

Rosenbaum, P. (1967) *The Grammar of English Predicate Complement Constructions*, Research Monograph No. 47, MIT Press, Cambridge, Massachusetts.

Suñer, M. (1983) "*pro_{arb.}*." *Linguistic Inquiry* 14, 188-191.

MELODIC DISSIMILATION IN
AINU

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Although floating melody elements have been strongly motivated within autosegmental tonology (see Goldsmith (1976) for Igbo tonal morphemes and Clements and Ford (1979) for Kikuyu downstep), their counterpart in vowel harmony has played a comparatively minor role in the literature. Previous proposals to introduce floating autosegments (e.g. Clements (1981) for Akan roots with initial labialized consonants, Clements (1977) for Hungarian stems with neutral vowels, and Kenstowicz (1979) for Chukchee roots without vowels) are based on exceptional disharmonic items within overall harmonic systems. In the Ainu¹ system to be presented in this squib, however, the disharmonic pattern is as common, if not more common, than the harmonic pattern. As a consequence, the floating autosegment is undeniably central to the phonology and morphology of the language as a whole. I will show that an explanatory account of the surface forms of various nominal and verbal suffixes in Ainu can be achieved by characterizing one class of roots with a floating melody. This nonlinear analysis has system-internal motivation akin to that of its tonal counterpart, and it more fully justifies autosegmental views on various harmony processes.

1. Ainu has a transitivity verbal suffix with five surface forms, /a/, /e/, /i/, /o/, /u/, exhausting the vowel phonemes of the language. To derive the "possessed" form of nouns, the same five vowels are attached as suffixes to nominal stems. Chiri (1952) notes that these suffixes show interesting co-occurrence restrictions with their respective roots and stems.

Let us use the verbal forms to illustrate the phenomenon. To a monosyllabic verbal root of the form CVC, a vowel suffix is added to form the transitive stem, CVC+V. The monosyllabic root may be either an intransitive stem or a bound root. Of the 25 logically possible combinations of root vowels and suffix vowels, only 15 are regularly attested. The key to this

I am indebted to Armin Mester and Alan Prince for invaluable discussion and comments on this squib. Thanks also to Ellen Broselow, Toni Borowsky, Lisa Selkirk, and an anonymous LI reviewer for helpful suggestions. All errors and inadequacies are my own.

¹ Ainu is an almost extinct language of the aboriginal people of northern Japan. Its relationship to the Japanese language or to any language family is still controversial. For detailed discussion of the topic, see Patrie (1982).

problem comes from another observation made by Chiri: when the root ends in a glide, the quality of the root vowel plays no role and the suffix vowel is always /e/.²

(1) *CVG + e*

ray-e	'to kill'	say-e	'to wind'
chaw-e	'to solve'	taw-e	'to pull with force'
hew-e	'to slant'	rew-e	'to bend'
piw-e	'to cause to run'	chiw-e	'to sting'
poy-e	'to mix'	moy-e	'to move'
huy-e	'to observe'	tuy-e	'to cut'

Let us for the moment assume that another mechanism is involved in these glide cases. Once we eliminate these forms from immediate consideration, we can arrange the remaining types in a more perspicuous fashion.

(2) *Root vowel identical to suffix vowel:*

CaC+a	mak-a	'to open'	tas-a	'to cross'
CeC+e	ker-e	'to touch'	per-e	'to tear'
CiC+i	pis-i	'to ask'	nik-i	'to fold'
CoC+o	pop-o	'to boil'	tom-o	'to concentrate'
CuC+u	tus-u	'to shake'	yup-u	'to tighten'

(3) *Nonlow vowel roots taking high vowel suffixes with opposite backness value. If the root vowel is [+back], then the suffix vowel is [-back], and vice versa:*

CuC+i	hum-i	'to chop up'	mus-i	'to choke'
CoC+i	pok-i	'to lower'	hop-i	'to leave behind'
CiC+u	pir-u	'to wipe'	kir-u	'to alter'
CeC+u	ket-u	'to rub'	rek-u	'to ring'

(4) *Low vowel roots taking high vowel suffixes.³*

CaC+i	kar-i	'to rotate'	sar-i	'to look back'
CaC+u	ram-u	'to think'	rap-u	'to flutter'

In what follows, I shall argue that the system behind this seemingly complex pattern can be captured in a simple and revealing way within a nonlinear framework.

2. Consider first the cases in (2), where the root and suffix vowels are identical. We autosegmentalize the vowel features

² Henceforth, all reference to Chiri will be to his 1952 article, unless otherwise noted. I have also adopted his orthographic conventions.

³ There are some forms that do not conform to the pattern in (1)-(4), e.g. *sur-a* 'to throw away'. In the nominal pattern, several cases are attested where *CeC* stems take *i*-suffixes. I assume that these are exceptional lexicalized forms to be accounted for outside the regular harmony system.

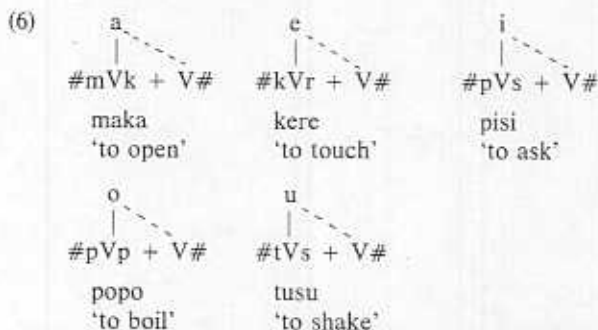
In polysyllabic roots, which seem to be historically compound forms, the same restriction applies to the rightmost of the root vowels and the suffix vowels.

onto the melodic tier, and the root forms appear as follows in the lexicon:

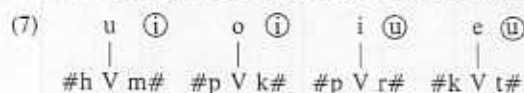


For notational convenience, vowel symbols are used to abbreviate feature matrices. Notice that unlike other proposed vowel harmony systems where a single vowel feature such as [\pm advanced tongue root] or [\pm round] is autosegmentalized, the entire set of tongue body features (i.e. [\pm low, \pm high, \pm back]) is on a different tier.⁴

The transitivity suffix is a syllabic segment without association to the melodic tier specifying vowel features. In the lexicon, its phonological representation is merely "V," or "[+syllabic]." The allomorphic variants need not be listed because when suffixation takes place, the root vowel features spread and the suffix appears automatically as the duplicate of the root vowel.



Let us now consider the forms in (3) and (4), where the root and suffix vowels are different. We might for the moment assume that an "extra" vowel feature set, i.e. a floating autosegment, is lexically specified for these monosyllabic roots.



⁴The proposal here is in fact more similar to the vowel tier of McCarthy (1981) than to that of other autosegmental "vowel harmony" tiers. However, the vowel tier proposed here for Ainu does not have any independent morphemic content as in Semitic. Lisa Selkirk (personal communication) points out that this is parallel to the morphemic and nonmorphemic status of tonal tiers in Tiv and Mende. Thus, Ainu corresponds to Mende with a nonmorphemic autosegmental tier, and Semitic to Tiv with a morphemic autosegmental tier.

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'to wind'
'to pull with
force'
'to bend'
'to sting'
'to move'
'to cut'

mechanism is in-
these forms from
remaining types

'to cross'
'to tear'
'to fold'
'to concentrate'
'to tighten'

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vowel is [+back],
id vice versa:

is-i 'to choke'
p-i 'to leave
behind'
-u 'to alter'
-u 'to ring'

uffixes:³
'to look back'
'to flutter'

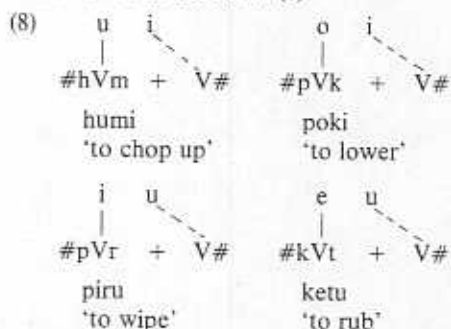
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If the roots appear without suffixation as intransitive verbs, then the second feature set will simply remain unassociated until the end of the derivation, where it is deleted by convention.⁵ When the transitive suffix is attached, the root vowel features do not spread as in (6) since the autosegmental association conventions will associate the floating autosegment to the suffix vowel as shown in (8).



Lexically specifying another (floating) vowel feature set will thus give the correct suffix forms. However, this does not capture the fact that the suffix vowels in (3) are predictable. The suffixes of these roots are always [+high] and the backness value is opposite that of the respective root vowels. A full lexical specification for each floating autosegment would be highly redundant. We can eliminate this redundancy by specifying the second melodic autosegments only as [+high] in the lexicon and letting the backness value be filled in by the following Melodic Dissimilation Rule (9).⁶

- (9) *Melodic Dissimilation Rule (MDR)*
 [+high] → [-αback] / [αback] —

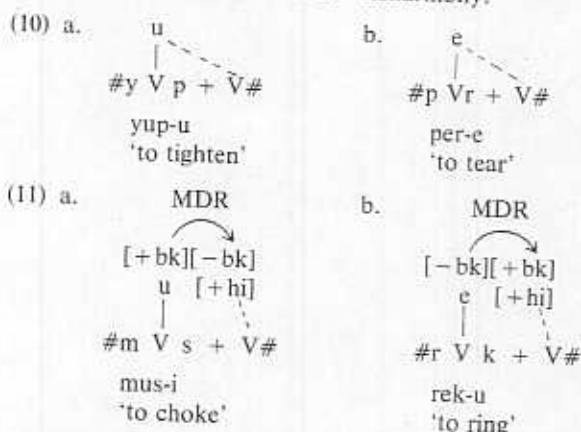
The MDR must be defined as a feature-specification rule and not a feature-changing rule so that it applies only to underspecified segments.⁷ The sole difference between the roots in (2) and those in (3), then, is that the former have the lexical

⁵ I am assuming the Association Conventions of Clements and Ford (1979), which grant priority to associating floating autosegments over spreading of preassociated autosegments. For relevant discussion of the status of unassociated autosegments at various stages of the derivation, see Clements and Ford (1979) and McCarthy (1981).

⁶ Note that I must adopt the Obligatory Contour Principle as an active constraint on the lexical representation of phonemic melodies, following McCarthy (1979). Otherwise, the MDR would also dissimilate the identical cases.

⁷ This ensures that it does not change the melodic features of vowels with full lexical specification such as the exceptional cases pointed out in footnote 3. It is also relevant to the floating autosegments of the *a*-roots discussed below.

melody [αF], whereas the latter have [αF][+high]. This analysis thus captures in a straightforward manner the cooccurrence restrictions: in (10) spreading of the root vowel features results in "harmony," and in (11) mapping of the [+high] autosegment that undergoes the MDR results in "disharmony."



This analysis cannot be extended to the *a*-roots in (4), since they may occur with either back or front suffixes. Noting that the [+high] restriction is still operative, we might conjecture that historically the low vowel once had a front counterpart with which the autosegment disharmonized. When the low vowels merged, the values of the suffixes were presumably lexicalized. Synchronically, let us assume that /a/ is itself unspecified for backness. The backness feature then cannot be spelled out on the [+high] autosegment by the MDR, because the environment of the rule is not met. The *a*-roots must therefore encode the value of the backness feature for their floating [+high] autosegment. We expect variation in the suffixes of the *a*-roots since their feature specifications are not the outcome of a rule.

Turning now to the diphthong roots in (1), we discover independent evidence for the MDR. Notice the interesting parallelism that appears when we compare the glides of the diphthong roots and the disharmonic suffixes of the nondiphthong roots.

- (12) a. *Diphthong roots*
 Ciw Cew Cuy Coy Caw Cay
- b. *Suffixed nondiphthong roots*
 CiC+u CeC+u CuC+i CoC+i CaC+u
 CaC+i

The available types of *root vowel-glide* combinations exactly mirror the available types of *root vowel-suffix vowel* combinations. This parallelism in distribution follows straightforwardly if glides and vowels have associations to the same me-

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lodic tier. The root-final segment is associated underlyingly to a [+high] autosegment. The backness feature will then be filled in by the MDR.

- (13) a.
$$\begin{array}{c} \text{MDR} \\ \curvearrowright \\ [-bk][+bk] \\ e \quad [+hi] \\ | \quad / \\ \#k \quad V \quad C\# \\ \text{kew} \\ \text{'bone'} \end{array}$$
- b.
$$\begin{array}{c} \text{MDR} \\ \curvearrowright \\ [+bk][-bk] \\ u \quad [+hi] \\ | \quad / \\ \#t \quad V \quad C\# \\ \text{tuy} \\ \text{'to break (intr)'} \end{array}$$

Since the dissimilation rule is defined on the melodic tier, it makes no difference whether the [+high] autosegment is "floating," as in (14a), or preassociated, as in (14b).

- (14) a.
$$\begin{array}{c} \#[\alpha F][+high]\# \\ | \\ \#C \quad V \quad C \quad + \quad V\# \end{array}$$
- b.
$$\begin{array}{c} \#[\alpha F][+high]\# \\ | \quad | \\ \#C \quad V \quad C \quad + \quad V\# \end{array}$$

Although the diphthong roots have turned out to provide strong independent support for the MDR, the occurrence of the *e*-suffix itself still awaits explanation. With automatic spreading, we expect the [+high] autosegment to spread onto the suffix as follows:

- (15)
$$\begin{array}{c} [\alpha F] \quad [+high] \\ | \quad / \\ \#C \quad V \quad C \quad + \quad V\# \end{array}$$

Why then do we not find forms such as $\#C \quad V \quad w \quad + \quad u\#$ and $\#C \quad V \quad y \quad + \quad i\#$? The answer seems to lie in the syllable structure constraints of Ainu. According to Kindaichi and Chiri (1936), /y/ is not a possible onset of /i/, and /w/ is not a possible onset of /u/. That is, there is a phonotactic constraint in Ainu that forbids the surface configuration (16).⁸

- (16) *yi, *wu

This constraint must override the association conventions so

⁸ Since there are also no diphthongs of the form /iy/ or /uw/, nor any distinctive long vowels in Ainu, the phonotactic constraint might be statable as a "nonbranching" requirement within a syllable:

- (i)
$$\begin{array}{c} [\alpha F] \\ / \quad \backslash \\ [_{\sigma} X \quad Y] \end{array}$$

This constraint may be related to the MDR, which has a morphemic character and is not syllable-bound. However, a straightforward incorporation does not seem to be possible and the generalization must await further investigation.

that the suffix vowel remains unassociated to the melodic tier. Either a rule of /e/-insertion takes place, or unassociated Vs surface as /e/ in the unmarked case. Further investigation is needed to choose between these possibilities.

3. In this discussion, I have tried to motivate a nonlinear analysis of the Ainu verbal and nominal system in which floating autosegments are accorded a crucial and nontrivial status. Lexicalization occurs in a restricted and predictable domain. The distribution of glides offers evidence that the dissimilation phenomenon covers a wider range of facts, and only the language-specific syllable structure constraint (16) overrides the spreading conventions. Thus, by positing floating autosegments and the Melodic Dissimilation Rule, this analysis captures quite directly the complex cooccurrence restrictions observed by Chiri.

4. Finally, as further independent support, I would like to point out that the disharmony phenomenon in the Ainu system is by no means an isolated and unprecedented case, and it may even be fairly common. Let us briefly look at two such systems.

In Tzeltal, a Mayan language spoken in northeastern Chiapas, Mexico, a (dis)harmony system almost identical to that of Ainu is reported by Slocum (1948).⁹ The vowel of the nominal suffix + *VI* indicating 'place in which a thing abounds' may in certain cases be a copy of the stem vowel, as in *ʔčil* 'chile-patch' < *ʔč* 'chile'. In other cases, "when the stem vowel is a back vowel, the suffix vowel is *i* (*č'umil* 'squash-patch' < *č'um* 'squash'), and when the stem vowel is a front vowel, the suffix vowel is *u* (*čenk'ul* 'bean patch' < *čenek* 'bean')" (Slocum (1948, 79)). The transitivity (and verbalizing) suffixes -*Vn*, -*Vy*, -*Vlay* also show the same characteristics. Since the whole (dis)harmony process in suffixation seems to be more regular than in Ainu, the analysis proposed here applies straightforwardly to Tzeltal word formation.

Ngbaka, a Central African language, is discussed by Westcott (1965) and Chomsky and Halle (1968) as exemplifying an interesting morpheme structure constraint. "Since there are seven vowels [i, e, ε, a, ɔ, o, u]/[I] in the language one might expect 49 different vowel-vowel patterns in bisyllabic formatives. In fact, only 35 patterns are admitted. . . . That is, in bisyllabic formatives containing no /a/, the vowels either differ with regard to the feature 'high' or they are identical" (Chomsky and Halle (1968, 387)). Setting morphemes with /a/ aside, the structure of bisyllabic words can be captured autosegmentally as either (16a) or (16b).

⁹ I am grateful to Armin Mester for directing my attention to this article.

- (16) a.
$$\begin{array}{c} [\alpha F] \\ \swarrow \quad \searrow \\ C \quad V \quad C \quad V \end{array}$$
- b.
$$\begin{array}{c} [\alpha high] \quad [-\alpha high] \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ CV \quad \quad \quad CV \end{array}$$

Thus, whereas Ainu and Tzeltal have a backness disharmony system, Ngbaka has height disharmony. All three, however, also allow complete harmony, i.e. identical vowels. That these languages that require dissimilation within certain domains also allow total identity within a certain domain bears on a theoretical point. In fact, it offers strong support for my contention that the vowel features must be autosegmentalized. If the dissimilation is defined linearly (as in Chomsky and Halle (1968) and Clements (1982)), a special provision must be made for the identity cases so as to exclude them from dissimilating.¹⁰ A generalization is obviously being missed if we need to repeat for each system that identical vowels are not affected in the dissimilation environment. In the present analysis, however, the identity cases are the result of autosegmental spreading of a single melodic unit:

- (17)
$$\begin{array}{c} [\alpha F] \\ \swarrow \quad \searrow \\ CV \quad \quad \quad CV \end{array}$$

The dissimilation constraint defined on the melodic tier would not affect them since the environment is not met. If there is only one melodic autosegment, there can obviously be no "cooccurrence" restrictions. Thus, the nonlinear analysis predicts that in the unmarked case, languages with melodic dissimilation requirements will also allow total identity. Whether this generalization holds is a question that must be left for future research.¹¹

¹⁰ Chomsky and Halle's (1968, 387) formulation of the rule involves Boolean conditions on variables over feature specifications. Clements (1982, 684) shows that the rule can be restated as two morpheme structure conditions that stand in a disjunctive relationship under the Elsewhere Condition. Although Clements's formulation attributes the phenomenon to a general and perhaps universal mechanism, it still requires two distinct morpheme structure conditions.

¹¹ Similar ideas on identity and dissimilation are found in Prince (1984). Pointing out that there exist languages with long vowels but no diphthongs and similarly languages with geminates but no other consonant clusters, Prince shows that if an independent tier representing syllabic terminals is assumed, the phonotactic constraints of such languages can easily be expressed as * $[\alpha voc][\alpha voc]$. Consecutive vowel or consonant slots can then be filled in only by spreading, resulting in identical adjacent segments, i.e. long vowels or geminate consonants. Note the similarity of the argument: "dissimilation" defined on one tier accounts for surface "identity." This shows that the generalization proposed in the text is valid in different areas of phonology and that the concept of dissimilation may play a more prominent role than hitherto suspected.

high] [-αhigh]

V CV

a backness disharmony. All three, however, are within certain domains. The first domain bears no support for my conclusion that the rule is not segmentalized. If Chomsky and Halle's analysis is correct, the rule must be made more general to account for the dissimilating effect. If we need to repeat the rule, it is not affected in the analysis, however, but the generalization of the rule to the spreading of

the melodic tier would not meet. If there is to be no obvious way to linearize the analysis, the rule with melodic dissimilation is not identical. Whether the rule must be left for future

consideration of the rule involves several specifications. Clements' analysis of two morpheme structures under the Elsewhere condition attributes the phenomenon to the phonetic environment, it still requires

the rule are found in Prince's analysis of long vowels but not of short vowels but no other condition. The independent tier representing the constraints of such languages. Consecutive vowel spreading, resulting in geminate consonants. The rule is defined on one tier but the generalization of the rule to the phonology and that the rule has a different role than hitherto

References

- Chiri, M. (1952) "Ainugo ni okeru boin chowa (Vowel Harmony in the Ainu Language)," *Hokkaido University Bulletin in Humanities* 1, 101-118. Reprinted in *Chiri Mashio Zenshuu* [Collected Works of Mashio Chiri], Vol. 4, 201-225, Heibonsha, Tokyo (1974).
- Chomsky, N. and M. Halle (1968) *The Sound Pattern of English*, Harper and Row, New York.
- Clements, G. N. (1977) "Neutral Vowels in Hungarian Vowel Harmony, An Autosegmental Interpretation," in J. A. Kegl, D. Nash, and A. Zaenen, eds., *Proceedings of the Seventh Annual Meeting of the North Eastern Linguistic Society*, MIT, Cambridge, Massachusetts.
- Clements, G. N. (1981) "Akan Vowel Harmony: A Nonlinear Analysis," in G. N. Clements, ed., *Harvard Studies in Phonology II*, Indiana University Linguistics Club, Bloomington, Indiana.
- Clements, G. N. (1982) "A Remark on the Elsewhere Condition," *Linguistic Inquiry* 13, 682-685.
- Clements, G. N. and K. Ford (1979) "Kikuyu Tone Shift and Its Synchronic Consequences," *Linguistic Inquiry* 10, 179-210.
- Goldsmith, J. (1976) *Autosegmental Phonology*, Doctoral dissertation, MIT, Cambridge, Massachusetts.
- Kenstowicz, M. (1979) "Chukchee Vowel Harmony and Epenthesis," *The Elements*, Chicago Linguistic Society, University of Chicago, Chicago, Illinois, 402-413.
- Kindaichi, K. and M. Chiri (1936) *Ainu gohō gaisetsu (An Outline of Ainu Grammar)*, Iwanami, Tokyo.
- McCarthy, J. J. (1981) "A Prosodic Theory of Nonconcatenative Morphology," *Linguistic Inquiry* 12, 373-418.
- Patrie, J. (1982) *The Genetic Relationship of the Ainu Language*, The University Press of Hawaii, Honolulu, Hawaii.
- Prince, A. S. (1984) "Phonology with Tiers," in M. Aronoff and R. Oehrle, eds., *Language Sound Structure*, MIT Press, Cambridge, Massachusetts.
- Slocum, M.C. (1948) "Tzeltal (Mayan) Noun and Verb Morphology," *IJAL* 14, 77-86.
- Wescott, R. W. (1965) Review of J. M. C. Thomas, *Le Parler Ngbaka de Bokanga: Phonologie, morphologie, syntaxe*, *Language* 41, 346-347.