [t͡h]    >    [t͡s]

| | debuccalization | spread | post-aspiration | affrication | gloss |
|---|---|---|---|---|---|
| /asta/ | [ahta] | [aʰtʰa] | [atʰa] | [at͡sa] | 'until' |
| /aspa/ | [ahpa] | [aʰpʰa] | [apʰa] | n.a. | 'cross' |
| /asma/ | [ahma] | n.a. | n.a. | n.a. | 'asthma' |

Table 3: Changes affecting coda /s/ in Andalusian Spanish.

Synchronically, all the production variants in (1) coexist, and all of them seem to be perceived as /sT/ (Ruch and Peters 2016; Gilbert 2023). Their distribution in the population is in line with an incremental sound change, with older generations showing more pre-aspiration, middle generations showing more post-aspiration and the youngest showing post-aspiration and affrication (Ruch and Harrington 2014; Cronenberg et al. 2020). In addition to persistently moving forward with each coming generation, we expect a regular sound change to initially occur in every instance of a given context in the speech chain, including across word boundaries. In the case of Andalusian Spanish, we would expect that a word-final /-s/ followed by a word-initial voiceless stop in consecutive words will show post-aspiration insofar this sound change is in the initial stages of its cycle. Given that this sound change was first reported some decades ago, we can still find evidence of post-aspiration at the word boundary in acoustic data, as shown by Figure 1 (from Egurtzegi et al. in prep.).
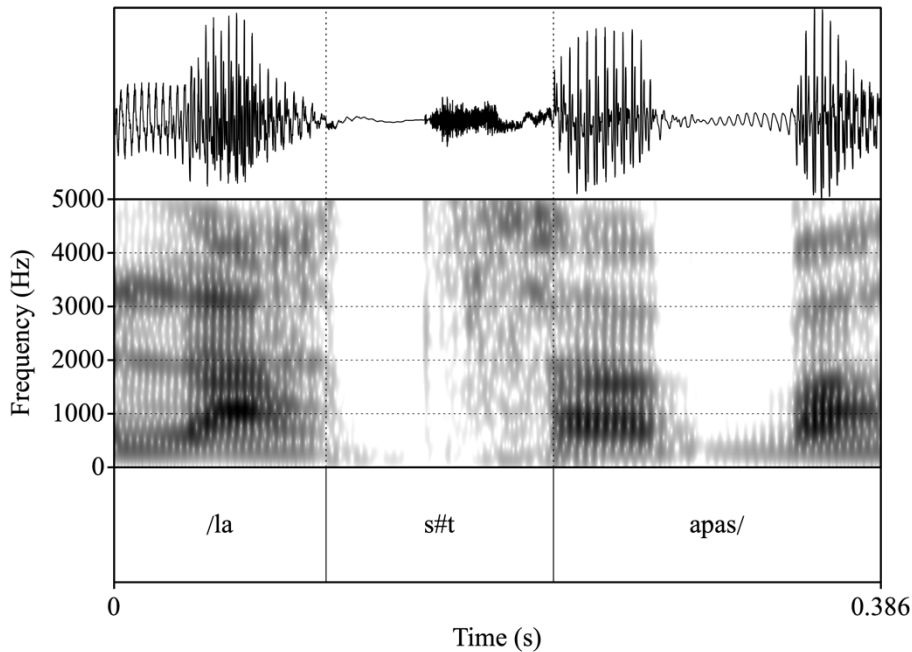
Figure 1: Waveform and spectrogram of Andalusian Spanish *las tapas* 'the tapas'

Figure 1 depicts the sequence /las#tapas/ 'the tapas', as produced by a Western Andalusian young female speaker. This utterance can roughly be transcribed as [la̤⁽ʰ⁾t͡hapa̤], with a breathy-voiced phase in the first vowel (included in /la/ in the vertical segmentation), a very short pre-aspiration right before the stop closure (just right of the first vertical dotted line), and a strong post-aspiration from the stop burst to the second vertical dotted line. Although the underlying /s/ —which is the plural morpheme in Spanish— is produced in a variety of ways, including breathiness in the preceding vowel or post-aspiration in the following stop, listeners can retrieve morphological information from it, regardless of its main cues being at the end of the expected word or at the beginning of the word that follows it (Gilbert 2023).

Many comparable processes (which would likely fall under *perceptual metathesis* in the classification in Table 1, see Section 4) that apply to the relevant context across the board have been reported diachronically. In Judeo-Spanish or Ladino (ladi1251), the sequence of a tap and a dental voiced approximant [rð̞] has been systematically reversed (Subak 1906, 171–2). This occurred even over the word boundary, as shown by the last example in (2), where metathesis occurs between two words.

(2)     Regular metathesis in Istanbul Judeo-Spanish

| Standard Spanish | Istanbul Judeo-Spanish | |
| --- | --- | --- |
| *tarde* | ['tað̞re] | 'evening' |
| *bastardo* | [bas'tað̞ro] | 'bastard' |
| *verdura* | [be'ð̞ruɾa] | 'verdure' |
| *cuerda* | ['kweð̞ra] | 'cord' |
| *cordero* | [ko'ð̞reɾo] | 'lamb' |
| *sordo* | ['soð̞ro] | 'deaf' |
| | | |
| *por amor de* | [paɾa'moð̞re(ð̞e)] | 'for the love of' |

Although rarely, metatheses over word boundaries can lexicalize in cases where a particular sequence of words occurs frequently enough in the language. Note that, after the lexicalization of /paɾaˈmorǧe/ > /paɾaˈmoǧre/, the word /ǧe/ 'of' is no longer recognized and a second /ǧe/ is required.

The Andalusian Spanish development is uncharacteristic of the classical definition of metathesis, which was often described as an irregular and categorical sound change with psychological origin (as opposed to articulatory). However, this kind of gradual metathesis based on incremental gestural overlap that gradually develops over a few generations is supported by the data. Many forces might play a role in making the Andalusian sound change systematic, including gestural coordination (Croneberg et al. 2020; Parrell 2012; Ruch and Harrington 2014), perceptual biases (Ruch and Peters 2016; Gilbert 2023) and even a hypothesized structural drift favoring open syllables in this variety (Moya Corral and Tejada Giráldez 2020). What is clear is that they have resulted in a regular, phonetically natural, major neogrammarian sound change, a category from which metathesis was excluded not that long ago.

Although it might seem that Andalusian pre-to-post-aspiration is just one isolated case of gradual metathesis, many potential parallels to this change that we were not able to observe synchronically have been reported as historic sound changes, and they may reflect the same mechanisms. Comparable examples of contact metathesis include Monguor (tuuu1240; Svantesson et al. 2005: 207-208) or Welsh Romani (wels1246; Turner 1959, 491, 494) for aspiration, or the Judeo-Spanish example in (2) for rhoticity.

CV metathesis in the Molo dialect of Uab Meto (moll1242) could, like the above example from Andalusian, also be gradual and systematic. In Molo, the final syllable of a root may be deleted in order to reduce stress lapses (Mooney in press). This results in the anticipation and coalescence of the unstressed final root vowel into the preceding stressed syllable, as shown in example (3) (adapted from Mooney in press).

(3)     CV metathesis in Uab Meto

/ˈmanus/ [ˈmanus] 'betel vine'          →     /ˈmanus-es/ [ˈma͡ʊnses] 'a betel vine'
/baˈkaseʔ/ [baˈkaseʔ] 'horse'          →     /baˈkaseʔ-e/ [baˈka͡esʔe] 'the horse'
/ʔa-ˈmepo-t/ [ʔa-ˈmepo-t] 'worker'   →     /ʔa-ˈmepo-t-in/ [ʔa-ˈme͡optin] 'workers'
/ˈkokɪs/ [ˈkokɪs] 'bread'               →     /ˈkokɪs-e/ [ˈko͡ɪkse] 'the bread'

The metathesis in (3) is further conditioned by structural factors. According to Mooney (in press), Meto has a preference against rising-sonority diphthongs. Compatibly, deletion tends to occur if the output of metathesis is a rising diphthong. Note that the metathesized vowel is always added to the nucleus of the previous syllable as an offglide, which would not be possible if the metathesized vowel were lower in height (and thus higher in sonority) than the stressed vowel.

This kind of metathesis, named *compensatory metathesis* by Blevins and Garrett (1998, 2004), can be found in other Austronesian and Pama-Nyungan languages (listed in Blevins and Garrett 1998, 527–39), and occurs both anticipatorily and perseveratively, as shown in (4).

(4)     Metathesis in Rotuman and Ngkoth (Blevins and Garrett 2004, 135)

a)      Rotuman (rotu1241)

| | | | |
|---|---|---|---|
| *seséva* | → | *seséav* | 'erroneous' |
| *tíko* | → | *tíok* | 'flesh' |
| *fúti* | → | *fýt* | 'to pull' |
| *móse* | → | *møs* | 'to sleep' |

b)      Ngkoth (ngko1236)

| | | | |
|---|---|---|---|
| *alí- | > | *láj-* | 'to go' |
| *amí- | > | *máj-* | 'up' |
| *i·ná- | > | *njá-* | 'to sit' |
| *ulán | > | *lwán* | 'possum' |

The Meto metathesis does not involve a direct clear-cut transposition, but a gradual spread of the unstressed vowel into the stressed syllable. This is illustrated by Figure 2 (reproduced from Mooney in press). This figure depicts the Uab Meto word /manus-es/ 'a betel vine' produced as [ma͡ʊnᵛses], with a newly-added velar offglide in the stressed syllable but no full deletion of the original unstressed vowel (the short [ᵛ] between the [n] and the [s]), which shows an intermediate phase of the metathesis. Similar intermediate phases have also been reported in related Austronesian languages such as Leti or Kwara'ae (Gilbert and Mooney 2022, 7).
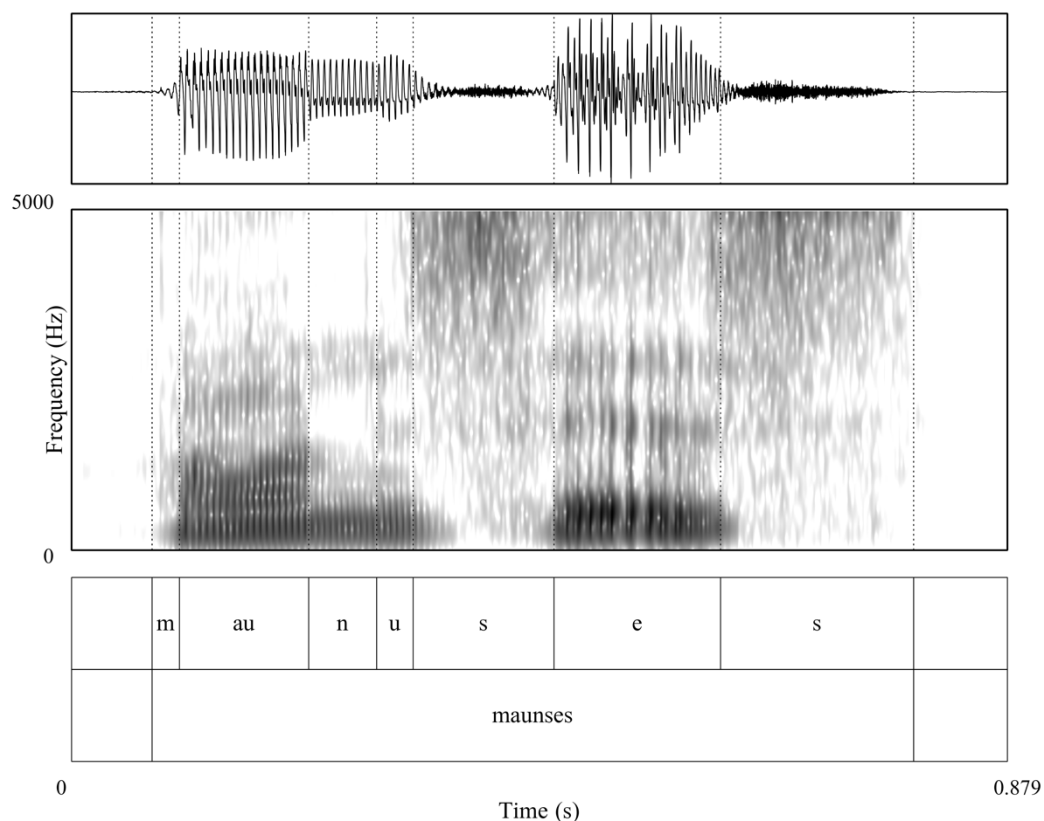


Figure 2: Waveform and spectrogram of Uab Meto /manus-es/ [ma͡ʊnᵛses] 'a betel vine'

There is extensive acoustic and articulatory evidence in line with the lingual movement required for $V_2$ often beginning during $V_1$ in a $V_1CV_2$ string, with vowel-to-vowel coarticulation and perceptual patterns being highly language specific (Öhman 1966; see Beddor et al. 2002 for references). This metathesis can thus be understood as

a prosodically conditioned shift that occurs when vocalic features in a weak syllable are gradually more and more coarticulated into the adjacent, more prominent syllable of the same foot until they completely disappear from their original peripheral position. Blevins and Garrett (1998, 548) observe that this kind of metathesis seems to be restricted to Austronesian and Pama-Nyungan languages, and adduce structural pre-conditions shared by languages in these families as a reason for this (such as reduced vowel inventories and CV syllable structure). Sound changes with similar proposed triggers and comparable observed results that are pervasive in other families with different phonological structure include umlaut in Germanic or metaphony in Romance.


## 3-Other cases of potentially regular local metathesis

In Section 2, I have presented detailed accounts of two cases of local metathesis in Andalusian and Meto, both arguably triggered by coarticulation. Nonetheless, under Blevins and Garrett's (1998) account, these would likely be classified as perceptual metathesis and compensatory metathesis, respectively. In the extension of their typology of metathesis, Blevins and Garrett (2004) propose two other categories, both involving local CC metathesis, one of them actually named coarticulatory metathesis.

Coarticulatory metathesis affects heterorganic consonant clusters with a single manner of articulation. Coarticulatory dynamics involving the production of obstruents with shared gestures in fast speech can result in the anticipation of a given gesture over another due to gestural overlap (Browman and Goldstein 1990). In cases with a nearly simultaneous closure and release of distinct articulatory gestures of two consecutive consonants, their place of articulation cues become difficult to recover perceptually. This situation can eventually result in reanalyzing $C_1C_2$ as $C_2C_1$, e.g. when the following vowel contains cues consistent with $C_1$.

The outcome of these anticipations is constrained by the degree of independence between the gestures involved in a given CC cluster. Specifically, Blevins and Garrett (2004, 126) identify two CC sequences that might result in nearly simultaneous closure: labial-velar (PK) and coronal-noncoronal (TK, TP) stop sequences, with greater overlap word-internally (Chitoran et al. 2008). In the former, the labial release follows the velar release (usually by 30-60 ms), while in the latter coronal release follows non-coronal release. Even when velar and labial closures are synchronous, an earlier velar closure is perceived auditorily (Connell 1994, 451). Thus, both cases of coarticulatory metathesis are predicted to be unidirectional, yielding velar-labial (PK > KP) and noncoronal-coronal (TK, TP > KT, PT) stop sequences respectively, with the opposite directions of change unattested. This is exemplified in (5), with examples of PK > KP in Mokilese (Micronesia, moki1238) and TK, TP > KT, PT in Cebuano Bisayan (Central Philippines, cebu1242).

(5)     Labial-velar and coronal-noncoronal metathesis

a)      PK > KP in Mokilese
/apkas/        [a**pk**as], [a**kp**as]          'now'
/kapki:la/     [ka**pk**i:la], [ka**kp**i:la]    'to drop'
/dipkelkel/    [di**pk**elkel], [di**kp**elkel]  'to stumble'

b)      TK, TP > KT, PT in Cebuano Bisayan
nm      *inum*   :      ***imn**-a*               'drink'

| nŋ | tunúŋ | : | tu**ŋn**-a | 'directly at a point' |
|----|-------|---|----------|----------------------|
| tp | atúp | : | a**tp**-an, a**pt**-an | 'roof' |
| tk | litik | : | li**tk**-an, li**kt**-an | 'snap the fingers' |

In Mokilese, all /pk/ sequences are optionally transposed to [kp] (Harrison 1976, 45), but this kind of reversal does not affect any other stop cluster in the language. Cebuano Bisayan (Blust 1979, 110) has examples of TK, TP > KT, PT that include both oral and nasal stops. While the metatheses between oral stops seem not to apply systematically, coarticulatory metathesis of nasal stops is regular in the data provided by Blust.

The last local CC metathesis proposed in Blevins and Garrett (2004) is *auditory metathesis*. In this framework, auditory metathesis is the result of aperiodic sibilant noise, the primary acoustic cue for sibilants, decoupling from the rest of the speech signal. According to Blevins and Garrett (2004, 128), sibilant noise can be "distracting", and that can produce high confusion rates with regard to the linear order of segments around sibilants due to the decoupling of sibilant noise from the rest of the speech stream (see Bregman 1990). This can on occasion make it difficult to retrieve the actual sequential position of a sibilant that was nevertheless clearly perceived, so that the listener might assign a non-etymological position to the affected segment. This kind of metathesis involves the reversal of sibilant-obstruent or obstruent-sibilant clusters (Blevins and Garrett 2004, 139), as in the Faroese (faro1244) examples in (6a) (Hume and Seo 2004, 38) and the colloquial French (stan1290) examples in (6b) (Grammont 1923, 76).

(6)  Stop-sibilant metathesis

a)  sk > ks in Faroese

| /tʊ**sk**-t/ | → | [tʊ**ks**t] | 'German (fem.sg)' |
|-------------|---|------------|-------------------|
| /na**sk**-t/ | → | [na**ks**t] | 'impertinent (fem.sg)' |
| /bai**sk**-t/ | → | [bai**ks**t] | 'bitter (fem.sg)' |
| /fran**sk**-t/ | → | [fraŋ**ks**t] | 'French (fem.sg)' |

b)  ks > sk in colloquial French

| French | Standard | Colloquial | |
|--------|----------|-----------|---|
| *fixe* | [fi**ks**] | [fi**sk**] | 'fixed' |
| *luxe* | [ly**ks**] | [ly**sk**] | 'luxury' |
| *sexe* | [sɛ**ks**] | [sɛ**sk**] | 'sex' |
| *axe* | [a**ks**] | [a**sk**] | 'axis' |
| *Félix* | [feli**ks**] | [feli**sk**] | 'Félix' |

The two sets of examples in (6) show that the metathesis can occur in both directions depending on the language where it develops, with structural differences of the languages likely conditioning the direction of the change. Blevins and Garrett (2004, 140) suggest that the different directions observed in the two cases they discuss — including a Late West Saxon example analogous to the Faroese example in (6a)— may be due to each language's prosody; Old English had a strong initial stress, while modern French has a weak final stress.

Finally, note that the set of segments that may produce auditory metathesis can theoretically be extended to include other noisy segments including [ʃ], [ɬ], and clicks, but no such metatheses have been reported in the literature. This might simply be due to

the limited cross-linguistic distribution of some of these segments when compared to [s], but, [ʃ] being quite common, it might also point to a different phonetic trigger. Experimental research is required to confirm the proposed account and better understand the facilitators or restrictors that this process may have.

Most (if not all) of the systematic metatheses discussed so far have deep roots in coarticulation. In addition, many show a gradual development, and we cannot discard that the rest also developed gradually until they are observed as intergenerational variation. Nonetheless, perception has also been shown to play a crucial role in sound change, especially in sound changes that may develop abruptly, as was expected of metathesis.

## 4-The role of perception

The Andalusian Spanish /h/-metathesis in Section 2 shows how certain phonological features can spread over a string of multiple consecutive segments. These "stretched-out" features include one or more acoustic characteristics that are articulated with an intrinsically long duration. In Ohala's (1993) account of listener-based sound change, elongated phonetic cues create ambiguous sequences where a listener could reinterpret one of these features in a non-etymological position, which would eventually result in sound change. Figure 3 shows an ambiguous realization of the Basque word *ahal* 'to be able to' (Egurtzegi 2014).
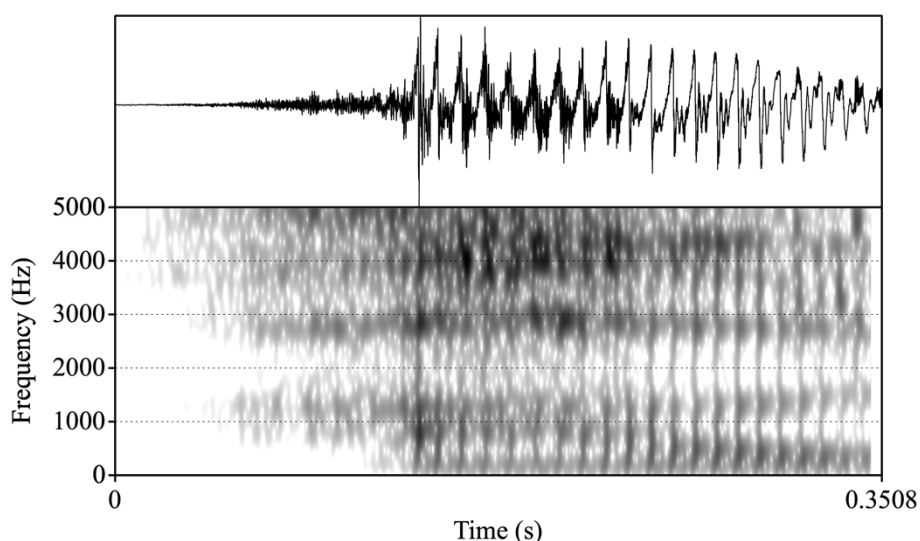


Figure 3: Image of Basque *ahal* 'to be able to', produced as [ha̤ʰa̤l]

The intended pronunciation of the word *ahal* should approximate underlying /ahal/ but was instead uttered as [ha̤ʰa̤l], including a non-etymological word initial aspiration that permeates the vowels as breathy-voiced all the way until the word-final [l]. This kind of production would require the listener to decide where the aspiration originates. But listeners are very good at such tasks and, even for very ambiguous productions like the one depicted in Figure 3, the most frequent result will be retrieving the intended phonological form of the utterance (*correction* in Ohala 1993). Nonetheless, an erroneous decision regarding the position where /h/ originated would result in sound change. While Ohala presented this mechanism to argue for the origin of

dissimilation, the same argumentation was extended to metathesis by Blevins and Garrett (1998; 2004, 121), who dubbed this process *perceptual metathesis*.

Let us take rhotics as an illustration, given that they are one of the most frequently documented targets of metathesis (see Example 2). English rhotics have been observed to show long-distance effects on unstressed vowels in both the preceding and the following syllable (i.e. $V_2$ in $rV_1CV_2$ and $V_1$ in $V_1CV_2r$, respectively), including a lowering in F2 and F3. Tunley (1999) reports that incorporating such a lowering into synthetic speech can improve segmental intelligibility by 7-28%. Table 4 presents a list of long-domain features.

| Feature | Segmental realization | Acoustic property with long duration |
|---------|----------------------|--------------------------------------|
| rhoticity | rhotics, rhotic Vs | lowered F3 (LM: 244, 313) |
| laterality | laterals, lateral Vs | lateral formants (LM: 193–7) |
| rounding | rounded Cs, rounded Gs, round Vs | lowering of all formants (LM: 356–8) |
| palatalization | palatalized Cs, palatal Gs, high front Vs | raised F2 (LM: 364) |
| velarization | velarized Cs, velar Gs and high back Vs | lowered F2 (LM: 361–2) |
| pharyngealization | pharyngealized Cs, Gs and Vs, ʕ, ħ | lowered F3, raised F1 (LM: 307) |
| laryngealization | laryngealized Cs, Gs and Vs, ʔ | more energy in F1, F2, more jitter (LMJ) |
| aspiration | aspirated / breathy Cs, Gs and Vs, ɦ, h | more energy in F0, more noise (LMJ) |
| retroflexion | retroflex Cs and Vs | lowered F3, F4, clustering of F2, F3, F4 (L: 203, LM: 28) |
| nasalization | nasals, nasalized Vs and nasalized Gs | spectral zero / nasal, anti-resonance (LM: 116) |

(L = Ladefoged 1993; LM = Ladefoged and Maddieson 1996; LMJ = Ladefoged, Maddieson, and Jackson 1988).

Table 4: Stretched-out features and their relevant phonetic cues (Blevins and Garrett 2004, 123).

Perceptual metathesis is restrictive because not all features are affected by it, and because not all elongated phonetic cues spread over equally long timespans. Thus the limits on its potential incidence are defined not only by the set of segments that can be targeted (only these with long-domain features), but also by language-internal coarticulatory dynamics, making some features subject to non-local metathesis in some languages but not in others. Thus, the extent of coarticulatory nasalization has been observed to be language-dependent (Pouplier et al. 2023), and often more extensive in languages without contrastive nasal vowels than in languages with frequent phonologically nasalized vowels (Manuel 1990), although exceptions have also been reported (e.g. Lakota, Scarborough et al. 2015; see Pouplier et al. 2023). Regarding pharyngealization, pharyngeal spread can span the whole word in Cairene or Palestinian Arabic, whereas in the Moroccan and Jordanian varieties it is restricted to the syllabic domain (Al-Raba'a and Davis 2020).

In addition, the spread of some features can be blocked by a given intervening segment. As an example, laryngeal metathesis of segments such as /ʔ/ and /h/ is often blocked by a segment with conflicting laryngeal specifications (e.g. /h/ can block /ʔ/ and vice versa, as in Cayuga; Blevins and Garrett 1998). The outcome of perceptual metathesis is also conditioned by language-internal structural factors, with the phonotactics of the language restricting the possible outcome segment sequences, and prosodic prominence also playing a role (Blevins and Garrett 1998). Lastly, the most frequent sequences of sounds are usually favored in case of perceptual ambiguity, ceteris paribus. Hume (2004, 229) incorporates this last point as *attestation*, "a bias towards more practiced articulatory routines". Similarly, Blevins (2004, 153–5) calls the

bias towards the most usual patterns in a language *structural analogy*, adding that pre-existing phonotactics can prime reanalysis of ambiguous strings in cases of metathesis. In contrast to previous approaches (Ultan 1978; Hock 1985), there is no teleology in the accounts that evolved from Ohala (1993): innovation is deemed to be the consequence of the erroneous reinterpretation of ambiguous strings.

Nonetheless, recall that listeners are highly skilled at interpreting very ambiguous utterances, and yet changes such as the metatheses discussed in Section 2 are widespread in the world's languages. Beddor (2009, 2012) built on Ohala's account based on the observation that, in addition to the structured variation in coarticulatory dynamics observed in different speakers, listeners within a community may also show structured variation in the primary cues they use to perceptually distinguish a given phonological contrast. For instance, while some speakers consistently produce one or more segments preceding a nasal with nasalization, others show a more strictly timed lowering of the velum and with limited nasal spread (see Scarborough et al. 2015 for Lakota). Similarly, some listeners would require a full segmental production to retrieve a given segment such as /n/, while for others suprasegmental nasalization in a vowel sequence may suffice. Sound change occurs as continuous speaker-listener interactions within a community result in a gradual perceptual cue re-weighting with concomitant shifts toward innovative productions.

A cue-weighting relation that results in the loss of the coarticulatory source is known as a trading relation (Beddor 2009). In the case of Andalusian Spanish, pre-aspiration in /st/ sequences gradually loses ground to post-aspiration, as a trade-off between the coarticulatory source and its effect occurs and the cues to the aspiration that originally preceded the voiceless stop gradually follow it instead. This means that we observe the evolution $[V^h t V] > [V^h t^h V] > [V t^h V]$ with each consecutive generation of speakers showing preference for a more innovative variant. Such trade-offs may result in the transphonologization of a feature previously not found in the language, as in the classic example of the development of nasalized vowels from VN sequences.

Unlike in Ohala's model, categorical misperception is not a necessary component of the change in Beddor's. This model is thus better suited to account for the gradual cases of systematic metathesis in Section 2, since change is implemented in an incremental rather than abrupt manner and affects all relevant contexts simultaneously. Nonetheless, error-based accounts may be a better fit for other cases of metathesis.


## 5-Irregularity and abruptness in non-local metathesis: Error-based models

As discussed above, structured variation in the incremental gestural overlap in the production of two specific adjacent sounds can result in regular gradual metathesis. Nonetheless, non-local metatheses are less likely to have developed that way. In non-local metathesis there are multiple segments in-between the original position of the metathesized segment and the position in which it surfaces afterward, and they can have very different nature. Although iterative contact metatheses have been proposed to account for non-local metatheses phonologically (Mielke and Hume 2000; Hume 2001), historical records do not show evidence of intermediate stages of metathesis —even in well-attested languages— and it is difficult to imagine stable intermediate stages that would show otherwise unattested phonotactics. In contrast, an instable stage that is resolved in a structure-preserving manner, in line with Ohala's model in Section 4, might be more plausible. However, in contrast to Beddor's model which might be

applied to the metatheses in Section 2, a model based on independent errors does not lend itself to regular processes.

In the different varieties of Basque, we can find many metatheses involving stretched-out phonological features such as these in Table 4 (at least nasalization, palatalization, velarization, rhoticity, laterality, and aspiration; see Egurtzegi 2014 for a detailed survey). However, none of them seems to be a clear-cut case of a systematic sound change in the language, with the potential exception of some of the aspiration metatheses in (7). This could be because, in these Basque varieties, misperceptions that led to metatheses were word-specific, not generalizable to any phonological context, and thus did not spread to the whole lexicon.

(7)      Metathesis of aspiration in Basque

a)       Metathesis of the aspiration in old loanwords

| Latin | | Unmetathesized variant | | Metathesized variant | |
|---|---|---|---|---|---|
| *arēna* | >> | *areh̃a | > | *harea* | 'sand' |
| *Asenārius* | >> | *azeh̃ari | > | *hazeri* | 'fox' (cf. *Acenari*) |
| *leōnem* | >> | *leoh̃e | > | *lehoi*(*n*) | 'lion' |
| *annona* | >> | *anoh̃a | > | *anhoa* | 'ration' |

b)       Metathesis of the aspiration in inherited words

| Unmetathesized variant | | Metathesized variant | | |
|---|---|---|---|---|
| *igune > *iguh̃e | > | *higũĩ > *higuin* | | 'repugnance' |
| *abune > *abuh̃e | > | *habũĩ > *habuin* | | 'foam' |
| *ebane > *ebah̃e | > | *hebãĩ > *hebain* | | 'disabled' |
| Medieval Basque *ibahi* | > | *hibai* | | 'river' |

c)       Metathesis of the aspiration in dialectal Basque

| Unmetathesized variant | | Metathesized variant | |
|---|---|---|---|
| *hon* 'good' + *erran* 'to say' | > | *onherran* | 'blessing, benediction' |
| *hon* 'good' + *eritzi* 'to deem' | > | *onheritzi* | 'to love, approval' |
| *er* + *hauts* 'dust' | > | *herrauts* | 'dust' |
| *loak* 'sleep (erg.)' + *hartu* 'to take' | > | *lohakartu* | 'to take sleep' |

d)       Metathesis of the aspiration as a feature

| Latin | Unmetathesized variant | Metathesized variant | |
|---|---|---|---|
| *parcere* | *barkha*(*tü*) | *pharka*(*tü*) | 'forgive' |
| *piper* | *bipher* | *phiper* | 'pepper' |
| - | *dithi* | *thiti* | 'tit, nipple' |
| *corpus* | *gorphutz* | *khorpitz* | 'body' |
| *catēna* | *gathea* | *khatea* | 'chain' |

Example (7) lists multiple instances of aspirate metathesis from different periods (see Egurtzegi 2014, 191–2, 2019). (7a-b) includes anticipatory metatheses that affected old loanwords and inherited words. These examples show why Ultan (1978, 373) called metathesis "a conservative process": metathesis helped preserve many /h/s that would otherwise be lost after a stress-shift to the second syllable resulted in a systematic post-tonic loss of the aspiration in the Medieval central-eastern dialects (Egurtzegi 2014). Examples in (7c-d) show more recent instances of metathesis (including feature

metathesis) where the aspiration moves between the first two syllables, once it is barred from later positions. Note that the initial unaspirated stops in (7d) undergo voicing.

Although previous work has suggested that the chronologically older metathesis in (7a-b) was systematic (see Egurtzegi 2014), a careful analysis shows a lack of regularity evidenced by the wide range of positions to which /h/ can metathesize: compare *areh̃a > *harea* and unattested **arhea to *anoh̃a > *anhoa* and unattested **hanoa in (7a), as well as other old Latin loanwords with comparable phonological structure showing no metathesis (e.g. Latin *ballaena* > *baleh̃a > *balea* 'whale' and not **balhea). It seems unlikely that a sound change that is sometimes local and sometimes distant —as in *leoh̃e > *lehoi(n)* vs. *areh̃a > *harea*— and shows variable results developed gradually as the Andalusian metathesis. Instead, I suggest that it was a collection of many individual instances of misperception driven by language-internal structural factors: the coarticulatory dynamics made the ambiguity possible, the stress shift conditioned their direction and made them pervasive, and the phonotactics of the language limited the possible outcomes. The diversity of outcomes would be due to the randomness of the innocent misperceptions described in Ohala's model, which also ensures particular words as targets instead of generalizable phonological contexts.

Given that many of the factors that facilitated the initial major wave of /h/-metathesis are still part of the Basque language, similar metatheses have occurred locally at later times. One such example is *lohakartu* 'to take sleep' in (7c), which is only used by one author (Axular, 1643). Later replications of structurally-conditioned metatheses can be expected to occur in other languages (see the Sardinian cluster metathesis in Section 6).

I have discussed how some cases of metathesis that are widespread in a language can be irregular and abrupt. Nonetheless, the clearest cases of necessarily irregular and abrupt metathesis may be those that have been argued to originate in speech errors.


## 6-Relationship to speech errors

Metathesis has been linked to speech errors since the early Neogrammarian accounts of sound change (Paul 1880). Recently, two particular kinds of metathesis have been proposed to originate from speech errors: *reciprocal metathesis* —the non-local interchange between two segments, as in Late Latin *padule(m) < Latin *palūdem* 'swamp'— and the transposition of the second member of an obstruent-liquid cluster to form a new cluster with another obstruent (Latin *crocodīlum* > Old French *cocodril*), which I will call *cluster metathesis*.

Reciprocal metathesis is a sound change whereby two non-consecutive segments exchange their position without affecting the rest of the phonological sequence —at least in the resulting form. The biggest superficial difference between this type of metathesis and the other kinds discussed in this section is that it necessarily involves the transposition of two segments, while local metatheses permit the interpretation of a segment moving across another. Buckley (2011: 1397) briefly discusses this kind of metathesis and provides examples from cognate pairs of Yuman languages (yuma1250) such as Havasupai /ka'to/ and Walapai /ta'ko/ 'chin' or forms within languages such as Ipai Diegueño /məxə'tum/ ~ /xəmə'tum/ 'knee' (Langdon 1976). Buckley (2011: 1397) notes that "[t]hese alternations are widespread, but remain lexically specific". After compiling a bigger survey (Egurtzegi in prep.), I am unaware of any language in which reciprocal metathesis is not lexically specific.

As suggested in Egurtzegi (in prep.), this process may originate from speech errors that are lexicalized and incorporated into the lexicon of a particular language. Although not enough work has been done on the potential lexicalization of speech errors, it has been argued that they could be the origin of certain sound changes (including sibilant harmony and metathesis, see Garrett and Johnson 2013, 66). The segmental exchanges involved in reciprocal metathesis, in particular, are usually called *spoonerisms* (MacKay 1970) and they are arguably the most common among segmental speech errors (Fromkin 1971; Nooteboom and Quené 2013). Single-word spoonerisms result from the interchange between two motor plans (or, on occasions, more) from two different segments within a given word that usually share one or more features/gestures. The two segments affected by reciprocal metathesis are typically on the same position (onset, nucleus or coda) of two syllables of a single word.

(8a) presents examples of consonantal reciprocal metathesis in Spanish (from Egurtzegi in prep.). In most cases, two segments in syllable onset exchange their position, while the last two cases affect a pair of segments in coda. (8b) includes examples of reciprocal metathesis between two vowels in Basque (Egurtzegi 2014).

(8)     Reciprocal metathesis

a)      Onset reciprocal metathesis in dialectal Spanish (stan1288)

| Source | | Spanish (metathesized) | |
|---|---|---|---|
| *mūrem + caecŭlum* | > | *murciégalo > murciélago* | 'bat' |
| *calabacín* | > | *cabalacín* | 'zucchini' |
| *animalia* | > | *alimaña* | 'vermin' |
| *calavera* | > | *caravela* | 'skull' |
| *humareda* | > | *humadera* | 'cloud of smoke' |
| *guijarro* | > | *guirrajo* | 'pebble' |
| *cerebelo* | > | *celebero* | 'brain(s)' |
| *Aljafería* | > | *Alfajería* | '(name of a palace)' |
| *neandertal* | > | *neardental* | 'Neanderthal' |
| *telgopor* | > | *tergopol* | 'expanded polystyrene' |

b)      Vowel reciprocal metathesis in dialectal Basque

| Basque/source | | Basque (metathesized) | |
|---|---|---|---|
| *atera* | > | *etara* | 'to come out' |
| Spanish *melancolía* | >> | *malenkonia* | 'melancholy' |
| *alkandora* | > | *alkondara* | 'shirt' |
| *hobaro | > | *haboro* | 'more' (cf. *hobeto* 'better') |
| Romance *acenoria* | > | *azenario* | 'carrot' |
| *hedoi* | : | *hodei* | 'cloud' |
| *herdoil* | : | *ordei* | 'rust' |
| *ukitu* | > | *ikutu* | 'to touch' |
| Latin *incude >> ingude* | > | *ungide* | 'anvil' |
| *unide* | > | *iñude* | 'wet-nurse' |
| *lizun* | > | *luzin* | 'mold, lascivious' |

Since speech errors occur within particular words instead of targeting a given phonological context, the expectation for this sound change is that it should always be sporadic, regardless of the language in which it occurs. Nonetheless, it can interact with morphology to spread by means of analogical extension. In some Spanish varieties of

Aragón, reciprocal metathesis has affected the suffix *-dera*, exemplified in (8a) by *humareda > humadera* 'cloud of smoke'. In these varieties, more words with this suffix show metathesis, including *polvareda > polvadera* 'cloud of dust', *vereda > vedera* 'path, sidewalk', and *Romareda > Romadera* '(placename)' (Egurtzegi in prep.).

Reciprocal metatheses follow a number of tendencies that can be observed in the examples in (8), including:
- Syllabic similarity —i.e. both segments are in either onsets, nuclei, or codas, most frequently in onset position.
- Phonetic similarity between the segments involved —they share one or more phonological features.
- Articulatory complexity of the affected word —roots with more syllables than usual, or these including clusters, etc. are more frequently affected.
- Phonological well-formedness of both input and output.
- Temporal proximity of the affected segments —usually in consecutive syllables or with a single intervening syllable.
- They most commonly affect lexically infrequent words.
- Spoonerisms often result in attested words, but reciprocal metathesis do not.

These tendencies are mirrored by single-word spoonerisms as these in (9), compiled by Bawden (1900, 110–1). The shared biases between these two processes have lead Egurtzegi (in prep.) to propose that reciprocal metatheses and single-word spoonerisms might have the same origin, and their differences might be due to the requirements for the lexicalization of these metathesized words.

(9)    Single-word spoonerisms in English

|  Standard English | | Speech error |
|---|---|---|
| *intrepidity* | → | *intripedity* |
| *annexation* | → | *ennaxation* |
| *derelict* | → | *direlect* |
| *cheerfulness* | → | *chulfeerness* |
| *protoplasm* | → | *plotoprasm* |
| *colonial* | → | *conolian* |
| *dominoes* | → | *donimoes* |
| *knapsack* | → | *knacksap* |
| *Cellini* | → | *Cenilli* |
| *relevant* | → | *revelant* |
| *regular* | → | *regural* |
| *Italian* | → | *Itanial* |
| *munificent* | → | *municifent* |
| *Polycarp* | → | *Colyparp* |
| *comedy* | → | *codemy* |
| *elevate* | → | *evelate* |
| *rejuvenate* | → | *rejunevate* |
| *seductive* | → | *desuctive* |
| *Swedenborgian* | → | *Swegenbordian* |
| *hypnotized* | → | *hyptonized* |

Another metathesis that has been linked to speech errors is cluster metathesis. Cluster metathesis involves the anticipation of the second member of an onset cluster, usually displacing a liquid to a preceding syllable while maintaining the etymological

order of the other segments in the word. The mechanisms behind these metatheses have been argued to involve motor plan anticipation (Garrett and Johnson 2013, 67) — instead of exchange, as in reciprocal metathesis.

Although the mechanisms proposed for cluster metathesis and these described in Section 5 for non-local perceptual metathesis are very different —the former being based on motor plan anticipation/delay and the latter on listener-based reinterpretation— the results of these two processes are superficially similar, which could make them difficult to distinguish. In addition, cluster metathesis targets liquids, whose time-span has been shown to extend over multiple syllables (cf. West 2000), making them a suitable target for long-distance perceptual metathesis. This may cast doubt on cluster metathesis as a metathesis category. Nonetheless, the fact that multiple mechanisms might account for the non-local sequential reordering of a liquid is in line with the observed comparatively high frequency of metatheses involving these segments. Cluster metathesis is especially well-documented in Romance languages (10b), as well as in languages in contact with Romance (10a) (Garrett and Johnson 2013, 67).

(10)    Cluster metathesis

a) South Italian Greek liquid metathesis (apul1236; Rohlfs 1964)

| Classical Greek | South Italian Greek | |
|---|---|---|
| *gambrós* | *grambó* | 'son-in-law' |
| *khondrós* | *xrondó* | 'thick' |
| *pastrikós* | *prástiko* | 'clean' |
| *tágistron* | *trástina* | 'food bag' |
| *kapístrion* | *krapísti* | 'halter' |
| *konūkula* > *konūkla | *klonúka* | 'distaff' |
| *pédiklon* | *plétiko* | 'fetter' |

b) Sardinian liquid metathesis (sard1257; Geisler 1994)

| Latin | Old Sardinian | |
|---|---|---|
| *castrum* | *crástu* | 'fort' |
| *cochlea* | *clocha* | 'snail' |
| *complēre* | *clòmpere* | 'fill' |
| *dextra* | *dresta* | 'right (hand)' |
| *februārium* | *frevariu* | 'of February' |
| *pigrum* | *prigu* | 'slow' |
| *pūblicum* | *plubicu* | 'public' |

The Old Sardinian metathesis is described as anticipating the production of a liquid in a cluster to form a new cluster with a stop in the contiguous syllable (Geisler 1994, 112). Even if the Old Sardinian liquid displacement is limited to adjacent syllables, modern Sardinian dialects show longer distance displacements, such as Latin *fenestra* > Old Sardinian *fenestra* > modern *fronèsta* 'window' or Latin *capistrum* > Old Sardinian *capistru* > modern *crapistu* 'halter'. Interestingly, the same examples find parallels in modern Gascon (gasc1240): Latin *capistrum* > *crabéste* 'head' and Latin *fenestra* > *frinéste* 'window'.

Although less frequent than single-word spoonerisms, single-word liquid displacements are also reported in the literature on speech errors, as in German *Brunsenbenner* for *Bunsenbrenner* 'Bunsen burner' (Meringer and Mayer 1895, 91).

Note that these mostly involve motor plan anticipation as well. Nonetheless, perseveratory cluster metathesis is also possible, as in Latin *escribanum* >> Basque *eskribaun* > *eskibraun* 'scribe' (although, again, this example could also be analyzed as an instance of perceptual metathesis).

Speech errors such as spoonerisms involve the direct transposition of two speech sounds in an anomalous speech act. If we take reciprocal metatheses as their lexicalized counterparts (and cluster metatheses as these of displacement-based speech errors), these kinds of metathesis are both necessarily abrupt and irregular, even if they show biases that greatly restrict their possible outcomes.


## 7-Rule telescoping vs. direct transposition

The two gradual mechanisms of metathesis discussed in Section 2 led Gilbert and Mooney (2022) and Mooney (in press) to propose that metathesis can be synchronically analyzed as consecutive spread and deletion. This analysis might be viable for specific synchronic stages of a gradually-developed metathesis. Nonetheless, intermediate stages of metathesis are not necessarily expected to phonologize, which implies that the many variants observed can co-occur synchronically, across and within generations of speakers. This looks different from rule telescopings involving epenthesis + deletion whose results mimic metathesis. In these so-called pseudo-metatheses (Mills and Grima 1980), each of the changes is independently motivated and can sometimes occur long time after the preceding step was completed. In Northern Straits Salish (stra1244) for example, an apparent /ə/ metathesis is better understood as a sequence of sound changes including a stress shift, /ə/ deletion, and /ə/ epenthesis (Montler 1986, 111–30; Blevins and Garrett 1998, 540); or a similar example from Najdi Arabic (najd1235, Ingham 1994) in which epenthesis and deletion occurring consecutively have produced different dialectal distributions.

An important consideration as far as reconstruction is concerned is that, while a sound change could develop between spread and deletion in the case of pseudo-metathesis, this is not expected for gradual metatheses such as those discussed above. Synchronic evidence shows that the apparent intermediate sound changes observed in gradual cases of metathesis do not interact with other synchronic phonological rules, and are thus applied late in the derivation (see Mooney in press for the non-interaction of Meto metathesis with other segmental rules and Gilbert 2022 for the lack of interaction of metathesis-based coda loss with stress assignment rules in Andalusian). From a diachronic perspective, these intermediate stages do not involve independent sound changes that can be ordered with respect to other sound changes. All the intermediate variants are contemporary, and the sound change will only be completed once the form that will prevail is phonemicized/lexicalized. In these situations, we will likely only find evidence of the lexicalized variant in the written records. Nonetheless, it could be useful to reconstruct intermediate stages through typological comparison with parallel synchronic processes of metathesis, given that this kind of ongoing variation might last for centuries (or an older form can be preserved, e.g. English *frost* vs. Old English *forst*, from Proto-Germanic *frustaz).

Although attested in many languages (see Egurtzegi in prep.), reciprocal metathesis is not frequently discussed in the literature, and it is not always considered when generalizations about the nature of metathesis are proposed. Nonetheless, reciprocal metathesis is a likely counter-example to the suggestion that distant metatheses are unattested or do not exist (Mielke and Hume 2000; McCarthy 2000) or

that direct transposition is impossible (Takahashi 2019; Gilbert and Mooney 2022; Mooney in press), or that multiple local metatheses underlie non-local exchanges (Mielke and Hume 2000; also in Hume 2001). If reciprocal metatheses indeed reproduce single-word spoonerisms as the parallelisms between the two processes suggest (Section 6), direct long-distance transpositions between two sounds would be attested in a wide range of languages.

## 8-Conclusions

For decades, broad definitions of metathesis have often resulted in the reconstruction of any kind of segmental transposition. However, not all metatheses are equally probable; e.g. the long-distance movement of a single oral stop is not predicted as a sound change (i.e. excluding morphological changes). Likewise, while some types of metathesis are bidirectional, others are only observed in a given direction, the opposite change not only being unattested, but unexpected on phonetic grounds, as is the case of PK > KP vs. **KP > PK. Unattested cases of metathesis should not be favored in reconstruction, especially when they lack phonetic grounding.

Although metathesis has often been regarded as a minor sound change, apparent-time studies show that metathesis can be regular and have phonetic origins in the same way as other neogrammarian sound changes. Regular metathesis can develop through intermediate (non-phonologized) incremental stages, which can be analyzed in frameworks of sound change based on cue re-weighting (Beddor 2009). The failure to consider gradual change in metathesis could lead to the erroneous reconstruction of a /st/ > /ts/ metathesis in forms such as Spanish *pasta* > Western Andalusian *patsa* 'pasta, paste', whereas synchronic analyses show, at least, the following intermediate stages in the progression of this sound change: /st/ > [ht] > [ʰt] > [ʰtʰ] > [tʰ] > [t͡h] > [t͡s]. Multiple categories in the typologies of metathesis in the literature show comparable mechanisms, which points to more inter-categorical overlap than expected.

On the other hand, word-specific cases of (non-local) metathesis are also attested, and they seem to better conform to the mechanisms described by error-based accounts (Ohala 1993). Although they do not show the regularity observed in local metatheses (coarticulatory dynamics being one of the main driving forces behind regularity), there is evidence suggesting that non-local perceptually-based metathesis can be pervasive to the point of mimicking it. This interpretation of the data would make local and distant metatheses that could be described as perceptual metatheses under Blevins and Garrett's typology (1998, 2004) quite different (Sections 2 and 5).

Finally, reciprocal metathesis, if it were to follow the mechanisms observed in speech errors, may represent an example of both distant metathesis and direct transposition, both of which have been claimed to be nonexistent (Mielke and Hume 2000; McCarthy 2000 and Takahashi 2019; Gilbert and Mooney 2022; Mooney in press, respectively).

Different mechanisms underlie different kinds of metathesis. Some metatheses show a gradual coarticulatory spread of a feature synchronically (with concomitant deletion from its original location), and only resemble a complete transposition when studied diachronically. By contrast, others may involve direct segment transposition even synchronically. In short, metathesis can be considered to be a cover term spanning many sound changes, both systematic and irregular, and with diverse phonetic origins and types of development.

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