Interacting sonority hierarchies

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The most central principles restricting syllable phonotactics in the languages of the world do so by reference to the sonority of segment classes. In the sonority hierarchy every segment class is located on a stratum that determines its status as more or less sonorous than other segment classes (Sievers 1881, Venneman 1972, Hooper 1976, Kiparsky 1979, 1981, Steriade 1982, Selkirk 1984, Clements 1990). The probably most elaborate proposal comes from Parker (2002, 2011), who distinguishes 17 levels of sonority. Syllables are organized in adherence to the Sonority Sequencing Principle (Hooper 1976, Harris 1983, Selkirk 1984, Clements (1990), Maximal Sonority Distance Principle (Steriade 1982, Selkirk 1984), Sonority Dispersion Principle (Clements 1990) and the Syllable Contact Law, which also refers to sonority (or consonantal strength; Vennemann 1988), as well as by markedness scales for different syllable constituents derived from the sonority hierarchy, such as the language-specific sonority thresholds for nuclei and codas, low sonority preference for onsets, and high sonority preference for coda consonants, as in the Coda Filter (Itô 1988) (see Prince & smolensky 1993/2004 for distinct markedness hierarchies for onsets, nuclei, and codas derived from the sonority hierarchy).

While there is no consensus at all on the physical correlates or basis of sonority (see the pages of definitions compiled in Parker 2002), it can be defined a) in articulatory terms by reference to the degree of opening of the vocal tract, b) acoustically by reference to amplitude, spectral energy or inherent intensity, c) perceptually by the stability of acoustic cues or d) phonologically by reference to the values of contrastive features such as [±consonantal], [±vocalic], [±sonorant], [±continuant] [±voiced] etc. or the number of specified privative features in an approach in which features don't have universal phonetic correlates (e.g., number of features per segment inversely correlated with sonority rank).

In this paper we compare the variation among licit segment classes in onsets, nuclei and codas across languages. The data come from a database of more than 200 languages. It turns out that the claims on relative markedness of certain levels of sonority can't straightforwardly be substantiated. Instead of the expected patterns, we observe different interacting scales for different positions. That is, the markedness scale for syllabic consonants is not only different from that for codas, there are apparently several scales at work in both codas and nuclei. This results in apparently contradictory behaviour of certain segment classes with regard to their position in the sonority hierarchy.

In our analyses we used the simplified hierarchy in (1a), which refers to vocoids (V) and four classes of consonants, liquids (L), nasals (N), fricatives (F), and plosives (P), rather than the even coarser hierarchy that is implicit in many statements about phonotactics or consonant moraicity, distinguishing only between two consonant classes, the sonorants (R, i.e., resonant) and obstruents (O).

(1) Sonority High----------Low

a. V > L > N > F > P

b. V > R > O

To begin with, restrictions in simple onsets usually affect only Ls or certain (coronal) places of articulation, rather than languages drawing a line anywhere on the hierarchy and allowing only the categories below it in onsets.

Restrictions in simple codas broadly adhere to sonority in that, in general, Rs are preferred. However, in a few cases either Fs or Ps are the only allowed class in the coda and in

[1] Joint work with Draga Zec. Though, she might not necessarily agree with everything I say here.

systems in which Os are banned we find Ls and Ns or only Ns but never only Ls. Noncontiguous patterns with F and N as well as P and N can be found while FL and PL are unattested. Another very common pattern allows the Rs or just Ns as well as a sibilant (S) in the coda. Ss – or Fs with the feature [+strident] – can be argued to be of inherently higher intensity or involving more spectral energy than other Os and might be classified higher up in the sonority hierarchy than other Fs for this reason (e.g., Selkirk 1984). This, however, is contradicted by the common occurrence of Ss in initial position of prevocalic consonant clusters (e.g., Goad 2011). If they are to be integrated into the onset constituent rather than receiving exceptional appendix status or an analysis as the coda of a defective syllable, they should be of lower sonority than Ps. A similarly bipartisan behaviour can be observed in Ns, which are often excluded from second position in complex onsets, suggesting that they are of relatively low sonority, but which are almost omnipresent in codas, suggesting their high sonority. Ns can be argued to be of low sonority for their close articulatory relation with stops in the oral cavity and of high sonority for their relatively unimpeded continuous airflow through the nasal cavity.

In nucleus positions we expect that languages choose a cut-off point on the simplified sonority hierarchy in (1a) and allow everything above that point in this position. The only implication that can be found is that Os can only be syllabic if all other classes can be syllabic, as observed already by Bell (1978).

(2) Languages with syllabic consonants in our database (S=sibilant)

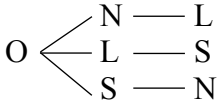
P/O	S	N	L	NL	NS	LS	LNS	LNFP
0	2	58	5	19	2	1	1	1

Since languages converge on different categories as the least marked or default in coda as well as in nucleus position we conclude that in each of these positions there are several hierarchies at work. Coda markedness is based either on Fs or on Ps as the most marked category and then classifies Ls as the next marked and nasals as the least marked category, as indicated in (3). While Ls are of intermediate markedness in both hierarchies, they can never emerge as the default, i.e., result of neutralization, or as the exclusive surviving, i.e., least marked category, while this is observed for all other major categories, F, P, and N. Nucleus markedness picks either Ns, Ls or Ss or a combination of them as the admitted consonantal class. Os are only admitted if all other classes are.

(3) Coda hierarchies (markedness decreasing from left to right)

a. F —— L —— N
b. P —— L —— N

(4) Nucleus hierarchies



The dichotomies can be derived by dividing nasals into a low and high sonority category, i.e., either using its stop nature or its acoustic salience as the crucial criterion for ranking it in the hierarchy and by doing the same with the sibilants, ranking them low for their obstruent character or high for their inherent perceptual cue strengths (on cue strength, see Henke et al. 2012).

We discuss if these hierarchies are an epiphenomenon of different uses of distinctive features (see e.g., Mielke 2005 on laterals and [±continuant] and Krämer & Zec, in prep., on nasals and [±continuant] underspecification in the sonority hierarchy) or phonetic factors, as alluded to above, or both.

In conclusion, while the sonority hierarchy is generally seen as a monolithic scale, potentially with small language-specific parametrizations – which are telescoping effects or reversals of adjacent segment types, such as rhotics and laterals – comparison of syllable phonotactics in a large number of languages shows that several hierarchies can be at work in the same syllabic constituent in the same language. There is thus not one sonority hierarchy, there are many.