55 Onsets

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Onsets are obligatory in the most typical syllable found cross-linguistically, the consonant–vowel (CV) syllable, and as such, are found ubiquitously across languages. This chapter explores various aspects of onsets, covering much of their structural, segmental, and suprasegmental behavior. Using empirical data as a point of departure, various stances and theoretical views will be addressed on a number of issues. These include the presence of the onset in unmarked CV syllables (§1), onset clusters and the role of sonority in their formation (§2), and the structure and representation of the onset within the syllable (§3). The focus will then shift to the onset's often disregarded role in suprasegmental phonology with reference to several weight-based phenomena (§4). The chapter closes by briefly reviewing approaches that tackle the onset–coda asymmetry (§5).

1 Onsets in unmarked syllables

Most phonologists agree that the most unmarked syllable universally is a CV syllable (Jakobson 1962: 526; CHAPTER 33: SYLLABLE-INTERNAL STRUCTURE), i.e. a syllable that consists of a nucleus and a preceding consonant, the onset. When the onset consists of a single segment then it is simplex; when it contains a consonant cluster then it is complex. The present section deals with the former.

Evidence for the unmarkedness of CV syllables comes from a variety of sources. First, CV syllables exist in all languages (unlike other syllable types, which only occur in some) and indeed there may be languages whose sole syllable type is CV, e.g. Hua (Blevins 1995) or Senufo (Zec 2007). While it is the case that every language will have CV syllables, it is not equally true that every syllable in a language will have an onset. Unlike Totonak and Dakota (and of course Hua and Senoufo), where onsets are obligatory, in many other languages they are optional, e.g. Greek, English, and Fijian (Zec 2007).

The naturalness of CV syllables is also indicated by the fact that they are the first syllables produced by children during the initial stages of language acquisition (CHAPTER 101: THE INTERPRETATION OF PHONOLOGICAL PATTERNS IN FIRST LANGUAGE ACQUISITION).

(1) *CV outputs by a Dutch child at age 1;5,2* (Levelt *et al.* 2000)

/pus/	[pu]	'cat'
/klar/	[ka]	'finished'
/oto/	[toto]	'car'
/api/	[tapi]	'monkey'

As Buckley (2003) shows, however, children's initial productions may also involve VC syllables. Importantly though, these never seem to arise independently, i.e. without CV syllables also being present in the language.

The dominance of CV syllables is seemingly contradicted by Arrernte (also known as Aranda; Breen & Pensalfini 1999), Barra Gaelic, and Kunjen – especially its dialect Oykangand – whose syllables are claimed to be of the VC type (with extra codas if need be) and not of the CV type (Blevins 1995 and references therein). These cases are rather weak, however, since for the most part alternative explanations that actually make use of the CV syllable type have been proposed.

For instance, Blevins (1995: 230–231) observes that in Kunjen, aspiration only appears prevocalically. In principle, this could be understood as occurring either syllable-initially or syllable-finally, but empirical facts suggest that only the former analysis is viable. If aspiration were to apply syllable-finally, then it should also emerge word-finally, something that never occurs. The facts are thus only compatible with syllabification in the onset. Perhaps the strongest argument in favor of the existence of CV syllables, though, comes from a rule of utterance-initial reduction that deletes initial onsetless syllables, presumably as a means to achieve more well-formed onsetful syllables, as in (2).

(2) *Oykangand reduction in utterance-initial position* (Sommer 1981: 240)

unreduced	*reduced*		*deleted material*
igigun	gigun	'keeps going'	[i]
amamaŋ	mamaŋ	'mother (voc)'	[a]
uŋgul	gul	'there'	[uŋ]

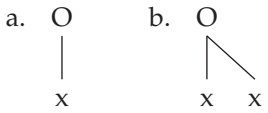
2 Complex onsets

As well as simplex onsets, onsets can also be complex, usually composed of two segments and hence considered maximally binary (Blevins 1995; Morelli 1999; Baertsch 2002; among many others), as in Greek ['tre.xo] 'I run', ['pe.tra] 'stone', ['vli.ma] 'missile', or ['tu.vlo] 'brick'. Longer sequences such as [str] or [spl] are also commonly allowed, as in English [əstreɪ] *astray* or [splɪt] *split*, but usually these are not considered to exceed the binarity maximum, as there is evidence that the [s] here is not part of the onset (see CHAPTER 38: THE REPRESENTATION OF SC CLUSTERS).

Yet in some works, the existence of complex clusters is denied altogether. For example, Lowenstamm (1996) and Scheer (2004) claim that all surface syllable types are subsumed under the CV matrix with the addition of empty positions, e.g. English [dØ][ri][mØ] *dream*. Duanmu (2008) interprets complex onsets such as *pl*, *fr*, *kl*, *kr* as complex sounds under a single timing slot, on the assumption that such sounds are possible if the articulatory gestures of two sounds can overlap (CHAPTER 54: THE SKELETON).

Most phonological models, however, allow complex onsets and provide relevant analyses to account for them. In Government Phonology (van der Hulst & Ritter 1999; Kaye 2000), for example, binarity is explicitly integrated within the model through the Binarity Theorem (Kaye 1990, 2000), which states that constituents cannot dominate more than two positions, so that onsets may either exhibit single association to a skeletal point (3a) or be maximally binary branching (3b).

(3) *Onsets within Government Phonology* (van der Hulst & Ritter 1999)



More commonly, the binarity of the onset and the combinatorial possibilities among segments within it are attributed to co-occurrence restrictions between adjacent segments (Clements 1990; Zec 2007: 164). In fact, a number of proposals subscribe to the idea that onset syllabification – like the other components of the syllable – is governed by sonority considerations (e.g. Hooper 1976; Steriade 1982; Selkirk 1984; Clements 1990; among others). Briefly, in this approach, more sonorous segments are preferred toward the center of the syllable, whereas less sonorous ones make better syllable margins, i.e. onsets and codas (Clements 1990).[1] Despite certain objections to sonority (see below; and also Parker 2002; CHAPTER 49: SONORITY), its importance for phonological theory is generally acknowledged (Steriade 1982; Selkirk 1984; Clements 1990; Rice 1992; Kenstowicz 1994; Zec 1995). One fairly standard version of the sonority hierarchy is shown below (after Clements 1990).

(4) *Sonority scale* (> = more sonorous than)

vowels > glides > liquids > nasals > obstruents[2]

One principle that makes use of this scale is the Sonority Sequencing Principle (SSP; Clements 1990), which states that the sonority profile of a syllable must be such that sonority rises sharply toward the peak and gradually lowers after it.

Evidence for the SSP comes from various sources. One example is Imdlawn Tashlhiyt Berber (e.g. Dell & Elmedlaoui 1985), known for its long sequences of consonants. Indeed, there may be words that consist of no vowel at all, e.g. [tftkt] 'you suffered a sprain'. These seemingly highly complicated strings can, however, be easily analyzed if one utilizes the SSP, plus a few other assumptions. Bearing in mind that in Imdlawn Tashlhiyt Berber: (i) any segment can be a syllable nucleus, (ii) onsetless syllables are only allowed word-initially, (iii) codas may appear word-finally, and (iv) complex onsets are banned, the following examples are syllabified in such a way that the nucleus of each syllable comprises a sonority peak.

[1] For more detailed discussion on the Sonority Sequencing Principle and the Minimal Sonority Distance, see CHAPTER 49: SONORITY.

[2] For a discussion of other variants see Parker (2002).

(5) *Imdlawn Tashlhiyt Berber syllabification*

/ut-x-k/	[u.tx̩k]	'I struck you'
/rks-x/	[r̩.ks̩x]	'I hid'
/t-msx-t/	[tm̩.sx̩t]	'you have transformed'

Additional evidence for the SSP comes from onset cluster simplification processes, as in Sanskrit (see Steriade 1988 and CHAPTER 119: REDUPLICATION IN SANSKRIT for relevant data) or Attic Greek (Steriade 1982), whereby C_1C_2 onset strings are reduced to simplex onsets in reduplication. Notably, the surviving C is the least sonorous one, resulting in a more abruptly rising slope toward the nucleus. Similar facts arise in child speech (CHAPTER 101: THE INTERPRETATION OF PHONOLOGICAL PATTERNS IN FIRST LANGUAGE ACQUISITION), as is evident in the outputs of an English-learning girl aged 2;9 reported on by Gnanadesikan (1995).

(6) *Cluster simplification to the least sonorous consonant*

clean	[kin]
snow	[so]
friend	[fɛn]
sky	[kaj][3]

Not all languages admit the same inventory of complex onsets. It is generally held to be true that the larger the distance in sonority between C_1 and C_2, the more well-formed the onset cluster. Thus, obstruent (O) + glide (G) clusters are highly favored, followed by O + liquid (L), O + nasal (N), and so on. Onset clusters preferably satisfy a *Minimal Sonority Distance* restriction in order to be allowed in a language (Vennemann 1972; Hooper 1976; Steriade 1982; Selkirk 1984; Baertsch 2002). In Bulgarian, no distance at all is necessary, thus all of OL, NL, ON, LL, NN, and OO clusters are admitted (Zec 2007); in other languages, different degrees of Minimal Sonority Distance are applicable: in Chuckchee, only OL, NL, and ON clusters are well-formed (Levin 1985); in Spanish, only OL onset clusters (Baertsch 2002); and in Huariapano (Parker 1994), only OG clusters.

In a sense, Minimal Sonority Distance generates the expectation that if a language allows onset clusters where C_2 is of sonority X, then it should also admit onset clusters with a C_2 whose sonority is higher than X. But as we have just seen, this is not always the case: e.g. Spanish, which bans *OG clusters. To make things worse, many languages also allow sonority plateaus and even reversals. For example, Greek plateaus like [kt], [fθ], and [vɣ] are tolerated, as in [ktirio] 'building', [akti] 'coast', [fθiro] 'impair', [afθonos] 'abundant', [vɣazo] 'remove', [avɣo] 'egg'. Russian also permits reversals, e.g. [rtut] 'mercury' and [lvov] (city name) (Gouskova 2001), which, however, are often considered not to be complex

[3] Under the assumption that [sk] is a complex onset, then the fricative [s] must be more sonorous than the stop [k] (cf. Dell & Eldmedlaoui 1985; de Lacy 2006; among others). In the sonority hierarchy I have adopted here, this distinction is not made. On the other hand, a difference in sonority of fricatives as opposed to stops would yield incorrect results in other accounts, e.g. Kreitman (2006). If [s], however, is not part of the onset (cf. CHAPTER 38: THE REPRESENTATION OF SC CLUSTERS), this issue does not arise in the first place.

onsets; rather the segment(s) violating the SSP can be realized as syllabic, e.g. [r̩.tut], or even extrasyllabic, attaching to some higher level of prosodic structure, e.g. the foot or prosodic word (see CHAPTER 40: THE FOOT and CHAPTER 38: THE REPRESENTATION OF SC CLUSTERS for more discussion). Such data partly explain why the validity of sonority is sometimes contested.

Other objections to sonority include the lack of a clear way to phonetically define and measure it, and its inability to explain the frequent ban on sequences of the type *ji*, *wu*, *bw*, or *dl* (quite likely an Obligatory Contour Principle (OCP) effect). Some researchers have therefore gone as far as to discard sonority. For example, Ohala (1990) and Harris (2006) claim that attested sequences in languages can be best captured through the perceptual distance between neighboring sounds in terms of a number of different acoustic properties, including amplitude, periodicity, spectral shape, and fundamental frequency (F0) (Ohala 1990: 334). As Ohala (1990: 334–335) admits, however, this view explains which sequences should be found in languages, but does not explain how and why they are grouped into syllables.

This is perhaps why – despite criticism – sonority still remains highly influential in current work on syllabification (cf. Baertsch 2002; Gouskova 2004; Zec 2007; among many others). But there is yet another possibility. Rather than completely endorsing or abandoning sonority, we can accept it, but loosen somewhat the predictions and generalizations it makes. Berent *et al.* (2007) put forward a proposal along these lines. In particular, they suggest a more flexible version of sonority-based generalizations regarding the profile of onset clusters. They state that:

> In any given language:
> (a) The presence of a small sonority rise in the onset implies that of a large one.
> (b) The presence of a sonority plateau in the onset implies that of some sonority rise.
> (c) The presence of a sonority fall in the onset implies that of a plateau. (Berent *et al.* 2007: 594)[4]

On this view, Spanish is no longer problematic (since OL clusters involve high sonority, there is no reason that there should be OG clusters too), and the plateaus of Greek are expected, given that it also has sonority rises, while Russian has falls only because it also has plateaus. More generally, Berent *et al.* (2007) test the statements above against the sample of Greenberg (1978) and find that they overwhelmingly hold true typologically.

Other typological surveys on onset clusters also tend to employ sonority, usually with some modification or enrichment of the theory. For instance, Morelli (2003) investigates the patterns of obstruent onset clusters and proposes implicational relationships between them, as schematized in (7), where fricative + stop (FT) clusters are the least marked, TT the most marked and TF somewhere in between. FF clusters merely imply the existence of FT, without further implicational relationship with other clusters.

[4] Berent *et al.* (2007) seem to adopt Greenberg's (1978) characterization of small and high sonority. High-sonority rises are OL clusters; low-sonority rises are NL and ON; plateaus are OO, and falls are LN and NO clusters.

(7) *Implicational relationships between obstruent onset clusters* (Morelli 2003)[5]

$$\begin{array}{c} \text{TT} \\ \Downarrow \\ \text{TF} \\ \Downarrow \\ \text{FF} \Rightarrow \text{FT} \end{array}$$

Kreitman (2006) focuses on sonorant (S) and obstruent (O) clusters and proposes the implicational hierarchy SO ⇒ SS ⇒ OO ⇒ OS, with OS clusters being the most unmarked, and SO ones the most marked. These are respectively the most and least favored clusters as far as sonority is concerned. SS and OO clusters involve sonority plateaus, but do not randomly appear in languages as one would expect; instead the presence of SS systematically implies OO. To account for this fact, Kreitman points to the increased salience of obstruents as opposed to sonorants (cf. Ohala 1983: 193). Since obstruents are considered to carry more information, due to their acoustic form, they are easier to distinguish from non-obstruents. Thus, combinations between obstruents should be perceptually favored over those between sonorants.

What all these studies highlight is that removing sonority from the equation is not useful; rather it seems that consideration of other factors, e.g. the role of perceptual salience, may enhance the role of sonority conceptually and improve its empirical coverage.

3 The status of the onset within the syllable

Moving away from the principles that regulate onset syllabification, let us consider the representation of the onset within the syllable. Various models of the syllable have been proposed throughout the years (see Blevins 1995; van der Hulst & Ritter 1999 for overviews; see also CHAPTER 33: SYLLABLE-INTERNAL STRUCTURE), which due to lack of space will not be discussed here in detail. Nonetheless, reference will be made to those that are especially relevant to onsets. Broadly speaking, we can identify two major theories: (i) those that distinguish between onsets and rimes (Pike & Pike 1947; Kuryłowicz 1948; Fudge 1969; Selkirk 1982; Levin 1985; Kaye *et al.* 1990; Blevins 1995), and (ii) moraic models that do away with the rime, i.e. the nucleus + coda string, as a separate constituent (Hyman 1985; Hayes 1989; Morén 2001).

3.1 Onset–rime models

No single version of the onset–rime model is available, and there are significant divergences between models. For instance, Fudge (1969) accepts the syllable as a constituent, whereas Kaye *et al.* (1990) explicitly do away with it, but nonetheless treat the onset and rime as "an inseparable package" (van der Hulst & Ritter 1999: 23).

[5] Inclusion of sC clusters among the FT clusters and their treatment as onset clusters, at least word-initially, is quite problematic for Morelli, however, in light of evidence showing how sC clusters differ from true branching onsets in various ways (see CHAPTER 38: THE REPRESENTATION OF SC CLUSTERS).

(8) *A typical representation of the onset–rime model* (Blevins 1995)

Specific syllable models make different claims about constituent-hood. For instance, Blevins (1995) essentially only recognizes the rimal constituent and sees no strong argument for an onset constituent – and for that matter, a coda constituent – beyond sonority considerations. For Government Phonology (van der Hulst & Ritter 1999; Kaye 2000), on the other hand, onsets, nuclei, and rimes are constituents.

The basic argument for the rime hinges on the idea that co-occurrence restrictions are always more likely to occur between nuclei and codas, rather than between either onsets and nuclei or onsets and codas. The strongest argument for the rime though comes from weight facts (Blevins 1995; van der Hulst & Ritter 1999: 23). Consider stress, for example. As is well known, in many languages heavy syllables attract stress in contrast to light syllables (e.g. Hopi; Jeanne 1982). Importantly, heaviness implies a binary rime, $[VV]_R$ or $[VC]_R$, or both, depending on the language. Since the presence of onsets is disregarded in such an evaluation, it must mean that rimes form a constituent that clearly excludes the onset.

Nonetheless, each of the arguments in support of the rime has been challenged. Davis (1985) attacks the reliability of co-occurrence and phonotactic restrictions, given that those are not exclusive to nuclei and codas, but are also found between onsets and nuclei or onsets and codas. For instance, in Korean (Cho 1967), fronted vowels do not appear after labial onsets, while in Yindjibarndi (Wordick 1982), the presence of /r/ in both the onset and a coda of a syllable is banned. Another objection to the onset–rime distinction is found in Yip (2003), who claims that if it were valid, then the boundary between the two constituents should be clear and consistent, and thus segments should uniformly belong to either the onset or the rime, but not to both. English and Mandarin pre-nuclear glides, however, behave sometimes like onsets and sometimes as rimes. As for the weight effects induced by the rime, it is possible to capture them in a different manner without reference to the rime per se. This is what moraic theory does, as we will see in a moment.

Before moving on, though, it is notable that the onset–rime debate is also predominant in psycholinguistic studies that explore the onset–rime boundary in terms of implicit and explicit, i.e. non-conscious *vs.* conscious, phonological awareness. Work by Treiman (1986 and references therein) on various segmentation and substitution tasks in both adults and children suggests that there is a closer connection between VC than CV, thus offering support for the onset–rime boundary. In the same vein, Uhry and Ehri (1999) show that English-speaking kindergarten children preferred to keep VC, rather than CV, intact during segmentation. The opposite result, however, was found by Lewkowicz and Low (1979).

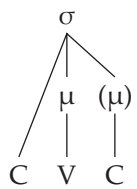
More recently, Geudens and Sandra (2003), in a series of four experiments on Dutch-speaking pre-readers and beginning readers, found no support for the onset–rime boundary. Importantly, they applied strict criteria regarding the selection of items under investigation, such that they could control for distributional and sonority effects. In particular, they used items of different sonority equally often and found that syllables with obstruents were easier to perceive and segment than syllables with sonorants (2003: 172); see also CHAPTER 8: SONORANTS. The influence of sonority may in fact explain some of the findings of previous studies, such as Schreuder and van Bon's (1989) finding that Dutch first-graders break up a CV string more easily than a VC one. In their study, sonorants were mainly used, but sonorants undergo more vocalization in coda rather than onset position, possibly explaining why children find it harder to break them up in a VC environment rather than a CV one.

All in all, psycholinguistic experimentation also reflects contradictory evidence with regard to the onset–rime boundary debate. What this absence of consensus at the very least suggests is that the boundary dispute is well grounded.

3.2 *Moraic model*

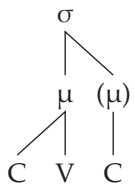
A common response to criticism against the rime has been to dispense with it as a constituent altogether and to replace it with the concept of mora. In moraic theory (Hyman 1985; Hayes 1989), only segments under – what used to be – the rime node may bear moras. Since the latter are needed independently to account for a number of phenomena related to syllable weight, the natural conclusion has been to structurally eliminate the rime from representations. The representation of a [CVC] syllable in this model is presented next (compare with (8)). Note that the bracket around the mora of the coda indicates that this may be moraic or not on a language-specific basis (cf. Weight-by-Position; Hayes 1989).

(9) *Moraic model* (Hayes 1989)



Within moraic theory, there is no definite agreement as to where exactly the onset associates to. According to Hayes, it directly adjoins to the syllable as in (9). For Hyman (1985), Itô (1989), and Buckley (1992), though, it attaches to the following nucleus, as in (10).

(10) *Onset association* (Hyman 1985)



In both these versions of moraic theory, the onset is not recognized as a constituent. This is much more clearly shown in (9), where it directly links to the syllable node, but it is visible even in (10), since the mora is shared between the onset and the nucleus.

While Hayes's representation is the most widely employed, there is nevertheless some evidence for (10). Katada (1990) describes the Japanese chain language game *shiritori*, in which players say a word that must begin with the final mora of the previous player's word. If the word ends in a CV syllable, as in [tu.ba.me] 'swallow', then the next word can be something like [me.da.ka] 'killfish'. If the word ends in a long vowel, then the last mora is the second half of the vowel, to the exclusion of the first half, as well as the onset. Thus [bu.doo] 'grapes' can be followed by [o.ri.ga.mi] 'folding paper' but not by *[doo.bu.tu] 'animal'. Importantly, a word like [riN.go] 'apple' (where N is a moraic nasal) cannot be followed by *[origami], but must begin with [go]. This is easily explained if the final mora in [go] also associates to the onset, as claimed by (10), rather than linking directly to the syllable (9). The game ends if the final mora cannot form a proper onset, as happens when it is a moraic nasal, e.g. [kiriN] 'giraffe'.

Since the moraic model identifies no rime constituent, it bypasses the problems faced by the onset–rime model with regard to the extension of co-occurrence restrictions beyond the rimal node, as well as the absence of a clear boundary between the onset and the rime. Superficially, however, it does equally well as the onset–rime model in accounting for syllable weight, simply by stating or – more accurately, stipulating – that moras are strictly limited to nuclei and codas. But even this assertion has been contested. Work by Hajek and Goedemans (2003), Gordon (2005), and Topintzi (2006, 2010) has shown that there is good evidence for the existence of onset weight. We explore this issue next.

4 The suprasegmental phonology of onsets

Contrary to popular belief, onsets do seem to be prosodically active, albeit in a limited number of languages. Their effects become evident in a range of phenomena, including stress, compensatory lengthening, germination, word minimality, and tone. This section examines the relevant data and theoretical issues that stem from them.

4.1 Stress

Of all these, onset-sensitive stress has received the most extensive attention. In brief, three patterns are attested: (i) onset effects due to the presence of an onset, (ii) onset effects due to the quality of an onset, and (iii) patterns (i) and (ii) combined.

Starting from (i), we find that in a number of languages onsetful syllables attract stress more than onsetless ones. Languages of this type include Arrernte (Strehlow 1944), Alyawarra (Yallop 1977), and other Australian languages, such as Lamalama, Mbabaram, Umbuygamu, Umbindhamu, Linngithig, Uradhi, Kuku-Thaypan, Kaytetj, and Agwamin (most of them are Cape York and Arandic ones; see Davis 1985, Goedemans 1998, and Blevins 2001 for more details). Beyond Australia, this pattern is attested in unrelated languages of North and South

America, Iowa-Oto (Robinson 1975), Banawá (Buller *et al.* 1993), and Juma (Abrahamson & Abrahamson 1984).[6]

In Arrernte, C-initial words receive stress on the first syllable (11a), but V-initial ones have stress on the second syllable (11b). One exception is disyllabic words, where stress is word-initial regardless of whether the word begins with a vowel or a consonant (11c). This is probably attributed to Arrernte's avoidance of final stress or preference for creating binary feet, as the lack of final secondary stress in words like *[a('ralka)(ˌma)] reveals.

(11) *Arrernte stress* (Strehlow 1944)

a. *consonant-initial words of three or more syllables*

'raːtama	'to emerge'
'kutunˌgula	'ceremonial assistant'
'lelanˌtinama	'to walk along'

b. *vowel-initial words of three or more syllables*

er'guma	'to seize'
a'ralkama	'to yawn'
u'lambuˌlamba	'water-fowl'

c. *words of two syllables (C- or V- initial)*

'ilba	'ear'
'aːtwa	'man'
'kala	'already'
'gura	'bandicoot'

A common denominator above is that stress may shift – albeit very locally – to dock on a syllable with an onset. This is not the only possibility, however. In other languages, the stress location remains constant, but if it falls on an onsetless syllable, this acquires an onset. Consider Dutch (Booij 1995: 65). In instances of hiatus where the first vowel is /a/, a glottal stop is inserted before the second vowel, but only if this is stressed by the normal algorithm, e.g. /paɛlja/ → [pa.'ʔɛl.ja] 'paella', /aɔrta/ → [a.'ʔɔr.ta] 'aorta'. Otherwise, no insertion is applicable /xaɔs/ → ['xaː.ɔs] 'chaos', /farao/ → ['faː.ra.oː] 'Pharaoh'. Most analyses view this as a prominence (Smith 2005) or alignment (Goedemans 1998; Topintzi 2010) effect.

In yet other languages, the mere presence of an onset is not the issue (see Topintzi 2010: 48 for details on Karo); it is the quality of the onset that matters. This is the case in Karo (Gabas 1999) and possibly Arabela (Payne & Rich 1988). In the former, stress falls on the final syllable, except when the penultimate syllable is a better stress bearer. Better stress bearers are, in order of priority, a syllable with (i) a high tone, (ii) a nasal vowel, or (iii) a voiceless or sonorant onset. When (i) and (ii) are irrelevant, (iii) is taken into consideration and stress falls on the final syllable if the onset is a sonorant (12a) or voiceless (12b) or a voiced obstruent preceded by another voiced obstruent onset (12c).

[6] However, the case of Juma should be treated with caution, because only a handful of data are available and because it is possible to re-analyze it. In particular, words like [pe'jikɔ'pia] 'bird (sp.)' may be argued to contain a final diphthong, i.e. [pe.'ji.kɔ.'pia], rather than a sequence of heterosyllabic vowels, i.e. [pe.'ji.kɔ.'pi.a], which would lend support to the onset effect. Interestingly, Juma is the sole language where the effect appears at the right edge of the word and not at the left. This may perhaps be an additional indication that it is not truly onset-sensitive.

(12) *Karo final stress and onset voicing* (Gabas 1999: 14, 39–41)[7]

a. *final syllable with sonorant onset*
kɔˈjɔ 'crab'
jaʔˈm^{b}ɔ 'yam (sp.)'
kɨɾɨˈwɛp˺ 'butterfly'

b. *final syllable with voiceless onset*
paˈkːɔ 'fontanel'
maʔˈpɛ 'gourd'
kuɾuʔˈcu 'saliva'

c. *final and prefinal syllables with voiced obstruent onsets*
kiɾiˈbɔp˺ 'frog (sp.)'
mɨɾɨˈɾɨj 'toad (sp.)'

Stress, however, falls on the penult if the final syllable has a voiced obstruent onset and the previous one does not, indicating the stress-attracting nature of the voiceless obstruents and the sonorants in this language.

(13) *Karo penult stress and onset voicing* (Gabas 1999: 14, 39–41)

ˈjaba	'rodent (sp.)'	ˈpibɛʔ	'foot'
ˈwɛɾɛ	'frog'	ˈkaɾo	'macaw'
ˈməga	'mouse'	iʔˈcɔgɔ	'quati (sp.)'

Nonetheless, other cases where stress is seemingly sensitive to the onset quality have been shown to be much less robust or even wrong. One example of the latter arises in Mathimathi, where stress is normally word-initial unless attracted by the second syllable when it begins with a coronal onset. Davis (1988) attributes this to genuine onset-sensitivity. Gahl (1996), on the other hand, shows that another account is more plausible, namely one that considers Mathimathi stress to be morphologically based. She claims that stress is located on the last stem syllable of the word (or better, last stem vowel). Stems are generally monosyllabic or bisyllabic. It so happens that apparent stress shift appears on stems of the type $C_1VC_2VC_3$, where the medial consonant is invariably coronal (Gahl 1996: 329). Evidence for Gahl's analysis comes from monosyllabic C_1VC_2 stems, where C_2 is again coronal. Addition of a suffix to such stems renders C_2 an onset of the second syllable. If Davis were right, then stress here should also be peninitial. However, it is initial, as predicted by Gahl's morphological account; cf. peninitial stress in bisyllabic stems such as [ˌgu.ˈra.g+i] 'sand' *vs.* initial stress in monosyllabic stems such as [ˈwa.ɖ+a.d̪+a] 'to come'. In both cases, C_2 is coronal. Thus, re-examination of the facts in light of morphological considerations may reveal the lack of true onset-sensitive effects (see also Nanni 1977 on the English suffix *-ative* or Davis *et al.* 1987 on Italian infinitives).

A final pattern that emerges involves the combination of true onset-presence and onset-quality effects. A well-known example is Pirahã (Everett & Everett 1984; Everett 1988), an Amazonian language where codas are banned. Onsetless light syllables [V] do not occur and stress may only dock on one of the three final

[7] Note that [ɾ] in Karo behaves like [d], which is otherwise missing from the inventory (Gabas 1999: 12).

syllables of the word. The weight and stress hierarchy the language motivates is: PVV > BVV > VV > PV > BV (P = voiceless; B = voiced). In particular, VV nuclei attract stress more than V ones (14c), and voiceless onsets have the same effect as opposed to voiced ones (14a, 14d). Crucially, and unlike Karo, Pirahã 'voiced' consonants also include sonorants, which appear as allophones of voiced stops, e.g. /b/ may surface as [b], [m], or the bilabial trill [ʙ]. Consequently, in this language, only voiceless obstruents attract stress. Between equally heavy syllables in terms of nucleic weight, onsetful ones attract stress over onsetless (14b). Finally, if there is more than one equal contender for stress, the rightmost receives it (14e).

(14) *Pirahã examples* (Everett & Everett 1984; Everett 1988)

a.	PVV > BVV			
	'káo.bá.bai	'almost fell'		(1988: 239]
	pa.'hai.bií	'proper name'		(1984: 708]
b.	BVV > VV			
	'bii.oá.ii	'tired (lit.: being without blood)'		(Everett, p.c.)
	poo.'gáí.hi.aí	'banana'		(1984: 709]
c.	VV > PV			
	pia.hao.gi.so.'ai.pi	'cooking banana'		(1984: 710]
d.	PV > BV			
	ti.'po.gi	'species of bird'		(1984: 710]
	'ʔí.ʙo.gi	'milk'		(Everett, p.c.)
e.	*rightmost heaviest stress*			
	ho.áo.'íi	'shotgun'	*ho.'áo.íi	(1984: 710]
	ti.'po.gi	'species of bird'	*'ti.po.gi	(1984: 710]
	paó.hoa.'hai	'anaconda'	*paó.'hoa.hai	(1984: 707]
			*'paó.hoa.hai	

What is common to all these examples is that the voiceless obstruent onsets systematically attract stress, contrary to the voiced obstruent ones. Various analyses have been offered to account for the Pirahã facts (and many fewer for Karo). These are examined in Topintzi (2010). Some make use of the increased prominence of onsetful syllables and voiceless onsets over onsetless syllables and voiced onsets respectively (Everett & Everett 1984; Hayes 1995; Goedemans 1998; Smith 2005). Some treat certain onsets as weightful and some as weightless (Topintzi 2006, 2010), and others offer a mixed system that utilizes weight but sees it as a function of prominence (Gordon 2005). Due to space limitations, these proposals will not be reviewed here. However, there is one important empirical argument that favors the onset weight approach, namely the existence of other phenomena beyond stress that are weight-related and influenced by onsets.

4.2 *Compensatory lengthening, geminates, and word minimality*

An explicit prediction of the onset–rime and the moraic models is that onsets will never participate in weight-related processes. For the former, this is because onsets are excluded from the prosodic hierarchy (van der Hulst & Ritter 1999: 31). For the latter, it is because onsets never bear moras (Hayes 1989). However,

both assertions are entirely stipulative and subject to modifications given the existence of counterevidence.

First, consider compensatory lengthening (CHAPTER 64: COMPENSATORY LENGTHENING), a phenomenon widely utilized in support of standard moraic theory. In standard moraic theory (Hayes 1989), it is predicted that onsets will neither induce compensatory lengthening (through deletion) nor undergo it (through lengthening). Yet several cases of both types have been reported.

In Samothraki Greek, the onset /r/ deletes and generally leads to lengthening of the following vowel, e.g. /ˈrema/ > [ˈeːma] 'stream', /ˈruxa/ > [ˈuːxa] 'clothes', /ˈðedru/ > [ˈðeduː] 'tree', /kraˈto/ > [kaːˈto] 'I hold' (Katsanis 1996: 50–51). Onondaga (Michelson 1988) is somewhat similar, although /r/-deletion leads to lengthening, whether it is in an onset or a coda originally. Numerous other examples have been reported (Rialland 1993; Beltzung 2007), all of which, however, are highly morphologized. For instance, in Romanesco Italian, the initial /l/ of the definite article and of the object clitic /lo la li le/ optionally deletes (Loporcaro 1991: 280), causing lengthening of the unstressed vowel that follows, e.g. [lo ˈstupido] > [oː ˈstupido] 'the stupid (MASC)' or [la ˈbruːʃo] > [aː ˈbruːʃo] 'I burn her'. Beyond this environment, such compensatory lengthening does not appear. Analogous effects are observed in Anuak/Anywa, Lango, Gyore, Turkana, and Ntcham (see Beltzung 2007; Topintzi 2010 and references therein).

Nonetheless, one could question the validity of this approach in terms of onset weight structure and instead provide a more phonetic explanation, as done by Kavitskaya (2002). She observes that vowels in CVC syllables are phonetically longer when followed by certain consonants whose transitions can be misheard as part of the vowel (i.e. sonorants, approximants). On deletion of such consonants, the 'excess' length of the preceding vowels can be phonologized, so that listeners reinterpret them as phonemically longer. Thus vowels are reinterpreted by listeners as phonemically longer. This approach also extends to compensatory lengthening induced by onsets, but only works when highly sonorous consonants are deleted. In principle, this is appropriate for some of the cases, e.g. Samothraki Greek or Romanesco Italian, but is nevertheless problematic. For instance, it cannot explain why the same phonologization of length has not occurred with regard to the Samothraki coda *r*, especially since this is the prototypical position for compensatory lengthening. More troublesome, though, is the inability to account for cases like Ntcham, where the onset that is lost is the highly *non*-sonorous /k/.

More strikingly, onsets also can serve as the target of compensatory lengthening. This means that a segment deletes and the preceding onset lengthens, i.e. geminates in order to compensate for its loss.[8] For instance, Pattani Malay (Yupho 1989; Topintzi 2008) contrasts singletons and geminates in onsets, but only word-initially (on initial geminates see CHAPTER 47: INITIAL GEMINATES), e.g. [ˌbuˈwɔh] 'fruit' *vs.* [ˈbːuˌwɔh] 'to bear fruit', [ˌɟaˈlɛ] 'road' *vs.* [ˈɟːaˌlɛ] 'to walk' (Yupho 1989: 135). Moreover, it exemplifies a case of compensatory lengthening (Michael Kenstowicz, personal communication). In instances of free variation, one variant involves loss of the word-initial syllable and gemination of the second

[8] This characterization is unavoidably linked to a broader discussion of what exactly constitutes a geminate. Briefly, the debate relates to whether geminates are inherently moraic (i.e. heavy) or involve double linking to higher structure (i.e. long). This issue is thoroughly examined in CHAPTER 37: GEMINATES and CHAPTER 47: INITIAL GEMINATES.

onset, as in e.g. [buwi] ~ [wːi] 'give', [sɨdadu] ~ [dːadu] 'police', [pɨmatɔ] ~ [mːatɔ] 'jewelry' (Yupho 1989: 130).

That these geminates are moraic is supported by another fact of the language, namely stress. Primary stress is word-final, unless the word begins with a geminate, in which case it shifts to the initial syllable (the other syllables receive secondary stress). We can easily understand this effect by claiming that the syllable hosting a geminate is bimoraic and therefore heavy, and as such, attracts stress in preference to monomoraic syllables.

(15) *Stress in Pattani Malay* (Yupho 1989: 133–135)

a. *words lacking geminates*
ˌaˈlɛ 'road path'
ˌdaˈlɛ 'in, deep'
ˌmãˌkɛˈnɛ̃ 'food'

b. *words with initial geminates*
ˈmːaˌtɔ 'jewelry'
ˈɟːaˌlɛ 'to walk'

As well as Pattani Malay, Trukese provides evidence that onset geminates are moraic (see also CHAPTER 37: GEMINATES for discussion). First, Trukese words are minimally (C)VV, e.g. [maa] 'behavior', [oo] 'omen', or C_iC_iV, i.e. a geminate plus a short vowel, e.g. [tto] 'clam (sp.)', [ʧʧa] 'blood' (Davis & Torretta 1998; Muller 1999).[9] CVC and CV words are not allowed (Davis 1999), thus singleton codas contribute no mora (Muller 1999). Presumably, minimality is satisfied by bimoraic words, provided of course that geminates add a mora to their syllable. An additional process of compensatory lengthening following the deletion of the final mora in a word corroborates the moraicity of onset geminates (CHAPTER 37: GEMINATES).

Various proposals within the standard moraic theory tradition have been put forward to account for initial moraic geminates (Davis 1999; Curtis 2003), common to which has been the lack of any association between the geminate's mora and the onset, in line with a major tenet of the theory, namely the ban on onset moraicity. Crucially, to achieve this effect, these approaches link the geminate's mora to some position other than the onset, which is made possible by the double linking commonly assigned to geminates (see CHAPTER 37: GEMINATES). But this solution is not available in cases of moraic initial consonants that are singletons rather than geminates. Such cases exist.

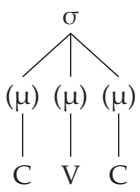
In Bella Coola (Bagemihl 1998) the minimality criterion is fulfilled by VV, VC, and CV words, but crucially not by V words.[10] Topintzi (2006, 2010) argues that the easiest way to uniformly understand these data and place them alongside the root-maximality facts of the language – that make reference to mora structure – is by stating a bimoraic word minimum and by allowing onsets to bear moras.

[9] Many languages impose a minimum size for words to be well-formed. Commonly words are required to be at least bimoraic (C)VV as in Ket or Mocha, or (C)VV/(C)VC as in English or Evenki (Gordon 2006), or bisyllabic, e.g. Pitta-Pitta (Hayes 1995: 201).

[10] In fact, words with minimally two unsyllabified consonants CC are also allowed. Evidence for the existence of unsyllabified consonants would take us too far afield; see Bagemihl (1998) and Topintzi (2006) for details.

To capture these facts, Topintzi (2006, 2010) puts forward a flatter syllable structure (reminiscent of Davis 1985), whereby all syllable constituents come in either moraic or non-moraic versions. This is hardly surprising for codas; cf. moraic codas in Latin, Delaware, English, Kiowa, and Turkish *vs.* non-moraic ones in Wargamay, Lenakel, Eastern Ojibwa, and Khalkha Mongolian (e.g. Hayes 1995; Zec 1995, 2007; Morén 2001). The claim extends to onsets too, e.g. for onset geminates in Trukese or voiceless obstruents in Pirahã *vs.* non-moraic counterparts in a host of other languages. Applying the same distinction to nuclei is also not too far-fetched, as it has been suggested that they can occasionally be weightless, for example in Malagasy (Erwin 1996), Kabardian (Peterson 2007), Alamblak (Mellander 2003), and Chuvash and Mari (Hyman 1985). The following representation illustrates the proposal outlined by Topintzi (2006, 2010).[11]

(16)



Even with this modification, though, moraic theory faces problems when it encounters data such as those in Seri and Kikamba (Roberts-Kohno 1995) and Onondaga and Alabama (Broselow 1995 and references therein), and French *h-aspiré* (Boersma 2007 and references therein). In Seri (Marlett & Stemberger 1983; Crowhurst 1988; Broselow 1995), the distal prefix [jo-] attaches to either C- or V-initial stems. In the former, nothing remarkable occurs (17a), but in V-initial stems, things become more complex. In general, when the first vowel of the stem is low back /a/ or low front /æ/ the prefix vowel deletes and compensatory lengthening results (17b). But in some specific stems, no deletion (and consequently no compensatory lengthening) occurs. Instead, a hiatus context is created (17c).

(17) *Seri distal forms*

	stem		*distal*	
a.	*C-initial stems*			
	-mækæ	'be lukewarm'	jo-meke	
	-pokt	'be full'	jo-pokt	
b.	*general pattern of* /a, e/*-initial stems*			
	-ataχ	'go'	joː-tax	
	-æmæ	'be used up'	joː-me	
c.	*exceptional pattern of* /a, e/*-initial stems*			
	-amwx	'be brilliant'	jo-amwx	*joː-mwx
	-ænx	'play stringed instrument'	i-jo-enx	*i-joː-nx

According to Crowhurst (1988), these data support a mixed representation that includes both X slots and moras (CHAPTER 54: THE SKELETON). The idea is that the stems in (17c) are underlyingly specified with an empty slot in the onset, whose

[11] Simultaneous moraicity on all three positions is presumably attested in Karo (see Topintzi 2010: 49).

net effect is to block deletion (and compensatory lengthening), because of its intervening position between the two vowels. Effectively, then, (17c) acts as if it were a C-initial stem (17a). Data of this type can also be easily accommodated in Government Phonology (Kaye *et al.* 1990), which by its nature allows reference to empty positions.

It is, however, not entirely clear that Seri cannot be accommodated by moraic theory alone (especially if onsets may bear moras). Unlinked moras appear in numerous works (cf. van Oostendorp 2005; Topintzi 2007) and are in fact suggested by Crowhurst herself. We could assume then that the input for [jo-amwx] is /jo-^{M}amwx/, where ^{M} indicates a floating mora. If on the surface this mora remains unassociated but anchored at the left edge of the stem, then it can produce the same blocking effect of deletion that Crowhurst achieves by means of an unassociated x-slot.

Even if this is feasible, it is unlikely that all similar kinds of facts will be subject to reanalysis. One solution would be to reconsider representations that simultaneously use x-slots and moras, as Crowhurst does. This idea has reappeared in Muller's (2001) Composite Model with respect to geminates, and in Vaux (2009) as a more complete model of timing. Whether such enrichment of the theory is justified remains to be seen. Alternatively, one could entertain Itô's suggestion (1989: 255 and references therein) that "the role previously played by lexically empty skeletal slots can be taken over, wholly or in part, by bare melodic root nodes."

4.3 Tone

Another phenomenon where onsets seem to be involved, albeit rarely, is tone (CHAPTER 45: THE REPRESENTATION OF TONE). Relevant cases reported include Musey (Shryock 1995) and Kpelle (Welmers 1962; Hyman 1985).

In Musey, consonants are divided into Type A (or High consonants) and Type B (or Low consonants). Type A consonants include the sonorants and the historically voiceless obstruents. Type B ones correspond to the historically voiced consonants. Both Type A and B obstruents are basically voiceless (Shryock 1995: 68–69), with Type A stops presenting longer positive voice onset time (VOT), less closure voicing, and higher F0 at the onset of the following vowel than the Type B ones.

The rightward displacement of lexical L tone when a suffix is added in (18) shows the genuine contrast between the two types of consonants as well as their tonal effects. When the lexical L tone shifts, the vowel that hosted the tone is interpreted as mid or high if the onset is Type A, but as low if the onset is Type B.

(18) *Rightward displacement of lexical L tone in Musey*

a. *cliticization of* /-na/

Type A	sà → sanà → sānà	'person'
Type B	ɦù → ɦùnà	'goat'

b.

	subjunctive		*subjunctive with affixation*	
Type A	tò	'sweep'	tōm̀	'sweep it'
Type B	dò	'pick'	dòm̀	'pick it'

Thus, at some level of representation, the onset consonants above seem to bear tone – be it by conditioning it or by having it floating in the input – which subsequently surfaces on the neighboring vowel to the right. What is more interesting is that the tone induced depends on the quality of the consonant involved: voiceless obstruents (and sonorants, which I will come back to in a moment) cause M tone, voiced obstruents cause L tone. This fact correlates precisely with data we find in tonogenesis (cf. Vietnamese (Haudricourt 1954) or synchronically in Kammu dialects (Svantesson 1983)), where the historical contrast between voiceless and voiced obstruents is neutralized in favor of voiceless obstruents and is reinterpreted by means of tone, as shown below.

(19) *Common pattern in tonogenesis*

voicing contrast; no tone		*no voicing contrast; presence of tone*
pa	>	pá
ba	>	pà

This pattern is phonetically grounded: in voiceless obstruents, the cricothyroid muscle stretches the vocal folds to obstruct vocal fold vibration resulting in vocal fold tensing, which in turn leads to a higher F0. In voiced obstruents the larynx and hyoid bone are lower and a lowered larynx results in a lower F0 (Yip 2002: 6–7; Honda 2004). In fact, depression of F0 after voiced stops is very likely universal, as Kingston and Solnit (1988b) state (CHAPTER 114: BANTU TONE). Sonorants, on the other hand, do not automatically perturb the F0 of adjacent vowels, and thus may cause either elevation or depression of the F0 (Kingston & Solnit 1988a: 276). This finding is also in line with the behavior of sonorants in onset-sensitive stress discussed above. Recall that in Karo sonorants act like voiceless obstruents in attracting stress, but in Pirahã like voiced obstruents in avoiding it.

Reviewing the vast literature on the phonological effects of the onset/tone interaction phenomenon is well beyond the goals of the present chapter (see Yip 2002; Gordon 2006; van Oostendorp 2006; Tang 2008 for relevant overviews). For our purposes and in light of the data above, it suffices to say that Musey exhibits mixed behavior. On the one hand, it has not entirely lost the voicing contrast between stops (see the discussion on Type A and B consonants) – since it retains phonetic voicing by means of short *vs.* long VOT – but is moving in that direction, as the facts above reveal; on the other hand, it has introduced tone, which is commonly associated to specific onset quality, but has not (yet?) extended this pattern throughout the system. One thing seems quite clear: onsets in Musey may act as phonological tone bearers. And as expected, voiceless obstruents produce tone raising and voiced ones tone lowering. The more neutral sonorants here pattern with the voiceless obstruents.

Along similar lines, we can understand the data in Kpelle. However, unlike Musey, Kpelle onsets act as surface tone-bearing units (TBUs). First, consider minimal pairs such as (20), where a sonorant onset can appear toneless, L-toned, or H-toned. This is hardly surprising, given the capacity of sonorants to bear any type of tone.

(20) mare-kɛ̂i 'a question'
m̀are kɛ́ 'ask him'
m̀are kɛ́ 'ask me'

Moreover, the possessive form involves an underlyingly H-toned nasal prefix for the 1st singular or a floating L tone for the 3rd singular (plus the independent processes of voicing assimilation in obstruent-initial stems and total assimilation and nasal simplification in sonorant-initial stems),[12] both of which surface on onset positions.

(21) *Kpelle onsets as TBUs* (Hyman 1985: 44)

	stem	'my'	'his/her'	
a.	*initial obstruent*			
	pólù	m̀bólù	b̀ólù	'back'
	túɛ	ńdúɛ́	d̀úɛ́	'front'
	kɔ́ɔ́	ŋ̀gɔ́ɔ́	g̀ɔ́ɔ́	'foot, leg'
	fíí	m̀víí	v̀íí	'hard breathing'
b.	*initial sonorant*			
	lēē	ńēē	ǹēē	'mother'
	jéé	ɲ́éé	ɲ̀éé	'hand, arm'
	mā̰lóŋ	m̀ā̰lóŋ	m̀ā̰lóŋ	'misery'
	ɲ̰íŋ	ɲ́ḭ̄ŋ	ɲ̀ḭ̄ŋ	'tooth'

These examples show that sonorants and voiced obstruents may appear as surface TBUs, but the same does not hold for voiceless obstruents. This is entirely expected, given that the physical correlate of tone is F0, thus only voiced segments should be able to present it, i.e. vowels, sonorants, and voiced obstruents (Gordon 2006). The Musey data nonetheless have suggested that voiceless onsets should be allowed to be input phonological TBUs (a similar claim for Kpelle appears in Topintzi 2010); if this view is along the right lines, future investigation should focus on how the phonology–phonetics mapping of onset–tone association is accomplished.

5 Onset–coda weight asymmetry

Finishing this chapter, it should by now be obvious that while there is evidence that onsets participate in at least some of the phenomena that codas do, the frequency with which they do so is indisputably much lower and in some cases exceedingly rare. This issue has been mentioned but barely dealt with in the literature; nevertheless, it deserves some brief discussion. Of course, for those who deny any role for onsets in prosody (cf. the standard moraic theory of Hayes 1989), there is not much to explain in the first place. The asymmetry in behavior is the outcome of the more restricted – moraically speaking – structural representation of onsets, compared to that of codas. However, as we have just seen, this approach is too restrictive when it encounters many of the empirical data presented previously.

[12] A reviewer points out that the input for the 3rd singular could instead include a low-toned nasal that on the surface fuses with the onset consonant, similarly to what happens in sonorant-initial stems. This is certainly a possibility, but not one Hyman seems to assume. In any case, this issue is orthogonal to the point made here.

To my knowledge, the first explicit attempt to account for the rarity of onset weight and hence of the onset–coda prosodic asymmetry was offered by Goedemans (1998). Through a set of perception experiments using synthetic stimuli, Goedemans found that Dutch listeners are more attuned to perceive fluctuations in vowel or coda duration rather than onset duration. He next devised an additional experiment to check for the possibility that there is inherently a human bias against perceiving onset duration, but found no evidence in support of this. He therefore concluded that the effect described above must genuinely be due to the weightlessness of onsets. One problem posed by this account is that Goedemans found that listeners recognize duration shifts in onset sonorants better than obstruents. This implies that the former should be preferred as weight bearers to the latter, *contra* the empirical data, which suggest that in onsets the real difference is between voiced and voiceless obstruents (and that sonorants may pattern with either; cf. Karo *vs.* Pirahã). More troublesome for this proposal is how to accommodate later work by the same author (cf. Hajek & Goedemans 2003), where onset weight is emphatically argued for, albeit for geminates only (Rob Goedemans, personal communication).

Other, more functional accounts of the onset–coda weight asymmetry include Smith (2005) and Gordon (2005), both of which accept onset-sensitivity, but only with regard to stress. To explain why onsets may have a stress-attracting effect, they offer variants of the same idea relating phonological considerations to more general cognitive abilities, such as the sensitivity to auditory stimuli (Viemeister 1980; Delgutte 1982). More specifically, they allude to the evidence of "neural response patterns that the presence of an onset, and specifically a low-sonority onset, does in fact enhance the perceptual response to a syllable" (Smith 2005: 50). Empirically, though, as we know, sonorant onsets may also contribute to weight (or prominence), a fact that the current framework fails to capture. Despite this problem, Gordon (2005) claims that in most cases, i.e. most languages, the onset effect is subordinated to the perceptual energy of the rime itself, which is why rimal weight is prioritized over onset weight.

Finally, Topintzi (2006, 2010) does not confront this issue in much detail, but nonetheless claims that instead of a single property, it is a constellation of phonological factors, perhaps complemented by the functional accounts above, which may prove enlightening (for details, see Topintzi 2010: §3.3.3, §5.4.1, §6.2.3). For example, the rarity of onset-sensitive tone is attributed to the fact that tone and onset-weight requirements are incompatible with one another. Tone requires the presence of F0, whereas moras that can bear tone in the onset are best assigned to voiceless onsets, which by nature lack F0.

In spite of the virtues of each approach, none simultaneously manages to combine accurate empirical coverage with a convincing account that acknowledges the onset–coda asymmetry in its correct perspective and offers a plausible explanation. Future research may fill in the missing pieces of the puzzle.

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