Syllable Typology

In many languages, there is substantial evidence that speech sounds are organized into syllables. In slow speech, words may be uttered syllable by syllable, and the syllabic position of segments and features tends to remain constant in speech errors. In speech disguise and language play, syllables are manipulated, and a range of sound patterns require reference to the syllable as domain, to syllable edges, or to subsyllabic constituents (Blevins 1995).

This survey reviews the range of syllable types in the world's languages in relation to sound patterns or properties typically associated with syllables. These include sonority, general phonotactics, feature-based phonotactics, and weight. The purpose of this survey is to demonstrate the extent to which syllable types vary cross-linguistically, and to highlight cross-linguistic generalizations. In each case, exceptions to universal tendencies are noted, as are languages with sound patterns at the typological extremes.

The following discussion makes use of some standard terms that are applied to the description of syllables. The 'nucleus' or 'peak' refers to the syllabic element or elements within the syllable and contains the sonority peak; the term 'onset' refers to elements preceding the nucleus, and 'coda' to elements following the nucleus. The term 'rime' refers to a constituent made up of the nucleus and coda. The symbol 'C' denotes a non-syllabic segment, 'V' a syllabic segment, 'R' a sonorant consonant and 'T' an obstruent consonant.

1. Sonority. The syllable is often thought of as a unit that organizes speech sounds in terms of their intrinsic sonority. A rough definition of sonority is the loudness of a sound relative to the energy used to produce that sound. Vowels are highly sonorous sounds, while voiceless stops have low sonority. Most phonologists and phoneticians agree on a sonority scale in which low vowels are the most sonorous segments, followed, in decreasing sonority by mid vowels, high vowels, high glides, liquids, nasal stops, fricatives, and oral stops. Sonority is often claimed to play a role both in the overall contour of syllables, and in the range of segments which can serve as syllable peaks or nuclei.

At the level of overall syllable sonority profiles, there is a strong tendency for syllables to rise in sonority or remain steady up to the sonority peak, and to remain steady, or fall in sonority thereafter. This tendency is sometimes referred to as *The Sonority Sequencing Generalization* (SSG) or the Sonority Sequencing Principle. Hawaiian, a language with only open syllables, obeys the SSG, since there is always a sonority rise from the non-syllabic onset to the syllabic nucleus. Within the nucleus, sonority may remain steady, or fall. In Yawelmani, where any single consonant may occur as onset or coda, there are also no exceptions to the SSG. A cross-linguistic generalization that emerges is that the SSG is obeyed in all languages which allow only a single consonant to precede and/or follow the syllable nucleus. Examples of languages supporting this generalization are given in Table 1. (In all Tables, non-genetic language groups are given in parentheses in the 'Family' column.)

[Table 1 near here]

In languages where syllables may begin or end in a consonant cluster, adherence to the SSG is less regular, as illustrated in Table 2. In Cheke Holo, with only open syllables, we find syllable types V, CV, and TRV and strict adherence to the SSG. However, in Leti with maximal CCV:C syllables, initial RT clusters violate the SSG. Similar splits are found for languages with complex codas: in both Ndjébbana and Yir-Yoront, maximal syllables are CVCC, but in the former complex codas are limited to RT, while in the latter, word-final TR sequences are also found.

[Table 2 near here]

Well studied Indo-European languages which violate the SSG include Russian and Czech with word-initial RT clusters and Rumanian with word-final TR clusters. Extreme violations of the Sonority Sequency Generalization occur in Georgian, a Kartvelian language, where word-initial tautosyllabic pre-vocalic clusters include *zrd, mkrt, msχv,* and *mcvrtn.* Violations of the SSG in these and many other languages have inspired numerous strategies for maintaining strong versions of the SSG in which the offending consonants are treated : as headless or degenerate syllables (which do not count for weight, stress, or tone); as segments prosodically licensed by the foot, word or phrase; or as unsyllabified moras. For details of these and other strategies, see papers in Féry and van de Vijver (2003) and the comprehensive treatment of syllable appendices in Vaux (2004).

Interestingly, however, there is little evidence from psycholinguistic experiments or native speaker intuitions that suggests that these cases are anything other than true violations of the SSG. Whatever the status of these surface violations of the SSG, one clear generalization which emerges from cross-linguistic surveys is that exceptions to the SSG are found only in languages which allow consonant sequences to precede or follow the syllable nucleus. There do not appear to be any languages in which a complex nucleus itself violates the SSG (e.g. no instances of mono-syllabic *aia, aua,* etc.), or where a CV or VC sequence violates the SSG where V is a syllabic segment and C a non-syllabic segment.

Sonority is also assumed to play a role in defining segments which can serve as syllable nuclei. In many languages, including all the languages in Table 1 with the exception of Lele, syllable peaks are limited to vowels. In other languages like Lele in Table 1 and Njébbana in Table 2, syllable nuclei include vowels and nasal consonants. In Modern American English, syllable nuclei include vowels, liquids, and nasals, while an extreme case of consonant syllabicity is described for Imdlawn Tashlhiyt Berber (Dell and Elmedlaoui, 1985), where any vowel or consonant, including voiceless stops, can serve as a syllable nucleus in the appropriate segmental context.

In general, if a segment with a relatively low sonority value can serve as a syllabic nucleus in a language, then any segment of greater sonority can also serve as a syllabic nucleus. However, languages like Lele and Njébbana which have syllabic nasals, but not syllabic liquids, are well represented cross-linguistically and such systems, as exemplified within Bantu, appear to be quite stable. If evidence comes to light that syllabic liquids are systematically excluded in languages of this type, then the universal role of the sonority scale in defining possible syllable peaks will have to be reevaluated.

Sonority has also been taken to play a role in limiting single member onsets to low sonority segments, and single member codas to high sonority segments. However, there is ultimately no secure empirical basis for such generalizations (Blevins 2004). No language limits onsets to obstruents, nor does any known language ban all sonorants from onset position. Although there are some languages in which single codas are limited to particular sonorants, these patterns do not cover contiguous ranges on the sonority scale. For example, in Manam, and Oceanic language, where only nasals are possible codas, liquids *l* and *r* must be prohibited from coda position, which raises problems for a sonority-based account. See Blevins (2004), where convergent evolution is shown to account for the preponderance of nasal codas in the world's languages.

2. General phonotactics. A variety of general constraints on the form of syllables have been proposed, including: the requirement that syllables must have onsets; a prohibition against syllables with codas; and constraints against consonant clusters within the syllable. These three constraints are claimed to encode three corresponding cross-linguistic tendencies: the preference for syllables with onsets over those without; the preference for open syllables over closed ones; and the preference for syllables with simple consonantal onsets or codas over those with clusters in the same positions. As with proposed sonority constraints on single member onsets and codas, the empirical basis for such generalizations is somewhat weak.

Though many have claimed that CV syllables are the least marked syllable type, few if any of the world's languages have only CV syllables, where C is a single non-syllabic segment, and V is a (short) syllabic segment. As shown in Table 1, languages with only open syllables typically have optional onsets. In addition, most of these languages allow long vowels, diphthongs, or checked vowels which can be analysed as complex nuclei. The rarity of CV-only languages forces one to question the association between syllable typology and proposed markedness constraints.

In many of the world's languages, words begin with vowels, with no evidence of an onset requirement. And in a few rare cases (e.g. Eastern Arrernte), even medial VCV sequences appear to defy the onset constraint, being syllabified as VC.V (Breen and Pensalfini, 1999). Rules of consonant epenthesis do not appear motivated by the onset constraint (Blevins, to appear). And the claim that such tendencies are emergent under reduplication is also difficult to reconcile with patterns like those found in Cheke Holo and other languages of the Solomons, where base-initial (C)VCV strings are reduplicated as (C)V.V strings with medial onsetless syllables (Blevins, 2003).

At the same time, there are many languages where words freely end in consonants, with no evidence of an open-syllable preference. In at least two different language families, there is evidence of a preference for closed, not open syllables. In Olgol and Oykangand, Paman languages of Cape York, there are no open syllables in the native vocabulary. In several different subgroups of Austro-Asiatic, all words end in consonants. This was true of Dvaravati Old Mon, and holds for modern Palaungic, Khmuic, and Aslian branches, where final open syllables do not exist except in borrowings. Again, the claim that a tendency towards open syllables is emergent under reduplication is also difficult to reconcile with patterns like that found in at least one dialect of Southern Oromo, a Cushitic language of Kenya, where base-initial CV strings are reduplicated as CV*m*.

The empirical support for constraints against complex onsets and codas appears to be based on languages in which certain clusters are split by epenthetic vowels. However, there appear to be just as many languages in the world which tolerate the same cluster types, as well as languages like Georgian in which the extremely long clusters noted above are tolerated without epenthesis. Hence, it is incumbent on proponents of constraints against complex onsets or codas to argue that these constraints are not language-specific, as they in fact appear to be.

The preference for V or CV syllables does characterize early stages of language acquisition, a point that has sometimes been taken to support a preference for open syllables and a dispreference for clusters in the grammar. However, it is widely accepted that such early patterns reflect production difficulties in coordinating distinct consonantal gestures, and have no ultimate effect on the form of the adult grammar.

3. Feature-specific phonotactics. The distribution of laryngeal and place features is also claimed to be sensitive to syllable structure. For instance, numerous languages show neutralization of obstruent voicing or place contrasts in word-final and pre-consonantal position. In many cases, this type of sound pattern can be captured with reference to syllable-final position, or neutralization within the syllable coda. However, recent work on word-based phonotactics also draws attention to the numerous languages where neutralization is not syllable based (Steriade 1999a, 1999b) . A prime example is the common neutralization of retroflex and non-retroflex coronals, which occurs in word-initial and post-consonantal positions, but not in post-vocalic positions. Since post-vocalic contexts include V.CV as well as VC.C and VC##, a purely syllable-based generalization is not possible.

While it is often the case that the class of possible syllable codas is more restricted than the class of syllable onsets, this is not always the case. In Kashaya, glottalized sonorants only occur in coda position, making the class of possible codas larger than the class of possible onsets.

4. Weight. Many languages distinguish between 'light' and 'heavy' syllables for the purposes of stress patterns, tone patterns, or metrical traditions. The most common divisions of syllable weight involve only the syllable rhyme and ignore the syllable onset. Of these, the most common divisions for stress are those in which VV is heavy and V is light, or where VV and VC are heavy and V is light. For tone, where heavy syllables are those with two (or more) tone-bearing units, the situation is slightly different. The most common division is one where VV is heavy and V is light, or where VV and VR are heavy, and V and VT are light (R a sonorant, T an obstruent).

No language appears to have more than a three-way contrast in rime-weight for the purposes of stress. A language that exhibits the maximal three-way contrast is Klamath, where syllables with long vowels are heaviest, followed by closed syllables, followed by light open syllables. On the other hand, there are languages like Cayuvava, where no long vowels, diphthongs, or closed syllables occur, and which have only a single 'light' syllable type.

A few languages are described in which syllable weight is sensitive to syllable onset. One language of this type is Pirahã where the heaviest syllables are TVV (where T is a voiceless obstruent), and these are heavier than DVV (where D is a voiced consonant), which are in turn heavier in VV syllables without onsets. The complete six-degree weight scale is: TVV > DVV > VV > TV > DV > V, and represents one of the most complex scales described for a stress system (Everett and Everett, 1984).

In languages in which moras and not syllables are the stress or tone-bearing units, there appears to be no upper limit on the number of moras within a syllable. Although many languages have an upper limit of two moras per syllable, trimoraic syllables are also found in many unrelated languages, including Japanese, Estonian, and Hawaiian. Gilbertese *raoim* 'your tranquility' has four moras, and nothing in Gilbertese rules out the unattested five mora syllable *a:oim*.

Recent work on syllable weight (Gordon 2002, to appear) demonstrates that the most common weight systems for tone and stress are grounded in phonetic properties relevant to the realization of these features. For stress, overall acoustic energy is relevant, while tone systems are characterized by high sonority weight units capable of carrying fundamental frequency contours with some degree of perceptual salience. These findings are consistent with the fact that some languages with tone and stress have distinct weight systems. The same facts suggest that the search for a universal unified theory of syllable weight for stress and tone is misguided.

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	Language/ Data source	Family	Sample syllable types	
(C)V(V)	BILUA Obata (2003)	(Papuan)	**i.nai.nae.ko**	'to prepare'
(C)V(V)(V)	BANAWÀ[i] Buller et al. (1993)	Arawan	**u.fa.bu.ne** **ba.due** **buei**	'I drink' 'deer sp.' 'die'
(C)V(V)	HAWAIIAN[ii] Pukui & Elbert (1971)	Austronesian/ Polynesian	**a.lo.ha** **ō.pū.he.a**	'love' 'quiet, calm'
(C)V(ʔ)	TARAHUMARA[iii] Lionnet (1972)	Uto-Aztecan/ Sonoran	**a.ká** **uʔ.sú**	'sandal' 'grandmother'
CV(X)	YAWELMANI[iv] Newman (1944)	Yokuts	**mɔ.jɔ:.net.naʔ**	'I was made tired'
CV(V)(C)	KARUK[v] Bright (1957)	(Hokan)	**ʔa.ra:r** **fi:.pa.jav**	'person' 'straight'
(C)V(X)	LELE[vi] Frajzyngier (2001)	Afro-Asiatic/ Chadic	**ŋ.lèé.sì.kaŋ.di** **am.du** **túg.sú** **è, éè**	'I ate meat here' 'he kept her' 'k.o. grass' 'go', 'go-future'
(C)V(V)(C)	YUP'IK Jacobsen (1984)	Eskimo-Aleut/ Eskimo	**a.cu.raq** **aa.luu.yaaq** **uug.nar**	'aunt by marriage' 'swing' 'vole'

C = a non-syllabic segment
V = a syllabic segment
X = C or V

Table 1. Sonority Sequencing Generalization:
Obeyed in all languages with simple onsets and simple codas

	Language/ Data source	Obeys SSG?	Family	Sample syllable types	
$(C_1^2)V(V)$	CHEKE HOLO[vii] White et al. (1988)	yes	Austronesian/ Western Oceanic	**e.lo** **kai.ka.fli** **kmai.kma.ji**	‘to float’ ‘flash on & off’ ‘eat a varied meal-RED’
$(C_1^2)V(V)(C)$	LETI van Engelenhoven (1995)	no	Austronesian/ Central-Malayo-Polynesian	**o.a** **pni.nu** **rka:.lu** **sra:t** **rsɔp.le**	‘you’ ‘fool’ ‘they shout’ ‘main road’ ‘they sail’
$(C)V(C_1^2)$	NDJÉBBANA[viii] McKay (2000)	yes	(Australian/ Non-Pama-Nyungan)	**n.ka.la** **ran.ba** **kalk.be**	‘fork’ ‘beach’ ‘northern black wallaroo’
$(C)V(C_1^2)$	YIR-YORONT[ix] Alpher (1991)	no	Pama-Nyungan	**pam, am** **ŋo.jo, o.jo** **melt** **paɹl**	‘person’ ‘I’ ‘animal, bird’ ‘clean, bald’

C = a non-syllabic segment

V = a syllabic segment

Table 2. Variable adherence to Sonority Sequencing Generalization in languages with complex onsets or complex codas

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Footnotes to Table 1

[i] Onsetless syllables are all of the form V, with simple nuclei. CVVV syllables only occur word-finally, and the final vowel is always *i*. Buller et al. (1993) interpret word-initial Vs and word-final *i* of VV*i* as extraprosodic segments.

[ii] Tautosyllabic VV sequences in Hawai'ian include all long vowels, possibly clusters of falling sonority, e.g. *ai, au, ae, ao*, etc., and *iu*. Long vowels are written with macrons. By some analyses (e.g. Schütz 1981), some V_1V_2 clusters where V_1 is long and V_2 is short, may also be tautosyllabic: compare *ʔā.i.na* and *ʔāi.na* 'land'.

[iii] Vowels in Tarahumara maybe be checked by glottal closure or unchecked. It is unclear whether to treat this glottalization as a vowel feature, or as an independent coda consonant. Within the word, there is morphologically conditioned reduction of certain

vowels to schwa or zero. Recent loans into Tarahumara have word-initial clusters and final consonants, but the SSG is still observed.

[iv] Yawelmani has CV:C syllables in a limited number of contexts: where the verbal *-lsa:, -sa:* causative/repetitive suffix is involved, e.g. in *nin**e:**lsa:hin* 'get (him) to keep still several times' (cf. /nini:-/ 'keep still'); in *-wiyi-/witi-* verbs indicated extended events, e.g. *pa:lwiyi-*'overspread slowly' (cf. *palwiyi-* 'overspread quickly'); and in loans, e.g. *gaxɔ:n* 'box'.

[v] Unstressed phrase-initial ʔV is optionally elided in Karuk, resulting in phrase-initial clusters. Compare phrase-initial *kva:t* or *ʔakva:t* for /akva:t/ 'raccoon'.

[vi] Lele has a single syllabic consonant *ŋ* 'I' which occurs as an independent V syllable, without onset or coda. Lele also has productive closed syllable shortening by which /(C)V:C/ surfaces as (C)VC. Long vowels are written as doubled letters.

Footnotes to Table 2

[vii] Syllable initial CC clusters in Cheke Holo (aka Maringe) are TR, where T is an obstruent, and R a sonorant. The only other CC clusters which occur in the native vocabulary are word-medial non-homorganic NN clusters, e.g. *emno* 'be limp', *daŋna* 'to fast'. These are assumed to be tautosyllabic, based on the syllabification of other clusters. Closed syllables do occur loans from Pijin, as in, e.g. *devol, fren, kikibol, wenesde*.

[viii] In addition to the syllabic nasal, which forms a V syllable of its own in Ndjébbana, there is one vowel-initial word reported: *a.rab.ba* 'and, but', a variant of the more common *ka.rab.ba.*

[ix] It is inclear whether VCV in Yir-Yoront is consistently syllabified as V.CV or VC.V. Dropping of initial consonants in Yir-Yoront is typical with pronouns and other particles post-consonantally, and in phrase-initial positions. Otherwise, word-initial vowels are not found. Final CR clusters are distinct from final CvR sequences, where 'v' = schwa. See Alpher (1991:14-15) for further discussion.