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What is lexical stress and how does it shift?

When I was a graduate student at the University of Southern California, I took Phonology II with a recently-hired professor who had just arrived from MIT, Doug Pulleyblank. He would later become my doctoral advisor. That class provided my first exposure to so many really interesting linguistic phenomena like tone assimilation, dissimilation and shift in languages with lexical tone and vowel harmony. Doug also taught me how to use Autosegmental notation to analyze those phenomena through a mapping between underlying and surface forms. I also learned from him about Lexical and Postlexical Phonology. I don't recall now whether it was also in that class or in a subsequent seminar that Doug introduced us to Feature Geometry, which was at the time a fairly recent phonological model and an active area of Doug's research. He encouraged his graduate students to also contribute to this developing area, and I enjoyed my attempts to do so under his guidance.

Doug illustrated the phonological phenomena with data from many languages, including some that he had incisively analyzed in his recently finished dissertation, such as Yoruba, Tiv and Margi. These were mostly languages that I didn't know at all. But, surprisingly, what I found most mystifying in Phonology II was a phonological aspect of a language that I thought I knew reasonably well, although not perfectly: lexical stress in English. Until I took Phonology II, my interpretation of English stress was based on the equivalent phenomenon in my native language, Spanish. Thus, I had no trouble perceiving that, say, *banana* and *Canada* differed in the position of the stress, but being told that *banana* and *bandana* had different stress patterns caught me totally by surprise. That words like *elevator* and *elevation* could differ in terms of stress pattern is something that had never occurred to me either. It also took me a long time to accept that in English a word like *supermarket* has primary stress on its initial syllable. And how was I supposed to know how to analyze the metrical pattern of words like *Apalachicola* and *Ticonderoga* if all I was aware of was that they had prominence on the penultimate syllable? At the time, I had been exposed on a daily basis to spoken English for three years or so, but I had never noticed any of these difference in stress. To actually internalize some of these differences in syllable prominence took considerably longer and I suspect it would never have happened had it not been for Doug's teaching.

The grounding of phonology in phonetics is a topic to which Doug Pulleyblank has made major contributions over the years. Taking inspiration from his work, I would thus like to offer to him this note with some unresolved stress-related puzzles that force us to consider the relation between phonetics and phonology.

Years after finishing the doctorate under Doug's direction, when teaching Spanish phonology had become part of my professional duties, I found other stress-related puzzles in my native language as well. Spanish stress placement is fairly simple and the orthographic stress rules of the language are based on the understanding that native speakers can perceive which syllable of each word is stressed, without any special training. But how is word-stress manifested acoustically in Spanish? Unlike English, Spanish has very little unstressed vowel reduction, and consonants in stressed and unstressed syllables do not differ substantially. In the canonical case (i.e. in words in isolation or under focus), duration, pitch and intensity all contribute to give acoustic salience to the lexically stressed syllable. But none of these is an intrinsic property of the stressed syllable of the word. In many cases, pitch prominence may be absent or, even, in the rhetorical stress phenomenon, may be shifted to a different syllable than the one lexically stressed: e.g. *universidad*, with final lexical stress, may be produced with pitch prominence on the first or third syllable under rhetorical stress, ^H*universidad*, *uni*^H*versidad*. Duration may still serve to identify the lexically stressed syllable under these conditions, but it is not at all unusual for all acoustic differences between lexically stressed syllables to be absent in the middle of an intonational phrase, so that minimally contrasting words like *canto* /'kanto/ 'I sing' and *cantó* /kan'to/ 'she or he sang' may become homophones.

Interestingly, the Spanish of Córdoba, Argentina has a characteristic prosodic pattern where it is the syllable preceding the stressed one that undergoes durational enhancement, so that a word like *semana* 'week' may be realized with lengthening of the /e/, and yet it is perceived by native speakers as being stressed on the penultimate syllable, [se:'mana]. This phenomenon is known in Argentina as *tonada cordobesa*.

And here is the real puzzle for me. In diachrony, it is also possible for lexical stress to shift to another syllable leaving some of its acoustic properties behind. I believe that the usual understanding of the origin of the lexical pitch-accent contrasts in Neo-Štokavian varieties of Bosnian, Croatian and Serbian is that the stress shifted one syllable towards the beginning of the prosodic word, leaving its tonal and perhaps additional correlates behind, so that a new contrast arose between words that were originally stressed on the initial syllable and words that developed initial stress through this shift (search: Lehiste and Ivić 1982 "The phonetic nature of the Neo-Štokavian accent shift...").

Similarly, the Basque linguist K. Mitxelena [L. Michelena] convincingly argued in his book *Fonética histórica vasca* that the contrast between aspirated and unaspirated voiceless stops in Northeastern Basque arose when the stress shifted from the second to the penultimate syllable of the word, leaving aspiration behind. That is, in this account, the alternation between aspirated [t^h] in *sarthu* 'enter' and unaspirated [t] in *agertu* 'appear', both with the same suffix, was once predictable from the position of the stress: voiceless stops were aspirated on the onset of stressed syllables only. Later on, stress moved to the penultimate syllable, and the aspiration of the stop became unpredictable: *[sar't^hu] /sartu/ > ['sart^hu] /sart^hu/ (vs. /agertu/ [a'gertu]).

I think these are some open issues that impinge on our understanding of the relation between phonetics and phonology. At least, it is a problem that I do not understand. What does it mean for the phonological property of lexical stress to shift to a different syllable, leaving behind some of the phonetic properties through which it was manifested before the shift took place, like in the Neo-Štokavian and Northeastern Basque examples mentioned? And how come some of the cues of lexical stress may also shift to a different syllable without altering the phonological stress pattern of words, like in the rhetorical stress and *tonada cordobesa* phenomena in Spanish? As his student, I can only offer Doug questions. I hope he thinks these are good questions!