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Metrical Incoherence or Opacity: A Stratal OT Analysis of Rhythmic Gradation in Nganasan

The topic of Rhythmic Gradation in Nganasan (Wagner-Nagy 2018) has been the subject of much discussion in the literature since it has been considered as an example of metrical incoherence (González 2003 and Vaysman 2009). In contrast to literature such as Hayes 1980 and Selkirk 1980 which argue that stress and foot-parsing are equivalent to each other, the literature on metrical incoherence argues that stress and foot-parsing should be considered as two phonological entities separate from each other since in various languages such as Nganasan, rhythmic phenomena explained by feet are seemingly independent of stress assignment:

1) Strong Grade
   (Vaysman 2009, p. 43):

   (a) (ɟyˈty)-(rəky) "hand-SIM"

   (b) (ŋuˈhu)-(rəku) "mitten-SIM"

2) Weak Grade
   (Vaysman 2009, p. 43):

   (a) (ˈnɨ-rə)(gɨ) "woman-SIM"

   (b) (ˌtɨri)(ˈmi-rə)(gɨ) "caviar-SIM"

In the examples above, while primary stress is in the antepenultimate syllable because it's avoiding word-final position and stressing a [ə], the alternation between the strong grade [k] and the weak grade [g] seems to be controlled by whether the consonant is in an even or odd syllable respectively. From facts such as these, Vaysman 2009 provides an analysis in terms of Optimality Theory (OT) which accounts for the Rhythmic Gradation facts in Nganasan by making stress be partially independent from the foot-parsing needed to generate Rhythmic Gradation.

Nonetheless, recent literature such as Benz 2018 and Kaplan 2022 have argued that cases of metrical incoherence can be reanalyzed as instances of opacity where phonological rules apply even though the context controlling for them is no longer present. They do so in terms of Stratal OT (Kiparsky 2000), a version of OT in which there can be more than one stratum and each stratum can have different constraint rankings. Thus, the current proposal will argue that what we see in Rhythmic Gradation in Nganasan is not a case of metrical incoherence, but a case of phonological opacity involving two strata.

For a word such as *ŋuˈhuðu* "mitten-3SG.POSS" (Vaysman 2009, p. 24), we can say that the constraint ranking in Stratum 1 is such that stress is assigned on every odd syllable no matter whether it is in the last syllable or not (**EDGE** dominates **NonFinal**). Since stress is now present on every odd syllable, Rhythmic Gradation could then be reanalyzed as a case of onset voicing whenever a syllable is stressed (**RG** dominates **IDENT(voice)**):

/ŋuhu-tu/ "mitten-3SG.POSS"	EDGE	NonFinal	RG	IDENT (voice)
1a) ☞ ˌŋuhuˈðu		*		*
1b) ˌŋuhuˈtu		*	*!	
1c) ŋuˈhutu	**!		*	

In Stratum 2, the previous winning candidate ˌŋuhuˈðu is the new input, but now the constraint ranking has changed such that stress assignment now cares about stress being in a final syllable (**NonFinal** now dominates **EDGE**). Nonetheless, at this level of representation Rhythmic Gradation can longer apply, yet all of the changes Rhythmic Gradation caused in Stratum 1 are maintained as well (**IDENT(voice)** now dominates **RG**), thus making the original relationship between stress and Rhythmic Gradation opaque:

/ˌŋuhuˈðu/ "mitten-3SG.POSS"	Non Final	EDGE	IDENT (voice)	RG
2a) ˌŋuhuˈðu	*!			
2b) ☞ ŋuˈhuðu		**		*
2c) ŋuˈbuðu		**	*!	

More constraints are required once other candidates and the effects of /ə/ and /ɨ/ on primary stress are considered, but overall, a Stratal OT analysis is attractive not only because it can explain the same facts as Vaysman 2009, but because it can do so without having to invoke metrical incoherence. Furthermore, it sets a framework that can help explain other opaque interactions involving Rhythmic Gradation as well.

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