

French schwa in Harmonic Grammar

French schwa refers to a back rounded vowel [œ] or [ø] that alternates with zero and [ɛ]. Dell (1973/1985) presents a strikingly thorough description and analysis in the framework of Chomsky and Halle (1968). Helpfully, Dell (1973/1985) also points to generalizations that escape his analysis. Despite the considerable attention that it has received in the generative literature (see Eychenne 2006 and Kaplan 2011 for overviews), there are still aspects of the patterning of French schwa that remain unaccounted for. In this paper, we show how the framework of Harmonic Grammar (HG; Smolensky and Legendre 2006, Pater 2009) permits further progress.

Schwa optionally deletes in open syllables, subject to a number of conditioning factors, which can make deletion more or less frequent, to the point of categorical application or blocking. In general, a preceding consonant cluster will block deletion: *Jacques le vend* versus *Marie l(e) vend*. Following Dell we underline an obligatory schwa and parenthesize an optional one. *Jacques* ends in [k], and the [kl] cluster blocks deletion. Not all preceding clusters block categorically though: Dell (1985: 231) mentions Morin's (1974) observation that deletion is possible following [χs], as in *la terre s(e) vend bien*. He also mentions that it is blocked in the same segmental context when the schwa is in penultimate position of the phrase: *la terre se vend*. Phrase penultimate position is a schwa-favoring prosodic context across segmental contexts. Dell also mentions that this position renders a pronounced schwa obligatory before *h-aspiré* (*une hausse*, cf. *un(e) hollandaise*, p. 262), and makes it more frequent following word-final clusters (*mets ta vest(e) rouge*, p. 224). Dell posits optional deletion and epenthesis rules that abstract from the conditioning of the penultimate context, and to our knowledge, there is no previous account that captures the independent effects of the constraint against clusters and the constraint favoring penultimate schwa.

HG's weighted constraints permit an analysis in terms of gang effects between a constraint favoring schwa in penultimate position and the relevant segmental contextual constraints. For example, if the [χs] cluster in *terre se vend* is syllabified as a coda when deletion applies (Morin 1974; cf. Côté 2000), deletion also violates a constraint against coda clusters. In (1), we show the result of a gang effect between these two constraints (Schwa-Penult and *CC\$) which conflict with a constraint favoring deletion, which we label *Schwa. Violations are shown as negative integers and constraint weights are given under constraint names. The column *H* (for Harmony) provides the weighted sum of violations, and the constraint with highest Harmony (lowest penalty) is indicated with an arrow. In (1a), both Schwa-Penult and *CC\$ are violated by deletion, and sum of their weights is greater than the weight of *Schwa, so the candidate with schwa is more harmonic. In (1b), only *CC\$ is violated by deletion, and so the candidate with deletion is more harmonic.

(1) *Illustrative gang effect*

a. la terre se vend	*Schwa $w = 3$	*CC\$ $w = 2$	Schwa-Penult $w = 2$	H
la.tɛʁs.vɔ̃		-1	-1	-4
→ la.tɛʁ.sœ.vɔ̃	-1			-3
b. la terre se vend bien	*Schwa $w = 3$	*CC\$ $w = 2$	Schwa-Penult $w = 2$	H
→ la.tɛʁs.vɔ̃.bjɛ̃		-1		-2
la.tɛʁ.sœ.vɔ̃.bjɛ̃	-1			-3

Frameworks with inviolable constraints or rules, or OT's ranked constraints, could capture this asymmetry by combining *CC\$ and Schwa-Penult into a single constraint or rule, which would be active in (1a), but not in (1b). Another approach is to propose different prosodic phrasings, as in Côté (2007). The problem with these approaches is that both *CC\$ and Schwa-Penult are active elsewhere in French, and they would need to be written into further constraints or rules, with resultant lack of generalization.

HG also has the advantage of possessing probabilistic variants with well understood learning algorithms, such as Maximum Entropy Grammar (MaxEnt: Goldwater and Johnson 2003). A probabilistic framework allows us to capture cases where two optional processes differ in frequency of application, which both Dell (1973/1985) and Morin (1974) mention, and explicitly abstract from, since SPE did not provide a means of formalizing them. For example, schwa deletion is optional for *la terre s(e) vend bien* in (1b), but less frequent when deletion would not result in a *CC\$ violation, as in *le vin s(e) vend bien*. To illustrate the ability of a MaxEnt grammar to capture a significant range of these asymmetries in application with a relatively small constraint set, we show the probabilities generated over a sample set of contexts (3), with the weights in (2).

(2) *CC\$ 2.41 Dep 1.39 *Schwa 0.70 Penult-Schwa 0.41

(3) Likelihood of schwa realization by context:

la terre s(e) vend	la terre s(e) vend bien	la vest(e) rouge	la vest(e) marron	le vin s(e) vend	le vin s(e) vend bien
0.89	0.85	0.67	0.58	0.57	0.33

Dep assigns a penalty to epenthesis, and is included to distinguish between cases in which schwa is underlying, as in *se*, versus when it is inserted, as in *veste*. A constraint penalizing deletion was not needed in the analysis. The MaxEnt grammar captures the generalizations that schwa is more likely after a consonant cluster, both in deletion and epenthesis, and that schwa is more likely in the phrase penultimate position.