

Language change as minimal change in the grammatical system

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Apart from imperfect learning or covert reanalysis of structures, language change may be driven by learners' biases to override evidence to which they have been exposed (Garrett & Johnson 2013; Garrett 2014; see Kiparsky 2015 for an overview). Following these approaches, we propose that one bias determining the direction of language change is to keep change minimal, in grammatical terms. Working in the framework of O(ptimality)T(heory)-based property theory (Alber & Prince 2015), we define minimal grammatical change as a single resetting of the defining ranking conditions (properties) of a typological system (Alber 2015; Alber & Meneguzzo 2016; DelBusso 2018; Apostolopoulou 2022).

We illustrate minimal grammatical change in these terms via two case studies where prosodic structure plays a decisive role: (1) the variation of metrical parameters of word stress in the world's languages; (2) long-distance metathesis in Romance. Change in prosodic structure (feet, sub-syllabic structure such as onsets and codas, prosodic words) is rarely explored in historical linguistics (for an exception see Lahiri 2015). However, it shows most clearly that phonological change does not necessarily imply a minimal change of surface features, but can involve significant change in surface structure via the minimal resetting of grammatical parameters. It is thus best suited to demonstrate that at least some language change is equivalent to a change in grammar.

From descriptions in the literature (Hayes 1995; van der Hulst et al. 2010) we built a database of the stress patterns in ~80 languages, tagging them by language family and basic metrical parameters of word-stress, such as foot-type (trochaic or iambic), foot-position (right- or left-aligned) and density of parsing (many feet or only one; (non)-exhaustive parsing). We explore variation of these parameters inside the same language family, under the assumption that variation in the typological data can be interpreted as an instance of language change. This is then compared to minimal grammatical change as defined in terms of property values in a formal model of word-stress, the typological model nGX (Alber & Prince 2017, in prep.). nGX is defined by 4 properties determining, in their interaction, the basic patterns of word-stress:

(1) Property - values	example contrast	Ranking conditions
Ft-type - trochaic/iambic	Xu vs. uX	TROCHEE <> IAMB
Ft-Position - left/right	Xu.o vs. o.Xu	AFL <> AFR
Multiplicity - many stresses/one stress	Xu.Xu vs. Xu.o.o	PARSE <> F.sub, A.dom
Unarity - (non) exhaustive parsing	Xu.X vs. Xu.o	PARSE <> F.dom, A.dom

X = stressed syllable, head of a foot; u = unstressed syllable, parsed into foot; o = unstressed syllable, not parsed into foot; F.sub/dom = the subordinate/dominant Ft-type constraint (TROCHEE or IAMB) in a grammar, A.dom = the dominant alignment constraint (AFL or AFR) in a grammar.

Comparison with the data of the database shows that variation inside one language family (a) can be described as a change in property values following the model of nGX and (b) is indeed minimal in the sense that it almost always involves the change of a single property value. Crucially, though, change is not necessarily minimal in terms of surface features, thus confirming our assumption that a change of grammatical parameters is at stake. A striking example is the Pano language family, where foot-type is mostly iambic, but trochaic rhythm emerges in some languages and, inside some iambic Pano languages, in certain structures (Elias-Ulloa 2006; Gonzales 2016; Gonzales & Couto, *subm.*). The above change involves the change of a single property value (from IAMB >> TROCHEE to TROCHEE >> IAMB), but is massively disruptive on the surface, replacing even-stressed strings (uX.uX) with odd-stressed ones (Xu.Xu), i.e. changing the stress/unstress of every single syllable.

Similarly, our second case study concerns the drastic changes on the surface resulting from long-distance metathesis of liquids, as attested in the diachrony of certain Romance varieties, e.g. Tertenia Sardinian *kranmuya* < *CONUCLA* (Rohlf's 1966; Lai 2013 et seq.). Different patterns are observed with respect to (a) the source context of the metathesizing liquid (non-initial complex onset ($C_{2/3}L$), non-final coda (L.C)) and (b) distance limitations, distinguishing between unbounded metathesis all the way to the first onset of the word (e.g., $C_1V.C_2V.C_3LV > C_1LV.C_2V.C_3V$) and locally restricted metathesis to a closer docking site (e.g., $C_1V.C_2V.C_3LV > C_1V.C_2LV.C_3V$). There are no documented cases of stepwise movement of liquids to the left until they reach their final landing site, which indicates that diachronic long-distance metathesis could not have been guided by minimal disruption at the surface. Even though perceptual biases, e.g., the preference for complex structures in prominent positions such as the initial onset, seem to underlie the process (e.g. Blevins & Garrett 2004; Coffman 2013 and references therein), the attested variation is best captured by an OT-based typological model involving properties that determine (a) the presence/absence of metathesis from $C_{2/3}L$; (b) the presence/absence of metathesis from L.C; (c) the type of movement (distal or local); and (d) the marked structure ($C_{2/3}L$ or L.C) that is allowed in a metathetic language. Also in this case, diachronic change can be minimal in grammatical terms (i.e. yielded from the resetting of a single property value), but not easily interpretable as minimal change of surface patterns. The properties defining the typological system of long-distance metathesis are presented in (2):

(2) Property - values	example contrast	Ranking conditions
MetFromCL - yes/no	/CL ₂ / → [CL ₁] vs. [CL ₂]	CL=initial < > LINEARITY
MetFromLC - yes/no	/LC _α / → [C _β L...C _α] vs. [LC _α]	*LC < > LINEARITY
Distance - local/distal	/CL ₃ / → [CL ₂] vs. [CL ₁]	LOCALITY < > M.sub
SurvivingMarked - LC/CL _{2,3}	[LC] vs. [CL _{2,3}]	CL=initial < > *LC

L = liquid (subject to metathesis); CL = complex onset (CL₁ = initial; CL₂, CL₃ = CL in the 2nd and 3rd syllable, respectively); LC = L in non-final coda; M.sub = the subordinate m.constraint (CL=initial or *LC) in a grammar.

Our property-based approach contrasts with another OT-based grammatical theory of change in OT, that of *border point pairs* (Merchant 2019), i.e. minimal re-ranking. An OT grammar consists of a set of total orders on the constraint set. Two grammars G1, G2 share a border point pair if G1 contains a ranking PXYQ and G2 a ranking PYXQ, where X, Y are constraints and P, Q are (possibly empty) sequences of constraints. In this theory, a minimal change involves transition between two grammars that share a border point.

In many cases, the theory of border point pairs makes the same predictions as our property-based theory. We show two attested changes in stress on which they agree: a minimal change in direction of foot alignment in Djambarrpuyngo and Nakara, and a minimal change in the unarity property between Nakara and Maranunggu (all closely related languages spoken in Arnhem Land, Australia). For these examples, minimal property change and border point pairs both succeed where minimal surface change fails.

To distinguish minimal property change from border point pairs, we also present a case of a change in foot type property observed in two closely related Panoan languages, Saynáwa and Huariapano, both weakly dense and left-aligning. Within the stress system nGX, these two patterns are *not* adjacent in terms of border point pairs, even though they differ only on the foot type property. A weakly dense iambic language has the sub-ranking IAMB >> PARSE-σ >> TROCHEE, while a trochaic one has TROCHEE >> PARSE-σ >> IAMB, meaning there is no way to minimally re-rank the foot type constraints in either grammar to yield its opposite foot-type counterpart. This example therefore demonstrates the relevance of minimal changes in property values as a theory of grammatical change, distinct from simple minimal re-ranking.

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