Mark van Oostendorp's 1995 Tilburg University dissertation investigates in great formal detail many aspects of the interaction between vowel quality and syllable structure in Dutch.

Chapters 1 and 2 establish the main issues. As in Levin's (1985) seminal work, O assumes an X' syllabic structure. But unlike many earlier investigations, O argues that the $\mathrm{X}^{0}$, or head of the syllable (the vowel), may determine higher level ( $\mathrm{X}^{\prime}$ ) structure, namely, coda acceptability. This directionality is opposite to received notions about syllable structure, namely, that certain aspects of vowel quality are determined by the presence versus absence of a coda consonant. The main thrust of this investigation then, is built on O's Headedness hypothesis: The structure of a syllable is determined by the feature structure of its head. Specifically, O investigates the presence versus absence of tenseness/length in Dutch vowels, and, along with earlier researchers (for example, O cites Moulton 1962, De Rijk 1967, van der Hulst 1984, 1994, and Kager 1989), establishes a correlation between the presence of tenseness/length and the acceptability of coda consonants. Given the initial statement of the Headedness hypothesis, this correlation should derive from a specific direction of causation: it is the tenseness of the vowel that drives coda acceptability, and not vice versa. But O quickly (and correctly) rescinds this strong Headedness constraint, which falls under his rubric of the (X-bar) Project family of constraints (prosodic structure is a projected from elements of melodic structure), and formulates the hypothesis instead as bi-directional in power, thus classifying the constraint as a Connect family constraint.

As I understand the bi-directional Headedness hypothesis, supporting might come from languages in which (a) a lexical contrast is present between tense and lax vowels (ignoring length for the moment), and (b) tense vowels necessarily lack codas, while lax vowels
necessarily possess codas, and (c) morphological alternations are such that, in the relevant context, lax vowels demand coda incorporation from a rightward consonant, and (d) tense vowels maintain their open syllable status in these same morphological contexts. This scenario is schematized in 1.
(1) (a) $/ \mathrm{CV} /$ contrasts with $/ \mathrm{CV} /$

| $\mid$ | $\mid$ |
| :---: | :---: |
| [tense] | $[$ lax $]$ |


(c)


Actually, I have yet to encounter a language that patterns in this particular way, which is not to say, of course, that such a language does not exist. Standard notions of the tense/lax-coda correlation are derived from the observation that upon the attachment of a consonant-initial suffix, tense vowels in root-final position often become lax, as in Spanish.
(2) [klase $] \quad[\mathrm{klases}] \quad$ 'class (pl.)'
[tonto] [tontos] 'stupid (agr.)'

Moreover, it seems to be the case that Dutch patterns, superficially at least, somewhat differently from what the Headedness hypothesis predicts. First, Dutch has a superficial distinction between closed syllables with tense versus lax vowels, as O shows early on:
(3) a. [kım] 'horizon' [kıp] 'chicken' [krımp] 'shrimp'
b. [kim] 'germ' [kip] 'goalie' *[krimp]

O accounts for these superficial counterexamples to his claims by stipulating that only lax syllable heads may branch at the X-bar level (which includes the nucleus and any post-nuclear
material), and, additionally, that superficial codas are actually onsets to (invisible) syllables, thus incorporating the notion of "degenerate syllable" from the theory of Government Phonology (Kaye, Lowenstamm, and Vernaud 1985, 1990), thus kım, but ki.m. O further claims that Dutch rimes are maximally bipositional, modulo coronal stops which are extraprosodic, thus accounting for the gap in (3) (*krim.p, where the tense vowel illicitly branches at the X-bar level). If we accept this approach to the Dutch data, then Dutch indeed abides by the first two criteria we have set out for the viability of the Headedness hypothesis, namely, (a) a lexical contrast is present between tense and lax vowels, and (b) tense vowels necessarily lack lexical codas, while lax vowels necessarily possess codas.

Problems arise, however, when considering the third and fourth criteria for the viability of the Headedness hypothesis for Dutch. So, for example, O's (35) (here, 4) shows some of the few alternations presented in the dissertation.

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(4) [dax.] ?[day.ən]
    [vla.x] [vla.yen]
    [bəv\varepsilonl.] ?[bəvel.ən]
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While not specifically discussed by O , this is a rather questionable syllabification. Moreover, without the benefit of extensive alternation, it remains difficult to evaluate the viability of the Headedness hypothesis for Dutch.

Chapter 3 focuses on two areas. First, O explores the standard Dutch vowel inventory in rather more depth. Two sample argument summaries follow.

The phenomenon of so-called $r$-lengthening involves the lengthening and "coloring" of tense vowels which precede tautomorphemic $r$ within the foot, for example, bet (bite) versus bir (bear), stof (stove) versus storr (store). To account for these patterns, O posits a constraint ("rcolor") of the form *CV.r, a sequence of a short vowel followed by heterosyllabic $r$ is disallowed. That is, whereas other consonants in this position are onsets to degenerate syllables, $r$ patterns differently in that it is actually tautosyllabic with the prevocalic vowel, and thus short/tense vowels are disallowed preceding such $r$ s. According to O, "[T]his analysis can only work if we recognize a lexical-postlexical distinction. It is essential that heer 'lord' is first syllabified as [he.r] in the lexicon and that this is later changed into [hirr]. Otherwise, we cannot explain why we prefer to add an extra root node instead of simply laxing the vowel and syllabifying [r] into the coda (so that we would get [hrr], a non-existing well-formed word of Dutch)."
O. further interleaves such derivational processes as cyclical syllabification with more declarative-oriented optimality-theoretic faithfulness constraints: previously built syllable structure may not be changed. Thus given a UR /or/, and a candidate set o.r, o.o.r, oo.r, or. and эง.r, the first two violate "r-color," the third possesses an unacceptable long tense vowel, and the fourth violates lexical syllabification. The winning candidate at the post-lexical level is thus ง..r, which abides by all of these constraints.

Given the various sorts of theoretical machinery that O. employs, it is not always easy for the reader to keep a working model of the approach on hand as arguments and analyses are provided. Indeed, merging some of the various axiom-based approaches to phonology employed at various points leads at times to some rather unappealing conclusions. For example, consider extrametricality/extraprosodicity vis a vis catalexis (Kiparsky 1991). O assumes that superficially monomoraic stems come equipped with bare root nodes that presumably acquire moras during the course of the derivation. This might explain why CV words satisfy bimoraic minimality, and why final syllables could be marked (super)heavy, thereby attracting stress. He proposes that such syllables come lexically equipped with placeless obstruents (h or ?), thus, for example, [ma] (mum) is lexically /maX/ (where $\mathrm{X}=\mathrm{a}$ bare root node). These placeless obstruents will be onsets to degenerate syllables in the context of preceding heavy syllables. Thus 'chocolá' is lexically chocola.h, in which the ghost h is an onset to a degenerate syllable, so that the final foot will be bisyllabic. However, O posits a constraint that h may only surface in onsets. The result is that the ghost h deletes in codas leaving an open vowel in final position that may nonetheless pattern as heavy.

In two domains then, O makes use of ghost segments: catalexis, and degenerate syllables. But also, both extraprosodic material (word-final coronals) and extrametrical material (supposedly non-syllabified non-coronals) are posited as well. The rather peculiar result is that some wordfinal material is lexically and phonetically present but not phonologically relevant, while other word-final material is lexically and phonologically relevant but phonetically absent. Such counterintuitive scenarios are unfortunately not uncommon in analyses couched in overly formal and axiomatic theories, and render O's approach somewhat suspect.

One problem with such theory-internal argumentation is that it may obscure the forest for the trees: to the extent that one pattern "patterns as" some other pattern, formal constructs may be manipulated so that the one pattern is treated as formally identical to the other. In O's discussion of length in the Tilburg dialect, for example, phonologically long vowels in open syllables shorten upon affixation of a consonant-initial suffix, thus slpı.p+a 'sleep', but slpp +t . O derives the second form thus.

$\mathrm{N}^{\prime} \mathrm{N}^{0}$

s 1 p pt

$\mathrm{N}^{\prime} \quad \mathrm{N}^{0}$

s 1 p pt

Stem-final p gets its own degenerate syllable on the first round of syllabification, while t remains extraprosodic. On the second pass, it is now t's turn to acquire a degenerate syllable node, as the stem vowel has shortened, and p has been incorporated as a coda. And so, for purely theoryinternal reasons, syllables with long vowels cannot possess codas, and p is syllabified into a ghost syllable, formally identical to a non-degenerate syllable; the $p$ thus "patterns as" a syllable. Meanwhile, as final coronals are extraprosodic, they are not supplied with prosodic structure, and thus they too are invisible, formally identical to $\varnothing$, and thus "patterns as if" they were nonexistent. It is quite often that case that when one sound "patterns as" another, there are historical reasons for the observed discrepancy. Indeed, O discusses one such case in relative detail.

Boutkan (1990) discusses the diachronic origins of one Tilburg e-I alternation, where e laxes to it instead of $\varepsilon$. Responding to this discussion, O writes, "Regardless of the value of this as a diachronic explanation, we cannot explain the synchronic facts of Tilburg Dutch in this way. How does the child...acquire the productive process of e-I alternation..." But this classic generativist question is only a conundrum if one accepts certain of the many axioms on which the generative theory has been formulated. These include the axiom that all languages possess a very small set of distinctive features that interact in a highly restricted fashion. Consequently, certain historic changes that result in processes that are difficult to formalize are considered problematic; the learner is ill-equipped to decipher such patterns given the endowments of Universal Grammar. As a consequence, generativists have appealed to more and more abstract formal devices to "get the theory to work" for processes which in fact lend themselves to a transparent historical explanation. Were the theory to admit that learners do learn historically explicable patterns apparently as effortlessly as they do synchronically explicable (i.e., phonetically and phonologically "natural") ones, such abstract constructs as ghost segments, ghost syllables, and a myriad of other theory-internal structures would mercifully fall by the wayside.

Chapters Four, Five, and Six, deal with schwa in Dutch, French, and Norwegian. In Dutch (dealt with in chapters Four and Five), O argues that schwa arises from three distinct sources, (1) alternation conditioned by stress, (2) epenthesis, and (3) the lexicon. Chapter Seven investigates vowel-glide alternations in similarly abstract terms, while Chapter Eight provides an inventory of the posited constraints within the so-called projection family. However, the inventory of constraints is not subject to the factorial typological analysis that the most compelling
optimality-theoretic analyses undergo. Indeed one of the most powerful axioms of OT is the universality of all posited constraints, as well as their unconstrained ranking with respect to one another. If any given analysis is not subject to a factorial typological analysis, and if nonoccurring rankings are not accounted for in a logical or at least axiomatic fashion, then the analysis must be regarded as incomplete. In this sense, O's approach must be regarded as a work in progress, which, indeed, is a perfectly acceptable status for a dissertation.

## References

Boutkan, D. (1990) "Klinkerwissiling in het Tilburgs," Taal en Tongval 42:46-60.
Hulst, H. van der (1984) Syllable structure and stress in Dutch. Foris: Dordrecht.
Kager, R. (1989) A metrical theory of stress and destressing in English and Dutch. Foris : Dordrecht.

Kaye, J., J. Lowenstamm, and J.-R. Vernaud (1985) "The internal structure of phonological elements: a theory of charm and government," Phonology Yearbook 2:303-326

Kaye, J., J. Lowenstamm, and J.-R. Vernaud (1990) "Constituent structure and government in phonology," Phonology 7:193-231.

Kiparsky, P. (1991) "Catalexis," Manuscript, Stanford University.
Levin, J. (1985) A metrical theory of syllabicity. PhD dissertation, MIT.
Moulton, W. (1962) "The vowels of Dutch: phonetic and distributional classes," Lingua 11:294312

Rijk, R. de (1967) "Apropos of the Dutch vowel system," Manuscript, MIT.

University of Illinois at Urbana-Champaign
Department of Linguistics
4088 Foreign Languages Building, MC-168
707 S. Mathews Avenue
Urbana, IL 61801-3625

USA
daniel@cogsci.uiuc.edu

