

Syllabification, variation and perception

Marie-Hélène Côté
Université d'Ottawa

CUNY Conference on the Syllable, 17-19 January 2008

Introduction

- Starting point: Gap between
 - phonological theory, which usually posits invariant and rigid syllabification rules (within a language)
 - body of data on syllabification (speaker judgments or psycholinguistic results), which suggest a much more fluid and variable syllabification.

 - Syllabification of intervocalic consonants, which is where most of the variation is observed.
-

Introduction

- [st] (in French)
 - Theory: [s.t] (e.g. Pulgram 1970, Noske 1982, Levin 1988)
Ex. *moustachu* [mus.ta.ʃy]
 - Data: variation between [s.t] and [.st] (e.g. Laeufer 1991)
Ex. *moustachu* [mus.ta.ʃy] ~ [mu.sta.ʃy]
 - VCV
 - Theory: V.CV
 - Data: large proportion of ambisyllabic consonants (Content *et al.* 2001 for French)
 - Germanic languages
 - Theory: stressed vowels attract all following consonants in their coda.
E.g. *atlas* [átl.as] (Hoard 1971 fr English, Macken 1992 for Icelandic, références in Bannert 1998 for Swedish)
 - Experimental results show a strong preference for CVC.CV syllabification over CVCC.V (Redford & Randall 2005 for English, Berg 2001 for Icelandic)
-

Introduction

Many possible interpretations of this gap:

- ❑ Data do not reflect syllabification but other processes, e.g. word division.
- ❑ Variable data reflect competition between different levels of syllabification (surface/phonetic vs deep/phonological).
- ❑ The syllable is crucially an abstract constituent. The data reflect "phonetic syllabification" that may or may not be relevant in phonology.
- ❑ Abstract syllables use various concepts of "extrasyllabicity":
 - extrametricality
 - indirect licensing
 - appendices
 - deficient syllables (with an unpronounced or empty constituent)

Introduction

- How far do we have to go in the direction of abstract syllables?
 - Two questions:
 - What are the sources of concrete syllabification?
 - The role of perception
 - Is concrete syllabification phonologically active and in what domain? Initial assumption: since the syllabic affiliation of consonants is variable, categorical processes cannot depend on it (along the line of Steriade 1999). What about variable processes?
 - High vowel laxing in Québec French
-

I. Sources of syllabification (1)

□ Correspondance between word and syllable margins

Tendency to tolerate in onsets only segments and sequences that are possible word-initially, and in coda only segments and sequences that are possible word-finally.

(Steriade 1999a ; Berg & Niemi 2000 ; Martens et al. 2002).

I. Sources of syllabification (2)

□ High vowels in Québec French

- Lax vowels in final closed syllables

Tense vowels in open syllables (final or medial)

maudite [mod^zit] vs *maudit* [mod^zi]

duc [d^zYk] vs *duchesse* [d^zyʃɛs]

- Variation in non-final "closed" syllables, where syllabification is determined by the nature of the vowel.

Sylvain [si.lvẽ] [sɪl.vẽ]

toundra [tu.ndrɔ] [tʊn.drɔ]

- Contrast with *quelconque* [kɛl.kõk] ??[kɛ.lkõk]
-

I. Sources of syllabification (3)

- The correspondance between word and syllable margins may be part of something more general. Kharlamov & Côté (5:30 yesterday) show that the likelihood of CVC_1C_2VC being syllabified $CV.C_1C_2VC$ is correlated not only with the possibility and/or frequency of C_1C_2 word-initially but also to its frequency / possibility word-finally and medially.
-

I. Sources of syllabification (4)

□ Correspondance between syllabic and morphological boundaries

The syllabic affiliation of segments tends to respect the integrity of words and morphemes.

■ French:

hanterai Morphemic structure: [ãt-re] ‘haunt-fut’

Syllabification: [ãt.re] ~ [ã.tre]

entrer Morphemic structure: [ãtr-e] ‘enter-inf’

Syllabification: [ã.tre] *[ãt.re] *[ãtr.e]

I. Sources of syllabification (5)

□ Rhythmic constraint

The affiliation of consonants tends to equalize the duration of syllables or rhymes.

(Maddieson 1985)

Phonologically short vowels attract following consonants in their coda more than phonologically long vowels.

V:CCV vs. VC.CV

I. Sources of syllabification (6)

- These factors leave unexplained some central generalizations in syllabification:
 - Onset maximization and the "universality" of CV syllabification.
 - Tendencies related to the sonority of segments.
 - These elements are generally considered primitives of the theory.
 - Universal CV rule or constraint Onset.
-

I. Sources of syllabification (7)

□ Constraint of perceptual dependency

The syllabic affiliation of consonants depends on the degree of perceptual dependency between the consonant and each of its adjacent segments.

- Consonants tend to syllabify with the segment that provides them with relatively better perceptual cues.

□ This principle may subsume several tendencies observed in syllabification:

- Onset maximization / CV
 - Syllable contact (?)
 - Sonority
 - Special status of fricatives
-

I. Sources of syllabification (8)

□ Onset maximization / CV

- *Generalization*: Consonants associate more with the following segment than with the preceding one.
 - Asymmetry in the response of the auditory system: the onset of an acoustic signal (e.g. frication noise, formant structure) is perceptually more salient than its offset (Bladon 1986 ; Delgutte 1997 ; Wright 2004).
 - Following vowels tend to contribute more to the perceptibility of a consonant than preceding vowels (or sonorants) (Fujimura et al. 1978 ; Ohala 1990, 1992 ; Wright 2001). → V.CV
-

I. Sources of syllabification (9)

- The perceptual prominence of CV transitions, as opposed to VC ones, appears to be enhanced by reduced variability: CV transitions are less variable and more controlled than VC ones in English (a CV language).
- In Arrernte, language analyzed as VC (Breen & Pensalfini 1999), the CV and VC transitions are equally stable, so the perceptual advantage of CV is less pronounced than in English.

(Tabain et al. 2004)

I. Sources of syllabification (10)

□ Sonority and the special status of fricatives

- The tendency for forward syllabification depends on the nature of the C
 - $VC_1V \rightarrow V.C_1V \quad VC_1.C_1V$ (ambisyllabicity)
 - $VC_1C_2V \rightarrow V.C_1C_2V \quad VC_1.C_2V$
 - *Generalization*: C_1 appears in coda position according to the following hierarchy: sonorants > stops > fricatives
(e.g. Fallows 1981 ; Clements 1990 ; Barry et al. 1999 ; Zamuner & Ohala 1999 ; Content et al. 2001 ; Ishhikawa 2002 ; Moreton et al. 2005).
 - The perceptual boost at the CV transition is less pronounced with sonorants than with obstruents (Wright 2004), because sonorants are more similar to vowels. So sonorants are less strongly dependent on the following vowel and more free to associate with the preceding one.
-

I. Sources of syllabification (11)

- The coarticulation of sonorants with a preceding vowel is more salient than the coarticulation of obstruents with a preceding vowel. This could favor a stronger perceptual dependency, and a stronger syllabic dependency, between a vowel and a following sonorant than between a vowel and a following obstruent.
 - Stops have weak internal cues which make them more dependent upon contextual cues, including transitions from the preceding vowel. Fricatives have strong internal cues, they depend less on contextual cues, so they tend to avoid ambisyllabicity in VCV and their syllabic affiliation is more variable in VCCV.
-

I. Sources of syllabification (12)

□ Force of attraction of more salient segments.

- *Generalization*: consonants are attracted to more salient segments (longer and/or with greater amplitude), which provide better perceptual cues.

- Vowels > Consonants.

- Stressed vowels > Unstressed vowels

Stressed vowels attract following consonants in their coda more than unstressed vowels; e.g. Treiman & Danis 1988 ; Ishikawa 2002 ; Redford & Randall 2005.

- Long vowels > Short vowels

Phonologically long vowels appear to avoid codas, in respect of the rhythmic constraint. With phonologically short vowels, the link between duration and propensity to attract coda consonants is reversed: phonetically longer vowels appear more often with coda consonants than phonetically shorter vowel; Redford & Randall 2005.

I. Sources of syllabification (13)

□ Other possible segmental effects

- Contrast between intervocalic [pt] and [kt] in French (Delattre 1940) :
 - [k]: coda (rec.teur)
 - [p]: coda (rep.tile) or complex onset (re.ptile)
 - The release of [k] may be masked by the occlusion of the following [t], but not the release of [p], which is more anterior. Without a reliably audible release, [k] depends more on the preceding vowel for its perceptibility, hence its coda syllabification.
-

II. Phonological activity (1)

□ High vowel laxing in Québec French:

■ *Sylvain* [si.lvẽ] [sil.vẽ]

toundra [tu.ndrɔ] [tun.drɔ]

■ The two forms are not equally good or equally possible in all words.

■ Data. 2 native speakers of QF were tested on a list of disyllabic words of the form $CV_1C_1C_2V_2(C)$, where V_1 is a high vowel and C_1C_2 is a cluster that does not form a "natural" onset (e.g. [tr, pl, fl, etc.]). Words in which V_2 is also high were excluded, to avoid interference with high vowel laxing harmony (Poliquin 2006).

■ Ex. *turban, ouzbek, Gilbert, Victor, pichenotte*

II. Phonological activity (2)

□ Results:

- Laxing is indeed highly variable, with a large proportion of words compatible with both a tense and a lax vowel.
- The likelihood that V_1 be lax correlates with the nature of C_1 .

nasals, [r]	ex. <i>toundra, tournoi</i>	+ lax
[l]	ex. <i>Sylvain, bulletin</i>	↓
stops	ex. <i>Victor, soupçon</i>	
fricatives	ex. <i>piston, bûcheron</i>	+ tense

- This hierarchy corresponds exactly to the hierarchy observed in syllabification: The more C_1 likes to be in the coda, the more speakers accept the variant with the lax vowel.
-

II. Phonological activity (3)

- Analysis
 - No tense high vowels in closed syllables
 - Preference for tense high vowels
 - Coda hierarchy: N, [r] > [l] > S > F
 - In Standard French, high vowels are always tense and medial consonant sequences of falling sonority are syllabified as coda-onset sequences, not complex onsets (Laeufer 1991; Goslin & Floccia 2007). The syllabification of medial fricative-initial clusters is more variable, with fricatives appearing in coda or as part of a complex onset.
-

Conclusion

- ❑ Gap between phonological theory and syllabification data.
 - ❑ Constraint of perceptual dependency in syllabification of intervocalic consonants, which interact with other factors (lexical, morphological, rhythmic).
 - ❑ Potential case of phonological activity of surface syllabification tendencies.
 - ❑ How do we go from there to more abstract syllables, if we do want them?
-

References

- ❑ Bannert, R. 1998. Two thousand and one syllables in spoken Standard Swedish : aspects of syllabification. *Phonum* 6 (Department of phonetics, Umea University).
 - ❑ Barry, W., C. Klein & S. Köser (1999) Speech production evidence for ambisyllabicity in German, *Phonus* 4 : 87-102 (Institute of Phonetics, University of the Saarland).
 - ❑ Berg, T. (2001) An experimental study of syllabification in Icelandic, *Nordic journal of linguistics* 24 : 71-106.
 - ❑ Berg, T. & J. Niemi (2000) Syllabification in Finnish and German: onset filling vs. onset maximization, *Journal of phonetics* 28 : 187-216.
 - ❑ Bladon, A. 1986. Phonetics for hearers, in G. McGregor (eds.) *Language for hearers*, Oxford : Pergamon Press, 1-24.
 - ❑ Breen, G. & R. Pensalfini (1999) Arrernte: a language with no syllable onsets, *LI* 30 : 1-25.
 - ❑ Clements, G.N. (1990) The role of the sonority cycle in core syllabification, in J. Kingston and M.E. Beckman (éd.) *Between the grammar and physics of speech*, Cambridge : Cambridge University Press, 283-333.
 - ❑ Content, A., R.K. Kearns & U.H. Frauenfelder (2001) Boundaries versus onsets in syllabic segmentation, *Journal of memory and language* 45 : 177-199.
 - ❑ Delattre, P. (1940) Tendances de coupe syllabique en français, *Publications of the Modern Language Association of America* 55 : 579-595.
 - ❑ Delgutte, B. (1997) Auditory neural processing of speech, in W.J. Hardcastle & J. Laver (eds.) *The handbook of phonetic sciences*, Oxford : Blackwell, 507-538.
-

References

- ❑ Fallows, D. (1981) Experimental evidence for English syllabification and syllable structure, *Journal of linguistics* 17 : 309-317.
 - ❑ Fujimura, O., M.J. Macchi & L.A. Streeter. 1978. Perception of stop consonants with conflicting transitional cues: a cross-linguistic study. *Language and speech* 21 : 337-346.
 - ❑ Goslin, J. & C. Floccia. 2007. Comparing French syllabification in preliterate children and adults. *Applied psycholinguistics* 28: 341-367.
 - ❑ Hoard, J.E. 1971. Aspiration, tenseness, and syllabification in English. *Language* 47 : 133-140.
 - ❑ Ishikawa, K. (2002) Syllabification of intervocalic consonants by English and Japanese speakers, *Language and speech* 45 : 355-385.
 - ❑ Levin, J. 1988. Constraints on rime-internal syllabification in French: eliminating truncation rules. In D. Birdsong & J.-P. Montreuil, eds. *Advances in Romance linguistics*. Foris, 253-73.
 - ❑ Macken, M.A. 1992. Trimoraic syllable structure. *CLS* 26 : vol. 2 (Parasession on the syllable in phonetics and phonology), 273-285.
 - ❑ Maddieson, I. (1985) Phonetic cues to syllabification, in V.A. Fromkin (eds.) *Phonetic linguistics*, Orlando : Academic Press, 203-221.
 - ❑ Martens, E., W. Daelemans, S. Gillis & H. Taelman (2002) Where do syllables come from ? In W. Gray & C. Schunn (eds.) *Proceedings of the Twenty-Fourth Annual Conference of the Cognitive Science Society*, Fairfax, VA : George Mason University, 657-664.
-

References

- ❑ McCrary, K.M. (2004) *Reassessing the role of the syllable in Italian phonology : an experimental study of consonant cluster syllabification, definite article allomorphy and segment duration*, PhD thesis, UCLA.
 - ❑ Moreton, E., G.L. Feng & J.L. Smith. 2005. Syllabification, sonority, and perception : new data from a language game. *Talks CLS 41*, Chicago, avril.
 - ❑ Noske, R. 1982. Syllabification and syllable changing rules in French. In H. van der Hulst & N. Smith, eds. *The structure of phonological representations*. Foris, vol. 2: 257-310.
 - ❑ Ohala, J.J. 1990. The phonetics and phonology of aspects of assimilation, in J. Kingston & M.E. Beckman, eds. *Between the grammar and physics of speech*. Cambridge : Cambridge University Press, 258-275.
 - ❑ Poliquin, G. 2006. *Canadian French vowel harmony*. PhD dissertation, Harvard University.
 - ❑ Pulgram, E. 1970. *Syllable, word, nexus, cursus*. La Haye : Mouton.
 - ❑ Redford, M.A. & P. Randall (2005) The role of juncture cues and phonological knowledge in English syllabification judgments, *Journal of phonetics* 33 : 27-46.
 - ❑ Steriade, D. (1999) Alternatives to syllable-based accounts of consonantal phonotactics, in O. Fujimura, B.D. Joseph & B. Palek (eds.) *Proceedings of LP '98: Item order in language and speech*, Prague: Charles University in Prague - The Karolinum Press, vol. 1: 205-245.
-

References

- Tabain, M., G. Breen & A. Butcher (2004) VC vs. CV syllables : a comparison of Aboriginal languages with English, *Journal of the International Phonetic Association* 34 : 175-200.
 - Treiman, R. & C. Danis (1988) Syllabification of intervocalic consonants, *Journal of memory and language* 27 : 87-104.
 - Walker, D.C. 1984. *The pronunciation of Canadian French*. University of Ottawa Press.
 - Wright, R.A. 2001. Perceptual cues in contrast maintenance, in E. Hume & K. Johnson (éd.) *The role of speech perception in phonology*. San Diego : Academic Press, 251-277.
 - Wright, R.A. (2004) A review of perceptual cues and cue robustness, in B. Hayes, R. Kirchner & D. Steriade (éd.) *Phonetically based phonology*, Cambridge : Cambridge University Press, 34-57.
 - Zamuner, T.S. & D.K. Ohala (1999) Preliterate children's syllabification of intervocalic consonants, in A. Greenhill et al. (éd.) *BUCLD 23 Proceedings*, Somerville, MA : Cascadilla Press, 753-763.
-