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Review of The Production of Consonant Clusters

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Book Review
Review of the Production of Consonant Clusters: Implications for Phonology and Sound Change, Daniel Recasens (2018)

Not long ago, functional approaches to phonology were overshadowed by generative approaches, such as Optimality Theory (OT), which aims to identify a set of universal phonological principles innate to the human mind. In this view, the actual production of speech is considered epiphenomenal, a surface realisation resulting from underlying phonological principles and mental representations (Prince and Smolensky, 1993). Although OT has been highly successful in formulating descriptive models of sound patterns, it can be argued that these are not explanatory, but rather are formalised descriptions of possible sound patterns that fail to explain why some patterns are more common than others (Blevins, 2006: 131, 154–155). Later work in OT saw significant changes in the direction of functional explanation. These later, more functional OT approaches (e.g. Steriade, 1997) paid attention to phonetic and perceptual detail and the way sounds were produced in the human vocal tract, which had previously been considered epiphenomenal in OT and other generative approaches. The empirical advantage of this is that hypotheses can be supported with factors known independently from analysis, such as the physiology of the human vocal tract (Diver, 1979/2012).

Analytical success has led to more research on the functional motivation of sound patterns (Flemming, 2007). *The Production of Consonant Clusters: Implications for Phonology and Sound Change,* by Recasens (2018) is a wonderful example of this; by paying attention to articulatory detail, Recasens reveals the adaptation processes involved in the realisation of consonant clusters. The book considers the articulatory and aerodynamic properties of consonants to explain manner assimilations and weakening of syllable-final consonants, which have previously received little attention in the literature. In six chapters and 210 pages, the author presents the culmination of more than twenty years of his own research on different Catalan dialects (e.g. Recasens et al., 1997; Recasens and Espinosa, 2009; Recasens and Mira, 2015), evaluates new data, and compares his results to work by other authors on (mostly Romance) languages, including Spanish and several Italian dialects, as well as English and Tamil.

Much of the book is dedicated to testing Recasens' Degree of Articulatory Constraint (DAC) model of coarticulation, which proposes that consonants differ in the extent to which they are constrained by the requirements on place and manner of articulation involved in their production. In line with his earlier work (Recasens and Rodríguez, 2016), the author argues that, for example, certain coronals, namely [ʎ] [ɲ] [ʃ] [s] and [r], require a more precise tongue configuration in their production than other coronals, [l] [n] [ɾ] [t] and []. It is argued that there is not much variation in the production of alveolar trill [r] in Catalan, as it requires a lowered and backed tongue configuration and enough lingual tension to generate vibration: thus [r] is highly constrained.[1] Likewise, palatals [ʎ] [ɲ] and [ʃ] are more restricted than dento-alveolars, as their production involves not only the front of the tongue but constrains the whole tongue body instead. In contrast, [l] [n] [ɾ] [t] and [] show much more variation in the place and manner in which they are produced, which suggests that they require less articulatory precision and leave the tongue body freer to adjust to the phonetic context. Recasens thus considers these consonants less constrained.

In the production of consonant clusters, then, Recasens observes that, when consonants conflict in the place or manner of articulation, the articulation of the less constrained consonant is adjusted, because it is freer in its place or manner requirements and thus freer to adapt. We are offered an example from Catalan: *bany rus* 'Russian bath', where the sequence /ɲr/ is antagonistic. The raised and fronted lingual configuration of alveolopalatal nasal /ɲ/ conflicts with

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[1] Note that OT also uses this term, but Recasens uses the term "constrained" to refer to physiological restrictedness.

the need to anticipate the tongue body lowering and backing for alveolar trill /r/. Speakers seem to solve the problem by depalatalising /ɲ/, and importantly, they do not palatalise /r/ because it is highly constrained by the requirements involved in its production. In other sequences, the tongue body configurations of the first and second consonants in a cluster (henceforth C1 and C2) may be more compatible; in the sequence /nʃ/ the tongue body raising and fronting for /ʃ/ is freely anticipated because the alveolar nasal /n/ does not need a very precise lingual configuration; it is unconstrained. With this approach, the book aims to demonstrate why certain adaptations take place more than others, and how a production-based explanation is more plausible than one in terms of abstract phonological principles (as in generative approaches).

After the introductory chapter, Chapter 2 presents a general outline of the theory, including an explanation of the hypothesis supported in this book – the DAC model of coarticulation – and the adaptation mechanisms involved in the production of consonant clusters. Three of these are discussed, respectively: coarticulation, assimilation and blending, of which the latter is different from the former two because it does not involve the adaptation of one of the two consonants, but rather a "compromise realisation" between the two, typically when both are produced with the same articulator. At the end of the chapter, the direction of segmental adaptation is discussed. In principle, the direction of adaptation (C1 influences C2 or vice versa) depends on the consonants involved, but a favouring has been found for anticipatory effects (C1 is adapted to anticipate C2) compared to carryover effects (C2 is influenced by C1), a topic I will return to at the end of this review.

Chapter 3 focuses on homorganic clusters (when C1 and C2 are both produced by the same articulator) across the morpheme boundary, and tests predictions that are made based on the DAC model. To this end, Recasens uses ultrasound and acoustic analysis, and electropalatographic data (EPG, used to track contact between the tongue and the palate during speech) of participants speaking three different Catalan dialects. This, together with a review of experimental data from other languages (e.g. Spanish, English, Tamil, Malayalam, Italian) by other authors, provides support for the DAC model of coarticulation. Moreover, sequences of unconstrained + unconstrained or constrained + constrained consonants are discussed. It seems that in the former sequence category, the articulation of both consonants is often adapted (blending). For constrained + constrained clusters, the example of /sʃ/ and /ʃs/ is discussed; the DAC model predicts an adaptation of /s/, as /ʃ/ is more constrained than /s/, but this prediction is borne out only in the /sʃ/ sequence. For /ʃs/, we observe intermediate realisations (blending), an assimilation of /s/ or no adaptation at all. The author suggests that this might be due to the general favouring of anticipatory effects.

Chapter 4 is concerned with heterorganic consonant clusters (clusters produced with different articulators: lips, tongue front, and tongue dorsum). As these articulators can move separately, this cluster type may present gestural overlap. For instance, in the cluster /tk/, during the production of C1 /t/, the tongue dorsum is free to raise in anticipation of C2 /k/ before the /t/ stop release. Nevertheless, not all gestures can take place simultaneously, and not in all orders; our previous example /tk/ exhibits more overlap than the reverse order /kt/. After a C1 /k/ the tongue needs to reposition for C2 /t/. The author expects a positive relation between overlap and assimilation; sequences that exhibit more overlap (e.g. /tk/) should assimilate more often than sequences that exhibit less overlap (e.g. /kt/), and this prediction seems to be borne out by the data. Recasens points out that this could be due to perceptual factors; in the example of /tk/, as a result of great gestural overlap, the stop burst for /t/ is reduced and there is little motivation from a perceptual perspective to preserve the weak acoustic cue, with a /tk/ > /kk/ assimilation as a result. The strength of this argument is that it considers general assimilation processes in light of the observed patterns of gestural overlap.

Chapter 5 discusses the articulatory factors involved in consonant weakening and manner assimilation, which are discussed in five subsections, focussing on stops, lingual fricatives, nasals, laterals, and rhotics, respectively. Assimilation is shown to be facilitated when the consonants are produced by the same articulators (homorganicity), as changes in tongue configuration are argued to take place more easily if C1 and C2 have the same place of articulation. Weakening, on the other hand, is argued to be related to specific C2 phonetic characteristics. For instance, the shortening of the C1 seems to be especially triggered by voicing in the C2, as this voicing causes the intraoral pressure to lower for C1. It affects C1 dentals and alveolars most, as their articulation is already relatively short, with little contact with the passive receptor. Articulatory reduction may then lead to weakening through lenition, aspiration, rhoticism, vocalisation or deletion, after which the consonant is prone to assimilate completely to the other consonant in the cluster.

The DAC model of coarticulation clearly has a strong explanatory potential, and can therefore serve as a solid foundation for further work in the field of articulatory phonetics. Its appeal lies in its testable, functional hypothesis and clear predictions, which are rigorously tested with data from Catalan. The vast body of empirical evidence offered in the book convincingly accounts for common sound patterns that are also observed in languages other than Catalan. It may also shed light on sound change: the author successfully demonstrates parallels between the observed coarticulation effects (phonetic realisation) and patterns of consonant assimilation (phonetic realisations perceived as a phonemic change). Moreover, the observation that some consonants are freer to adapt to their phonetic context than others may also be useful to explain sound patterns outside of the scope of the book. Van Soeren, (2023) for instance, uses this insight to

explain the observation that near the ends of Spanish words, some coronals, namely /l/ /n/ /ɾ/ /t/ and /d/, occur more frequently than coronals /ʎ/ /ɲ/ /s/ and /r/.

In addition, the book raises interesting issues. The author claims that the general favouring of anticipatory effects (when C1 is adapted to anticipate C2) as compared to carryover effects (when C1 influences C2) "appears to be in support of the notion that the former [anticipatory effects] are planned while the latter [carryover effects] are conditioned to a large extent by the peripheral properties of the speech production system" (p.188). As the DAC model cannot directly account for this, Recasens suggests to further research articulatory planning and the physiomechanical nature of carryover effects. However, it may be that with a more perceptual focus, the DAC would be able to account for the favouring of anticipatory effects as well. Recasens himself discusses in Chapter 4 of his book that perceptual cues are sometimes reduced in coda position, which may explain why C1 assimilates to C2 more often than vice versa.

One minor point of critique might be that theoretically, there is a risk that the explanation of the data involves circular reasoning. The fact that some consonants, such as /r/ and /s/ are reluctant to coarticulate or assimilate is explained with the DAC model; they are more constrained than other consonants that do assimilate. But the reasoning behind this constraint seems to be based on the very same observations they serve to explain; they are said to be constrained because they do not adapt to adjacent consonants. One possible way to break this circle would be a more in-depth discussion as to *why* constrained consonants require a precise lingual configuration. For instance, /r/ might be constrained to an alveolar, lowered and backed tongue configuration because an altered configuration would not yield the same acoustic effect. In other words, the integration of perception and acoustics may lead to a more holistic, explanatory theory.

In conclusion, *The Production of Consonant Clusters* is a solid functional account of the coarticulation processes involved in the production of consonant clusters, in which the author employs several methodologies, such as EPG, acoustic and ultrasound analysis to investigate homorganic and heterorganic assimilation, coarticulation and blending. The DAC model offers a clear and testable hypothesis, which allows the author to explain common cross-linguistic coarticulation patterns in consonant clusters, and sound change resulting from assimilation. I would recommend it to anyone interested in articulatory phonetics, and it is essential reading to linguists studying consonant clusters.

References

Blevins, J., 2006. A Theoretical Synopsis of Evolutionary Phonology. Theoret. Linguist. 32 (2), 117–165.

Diver, W., 2012. Phonology as human behavior. In: Huffman, A., Davis, J. (Eds.), Language: Communication and Human Behavior. The Linguistic Essays of William Diver. Brill Publishers, Leiden/Boston, pp. 293–321, Original work published in 1979..

Flemming, E., 2007. Speech Perception and Phonological Contrast. In: Pisoni, Remez (Eds.), The Handbook of Speech Perception. Blackwell Publishing Ltd., Malden/Oxford/Carlton, pp. 156–181.

Prince, A., Smolensky, P., 1993. Optimality Theory. Constraint Interaction in Generative Grammar. Rutgers Center for Cognitive Science, New Brunswick, NJ.

Recasens, D., Pallarès, M.D., Fontdevila, J., 1997. A model of lingual coarticulation based on articulatory constraints. J. Acoust. Soc. Am. 102 (1), 544–561.

Recasens, D., Espinosa, A., 2009. An articulatory investigation of lingual coarticulatory resistance and aggressiveness for consonants and vowels in Catalan. J. Acoust. Soc. Am. 125 (4), 2288–2298.

Recasens, D., Mira, M., 2015. Place and manner assimilation in Catalan consonant clusters. J. Int. Phonet. Assoc. 45 (2), 115–147.

Recasens, D., Rodríguez, C., 2016. A study on coarticulatory resistance and aggressiveness for front lingual consonants and vowels using ultrasound. J. Phonet. 59, 58–75.

Recasens, D., 2018. The Production of Consonant Clusters: Implications for Phonology and Sound Change. De Gruyter Mouton, Berlin/Boston.

Steriade, D., 1997. Phonetics in Phonology: The Case of Laryngeal Neutralization. UCLA Work. Pap. Linguist..

Van Soeren, D.P., 2023. The Role of Word Recognition Factors and Lexical Stress in the Distribution of Consonants in Spanish, English and Dutch. J. Linguist.. https://doi.org/10.1017/S0022226722000081, In press
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