confronted words. Cf. 1. loc. *stremlén'i*–3. gen. *zabvén'ja*; 2. gen. *ljudéj*–4. acc. *caréj*.

The four lines of the two inner couplets of the poem (3.–4. and 5.–6.) omit the stress on their sixth syllable, which is a characteristic of the narrative, colloquially oriented variety of the iambic tetrameter. These couplets also show certain syntactic similarities: the first line of the couplet contains the predicate, while the subsequent line is occupied by secondary parts of the sentence in the form of fused phrases (4. *narody, cárstva i caréj*; 6. *črez zvúki líry i trubý*).

The pattern of stressed vowels in the even syllables corroborates the poetic unity of the octet and its significant division into a pair of stanzas. The "moderate" vowels, flat (rounded) *O* and nonflat (unrounded) *E*, occur in both quatrains. The compact (open) *A* is found only in the even lines of the first quatrain and at the beginning of the poem (*reká*). The diffuse (closed) vowels, the flat (rounded) *U* and the nonflat (unrounded) *I*, along with back *Y*, the contextual variant of the same phoneme, occur only in the even lines of the second quatrain. Moreover, the occurrence of *A* is limited to a position before a stressed *E* in the following word, and *U* requires a subsequent *I*. The last stressed vowel of any line is the nonflat member of the pair *O*–*E* or *U*–*I*. Thus the octet shows a general motion toward lower sonority and higher tonality. The words of the diiambic acrostic that sums up the plot of the octet, *ruína čtí*, echo with their reiterated *I* the vocalic trend of the poem.

The limitations imposed by the octet on the admissible concurrences of grammatical categories for the sake of their higher semantic expressivity may be exemplified by the use of feminines (all inanimate) only in the singular and masculines solely in the plural: 1. *reká*, 3. *v própasti*, 6. *líry i trubý*, 7. *véčnosti*, 8. *sud'bý*; but 2. *ljudéj*, 4. *narody, caréj*, 6. *zvúki*. The feminine singular forms in the acrostic (*ruina*, *čti*) show once more the close connection between the acrostic detected by Morris Halle and the poetics of Deržavin's octet.

The discoverer of *ruina čti* is correct in connecting the protracted inattention to this acrostic with the old surmise of viewing Deržavin's octet as merely an uncompleted fragment (Halle (1958)). This surmise in turn is based on the unusualness of short poems in Deržavin's legacy. Yet it must be taken into account that it is precisely the singular brevity of Deržavin's farewell poem that explains and expiates its extraordinary condensation of artistic devices.

Chapter 2

Syllable Structure in Finnish Phonology

S. J. Keyser
Paul Kiparsky

Morris Halle describes himself, in informal moments, as someone who does a little bit of work every day, like a shoemaker. Perhaps that is why his contributions have been so lasting and why so many phonologists have followed in his footsteps to boot. The present authors are no exception. Halle's recent work on three-dimensional phonology has broken new ground in our understanding of phonological theory and this study is intended as a continuation of and a tribute to his work.

In the study that follows we assume a multi-tiered phonological representation. We focus primarily on three tiers: the segmental tier, the syllable tier, and the CV tier.

The segmental tier is composed of the elements familiar to linear phonology—that is, distinctive feature bundles. The syllable tier represents the organization of the segmental tier into syllabic units by means of binary branching tree structures. Intervening between these tiers, we assume a level composed of C and V elements. The elements are linked by association lines to the segmental tier, vocalic feature bundles being linked to V elements and nonvocalic feature bundles to C elements.[1]

We assume certain conventions that associate segmental elements with CV elements. We do not enumerate all these conventions here but invoke them where necessary in the discussion.

One convention concerns the CV tier itself. Thus, if an element on the CV tier remains unlinked throughout a derivation, then it simply remains unrealized, having no effect at all on the representation.

A second convention, Spreading, involves relinking of delinked elements. Thus, if a deletion rule results in an unlinked segmental element and if there is a vacant C or V element on the CV tier, then the unlinked segmental element will link with the appropriate unlinked C or V element, providing no association lines are crossed (for an example, see (6) below).

In addition, we assume the *Obligatory Contour Constraint* on Finnish lexical representations, which precludes sequences of identical segments on the segmental tier. We will show that this constraint selects particular representations for a large class of Finnish words, for example, *terve*.

With these preliminary remarks we turn to consider certain processes central to Finnish phonology.

1. Some Central Rules of Finnish Phonology

As historical phonologists have long recognized (e.g., Rapola (1966)), problems of quantity and syllable structure lie at the heart of Finnish phonology. They loom large also in previous synchronic treatments, notably the excellent study of Wiik (1967). Further progress can be made by replacing the view of the syllable as a string of segments delimited by syllable boundaries with a more highly structured hierarchical representation. In particular, as we will show, such an approach to syllable structure can elucidate the complex allomorphy seen in certain cases of Finnish, such as the optional variants of the partitive plural and genitive plural (see (g) and (h) of table 1).

To lay the groundwork, we first briefly sketch our analysis of some of the central, in essence well-known, processes in Finnish word phonology that underlie the alternations in these and other paradigms of Finnish.

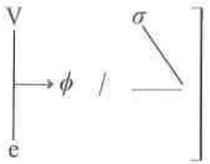
1.1 *e*-Deletion

The declension of stems in *-o*, *-u*, (and their vowel-harmonic cognates *-ö*, *-y*) is straightforward (see the first two columns of table 1). Other stem-final vowels (last three columns) are subject to certain changes in the declension. Before the plural suffix *-i*, *e* is deleted and *i/a* turn to *e/o*, respectively.[2] More important for present purposes is the deletion of *e* illustrated in the singular of *sammal*. It can be seen that *-e* stems alternate with consonant stems when there is no suffix (nom. sg. *sammal*) and before some of the suffixes that begin with CV (part. sg. *sammal-ta* vs. ess. sg. *sammale-na*). We treat the vowel stem as basic and derive the consonant stem by a rule that deletes stem-final *-e* in open syllables, marking essive *-na* as exceptionally not triggering the *e*-Deletion rule:

Table 1

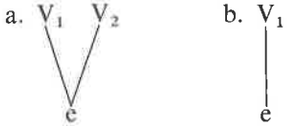
	'pigeonhole'	'surmise'	'stick'	'paper'	'moss'
a. nom. sg.	lokero	arvelu	karahka	paperi	sammal
part. sg.	{lokero+a / (lokero+ta)}	arvelu+a	{karahka+a / (karahka+ta)}	paperi+a	sammal+ta
b. nom. pl.	lokero+t	arvelu+t	karahka+t	paperi+t	sammale+t
gen. sg.	lokero+n	arvelu+n	karahka+n	paperi+n	sammale+n
iness. sg.	lokero+ssa	arvelu+ssa	karahka+ssa	paperi+ssa	sammale+ssa
abl. sg	lokero+lta	arvelu+lta	karahka+lta	paperi+lta	sammale+lta
c. ess. sg.	lokero+na	arvelu+na	karahka+na	paperi+na	sammale+na
d. ill. sg.	lokero+on	arvelu+un	karahka+an	paperi+in	sammale+en
e. iness. pl.	lokero+i+ssa	arvelu+i+ssa	karahko+i+ssa	papere+i+ssa	sammal+i+ssa
abl. pl.	lokero+i+lta	arvelu+i+lta	karahko+i+lta	papere+i+lta	sammal+i+lta
ess. pl.	lokero+i+na	arvelu+i+na	karahko+i+na	papere+i+na	sammal+i+na
f. ill. pl.	lokero+i+hin	arvelu+i+hin	karahko+i+hin	papere+i+hin	sammal+i+in
g. part. pl.	{lokero+i+ta / lokero+j+a}	arvelu+i+ta / arvelu+j+a	karahko+i+ta / karahko+j+a	{papere+i+ta / papere+j+a}	sammal+i+a
h. gen. pl.	{lokero+i+den / lokero+i+tten / lokero+j+en}	arvelu+i+den / arvelu+i+tten / arvelu+j+en	karahko+i+den / karahko+i+tten / karahka+j+en	{papere+i+den / papere+i+tten / paperi+en}	{sammal+ien / sammal+ten}

(1)
e-*Deletion*



We interpret rules of this form in the following fashion. If the V and the segment are exhaustively linked to one another, then both elements are deleted. If either element is linked to some other element, then only the element that is not dually linked deletes. For example, (1) will delete only V_2 in the representation (2a), yielding (2b) (where the subscripts have no theoretical import).

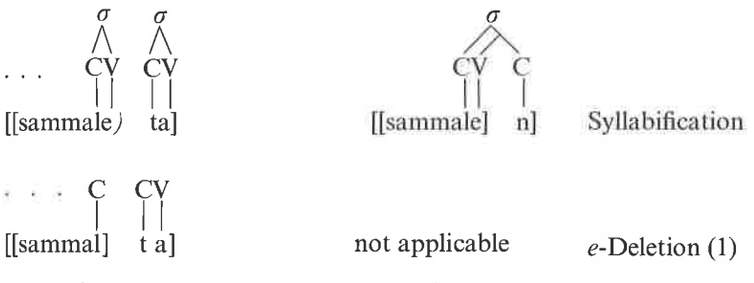
(2)



If both the V and the segment are dually linked, then only the linkage between them deletes (for an example of this last case, see (36b)).

Given this rule, the following derivations result:

(3)



A look at disyllabic stems (table 2) shows that *e*-Deletion actually has a more complex set of conditioning environments. The nominative singulars *tuli*, *vesi*, *savi* illustrate that *e*-Deletion generally does not apply word-finally in disyllables.[3] Instead, the stem-final *-e* appears there as *-i*, triggering a rule that assibilates *t* before *i*, as in /vete/ → *veti* → *vesi*.[4]

Table 2

	'house'	'mute'	'glass'	'fire'	'water'	'clay'	'snow'	'name'
a. nom. sg.	talo	mykkä	lasi	tuli	vesi	savi	lumi	nimi
part. sg.	talo+a	mykkä+ä	lasi+a	tul+ta	vet+tä	save+a	lun+ta	nime+ä
b. nom. pl.	talo+t	mykä+t	lasi+t	tule+t	vede+t	save+t	lume+t	nime+t
gen. sg.	talo+n	mykä+n	lasi+n	tule+n	vede+n	save+n	lume+n	nime+n
iness. sg.	talo+ssa	mykä+ssä	lasi+ssa	tule+ssa	vede+ssä	save+ssa	lume+ssa	nime+ssä
abl. sg.	talo+lta	mykä+ltä	lasi+lta	tule+lta	vede+ltä	save+lta	lume+lta	nime+ltä
c. ess. sg.	talo+na	mykkä+nä	lasi+na	tule+na	vete+nä	save+na	lume+na	nime+nä
d. ill. sg.	talo+on	mykkä+än	lasi+in	tule+en	vete+en	save+en	lume+en	nime+en
e. iness. pl.	talo+i+ssa	myk+i+ssä	lase+i+ssa	tul+i+ssa	ves+i+ssä	sav+i+ssa	lum+i+ssa	nim+i+ssä
abl. pl.	talo+i+lta	myk+i+ltä	lase+i+lta	tul+i+lta	ves+i+ltä	sav+i+lta	lum+i+lta	nim+i+ltä
ess. pl.	talo+i+na	mykk+i+nä	lase+i+na	tul+i+na	ves+i+nä	sav+i+na	lum+i+na	nim+i+nä
f. ill. pl.	talo+i+hin	mykk+i+in	lase+i+hin	tul+i+in	ves+i+in	sav+i+in	lum+i+in	nim+i+in
g. part. pl.	talo+j+a	mykk+i+ä	lase+j+a	tul+i+a	ves+i+ä	sav+i+a	lum+i+a	nim+i+ä
h. gen. pl.	talo+j+en	mykk+i+en	lase+i+en	tul+i+en tul+ten	ves+i+en vet+ten	sav+i+en	lum+i+en lun+ten	nim+i+en

Table 3

	'be on time'	'sit'	'laugh'	'wash'
a. past part.	ehti+nyt	istu+nut	naura+nut	pes+syt
potential	ehti+ne+n	istu+ne+n	naura+ne+n	pes+se+n
3 sg. imper.	ehti+köön	istu+koon	naura+koon	pes+köön
b. 2 inf.	ehti+en	istu+en	naura+en	pes+ten
c. 1 sg. pres.	ehdi+n	istu+n	naura+n	pese+n
1 pl. pres.	ehdi+mme	istu+mme	naura+mme	pese+mme
pres. part.	ehti+vä	istu+va	naura+va	pese+vä
d. 1 sg. past	ehd+i+n	istu+i+n	nauro+i+in	pes+i+n

(4)
Assibilation
t → s / ___ i

As exemplified by *savea* (not **savta*), *e*-Deletion is systematically blocked in some environments (for example, next to labial obstruents). In a few contexts (after *m* and certain consonant clusters) its application is lexically determined (/lum+ta/ → *lunta* but /nime+tä/ → *nimeä*). These contexts have sometimes been invoked as showing a putative underlying contrast between -VC and -VCV (/lum/ vs. /nime/); however, they are probably too restricted to justify such a contrast, especially in view of free variants such as *niemeä*/*nientä* from /nieme/, which would then require multiple lexical entries (cf. Campbell (1975)).

With these additional specifications, rule (1) will account also for the *e*/ϕ alternations in table 2.

Disyllabic verbs (table 3) behave like the nouns, confirming that the open syllable is the essential condition on *e*-Deletion. As in table 2, the *-e* stem /pese/ alternates with /pes/, the former surfacing when the stem-final *-e* is in a closed syllable (or, again, next to a labial), the latter surfacing in an open syllable: *pese+n* vs. *pes+ten*.

In longer verbs, however, the stem-final *-e*, when retained in closed syllables and before labial endings, appears not as *e* but as *a*:

(5)
a. halu+te+nut → halunnut
halu+te+nen → halunnen
halu+te+koon → halutkoon
b. halu+te+ten → haluten

c. halu+te+n → haluan
halu+te+mme → haluamme
halu+te+va → haluava
d. halu+te+in → halusin

We assume that the underlying *-e*, when not deleted by (1) as in (5a), turns to *a* by rule specific to polysyllabic verbs.[5]

The upshot of this analysis is that all stems in Finnish end in vowels and any vowel may occur stem-finally.

1.2 *s*-Deletion and Assimilation

Trisyllabic noun stems in *-se* undergo a special set of alternations illustrated in table 4.

Dialectally and in poetry, all stem-final long vowels in stems such as these may appear as *VhV*: for example, *vierahat* for *vieraat*. We assume a derivation like (6), involving the rules (7a, b):

(6)

vierase+t	
h	*s*-Deletion (7ai)
ϕ	*s*-Deletion (7aii) (optional)
a	Assimilation (7b)
viera(h)at	Output

(7)
a. s-*Deletion*

i. s → h
ii. h → ϕ (opt.)
} / CV_i ___ V
(where V_i is unstressed and nonbranching)

b. *Assimilation*

VCV
| |
ϕ e → ϕ

Since all Finnish words have stress on the initial syllable, the condition that V_i be unstressed blocks *s*-Deletion in disyllables. The reason for requiring V_i in (7a) to be nonbranching will become apparent below.[6]

Given rule (7b), the illative forms in *-(h)V_in*, where V_i is always a copy of the preceding vowel ((d, f) of tables 1 and 2), can be derived from underlying /hen/.[7]

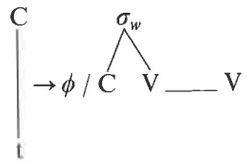
Table 4

	'guest'	'expensive'	'axe'
a. nom. sg.	vieras	kallis	kirves
part. sg.	vieras+ta	kallis+ta	kirves+tä
b. nom. pl.	vieraa+t	kallii+t	kirvee+t
gen. sg.	vieraa+n	kallii+n	kirvee+n
iness. sg.	vieraa+ssa	kallii+ssa	kirvee+ssä
abl. sg.	vieraa+lta	kallii+lta	kirvee+ltä
c. ess. sg.	vieraa+na	kallii+na	kirvee+nä
d. ill. sg.	vieraa+seen	kallii+seen	kirvee+seen
e. iness. pl.	viera+i+ssa	kalli+i+ssa	kirve+i+ssä
abl. pl.	viera+i+lta	kalli+i+lta	kirve+i+ltä
ess. pl.	viera+i+na	kalli+i+na	kirve+i+nä
f. ill. pl.	viera+i+{hin, siin}	kalli+i+{hin, siin}	kirve+i+{hin, siin}
g. part. pl.	viera+i+ta	kalli+i+ta	kirve+i+tä
h. gen. pl.	viera+i+{den, tten}	kalli+i+{den, tten}	kirve+i+{den, tten}
	vieras+ten	kallis+ten	kirves+ten

1.3 *t*-Deletion

Inspection of tables 1–4 reveals several other consonantal processes. The ending of the partitive singular is *-ta* after consonants (*sammal+ta* (table 1), *tul+ta*, *vet+tä*, *lun+ta* (table 2), *vieras+ta* (table 4)) and *-a* after vowels (*lokero+a* (table 1), *talo+a* (table 2), etc.). The ending *-ta* also appears after long vowels (*vapaa+ta*) and after stressed short vowels (*mi+tä* 'what'). Thus we formulate the rule of *t*-Deletion as follows, where σ_w denotes an unstressed syllable:

(8)
t-*Deletion*



This rule also derives the correct partitive plurals of words like *tuli*: /tule+i+ta/ → tul+i+ta → *tulia*. At first sight it appears inadequate for the deletion of *t* after diphthongs, as in /talo+i+ta/ → *taloja* ((g) of table

2) and optionally in /lokero+i+ta/ → *lokeroja* or *lokeroita* ((g) of table 1). In section 2.6 we will show that all these forms are in fact derived by (8) exactly as desired when the syllabic structure of dipththongs is taken into account.

t-Deletion also applies to the so-called second infinitive suffix /ten/ '(by)-ing'. The basic form *-ten* appears after stems ending (after *e*-Deletion) in *-s*:

(9)

Stem	*Second infinitive*
pese	pes+ten
potkaise	potkais+ten

t-Deletion applies after a short vowel to give the ending *-en*:

(10)

naura	naura+en
onnistu	onnistu+en

The following derivations result:

(11)

pese+ten	naura+ten	
pes+ten	—	*e*-Deletion (1)
—	naura+en	*t*-Deletion (3)
pesten	nauraen	Output

1.4 Consonant Gradation

Stems ending (after *e*-Deletion) with a sonorant or long vowel have *-den* for expected *-ten* (see (12)), which further assimilates to a preceding sonorant:

(12)

saa	saaden
pure	purren
tule	tullen
mene	mennen

Stems ending in *-t* (from *-te*) combine with *-ten* into *-ten* instead of *-tten*:

(13)

halute	haluten

Both weakenings are due to the process of consonant gradation, which voices *t* (and weakens *p*, *k* in various ways) and degeminates double stops before a branching rime, that is, in the onset of a closed syllable. The

weakened single stops are assimilated to preceding nasals (see (23)) and liquids (see (19)) in various cases that we shall not detail here. We state the rule informally as follows:

(14)
Consonant Gradation

p, t, k weakened
pp, tt, kk degeminated[8] } / [+ son] ___ V

1.5 Ordering the Rules

The rule of *e*-Deletion must apply before Consonant Gradation because it must feed it in derivations like /halu+te+ten/ → *halu + t + ten* → *haluten*. The same derivation shows that *t*-Deletion must precede Consonant Gradation, since the latter does not feed the former (*haluten* ↛ **haluen*). We can further order Assibilation before *t*-Deletion on the basis of derivations like /halu+te+i/ → *halut+i* → *halusi* (not **halui*) and establish that *s* → *h* in turn precedes Assibilation since the correct result is *halusi*, not **haluhi*. We also know already from /vierase/ *vieras* (table 4) that *e*-Deletion precedes *s* → *h*. These pairwise relations establish the following strict ordering,

(15)
e-Deletion (1)
s → *h* (7)
Assibilation (4)
t-Deletion (8)
Consonant Gradation (14)

which by transitivity correctly entails that Assibilation precedes Consonant Gradation (borne out by /halut V+i+n/ → *halusin*, not **haludin*), that *e*-Deletion precedes *t*-Deletion (borne out by partitives like /tule+ta/ → *tulta*, not **tula*), and that *e*-Deletion precedes Consonant Gradation. This last ordering is confirmed by stems that contain a gradating consonant before closed syllables created by *e*-Deletion (1), such as /ytime/ 'nucleus':

(16)

nom. sg.	part. sg.	gen. sg.	
ytime	ytime+tä	ytime+n	
ϕ	*ϕ*	—	*e*-Deletion (1)
ydim	ydim+tä	—	Consonant Gradation (14)
ydin	ydintä	ytimen	Other rules

In the following derivations involving /rakkase/ 'dear', *s*-Deletion also applies; here, the stem-final alternations follow the pattern of *vieras* (see rule (7b) and note 6).

(17)

nom. sg.	part. sg.	gen. sg.	
rakkase	rakkase+ta	rakkase+n	
ϕ	*ϕ*	n/a	*e*-Deletion (1)
n/a	n/a	*ϕ*	*s*-Deletion (7a)
ϕ	*ϕ*	n/a	Consonant Gradation (14)
n/a	n/a	a	Assimilation (7b)
rakas	rakasta	rakkaan	Output

2. Role of the CV Tier

2.1 Empty Consonants

Consider now the so-called first infinitive, with the forms shown in (18):

(18)

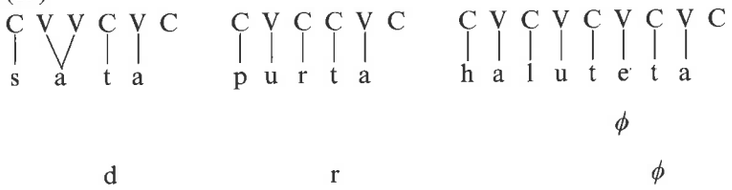
	Stem	*First infinitive*
a.	pese	pestä
	potkaise	potkaista
b.	naura	nauraa
	onnistu	onnistua
c.	saa	saada
	pure	purra
	tule	tulla
	mene	mennä
d.	halute	haluta

As these examples show, the alternation *ta* ~ *da* (*na*, *la*) ~ *a* is determined by exactly the same conditions as the alternation *ten* ~ *den* ~ *en* in the second infinitive displayed in (9)–(13). This comes as no surprise as far as the *-a* forms in (18b) are concerned, because *t*-Deletion will apply after a short vowel to derive *-ta* → *a* in just those cases. The weak forms (*-da*, etc.) in (18c) do at first glance pose a problem; we have seen that the *d* of *-den* comes by Consonant Gradation from *t* in the onset of a closed syllable, yet the syllable *-da* is ostensibly open. The forms in (18d) seem equally puzzling because, from underlying /halute+ta/, we would expect **halutta* rather than *haluta*.

To deal with these facts, we postulate that the first infinitive ending is represented abstractly as C V C. That is, it ends with an unspecified

consonant, which we take to be a slot in the syllable structure that has no segmental material associated with it. Given this assumption, the following derivations take place:

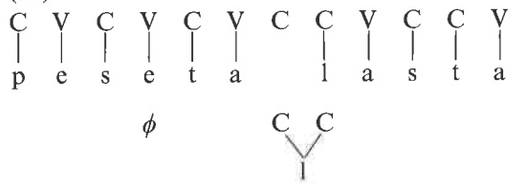
(19)



e-Deletion (1)
Consonant Gradation (14)
Output

In other words, the morpheme-final C of the first infinitive ending closes the syllable of the ending and therefore triggers Consonant Gradation. At the end of the derivation, this fleeting C, if it is not affiliated with a segment, remains unassociated. However, in sandhi environments that C will surface affiliated with the consonant-initial segment of a following word.

(20)



e-Deletion (1)

Spreading
Output

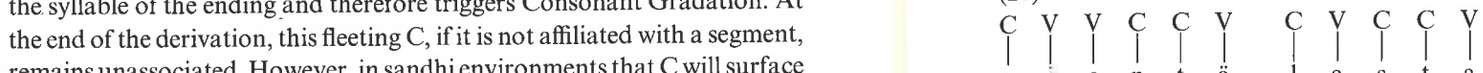
pestäl lasta 'to wash the child'

Contrast the behavior of the first infinitive ending in (20) with, for example, the partitive *-ta* that is underlyingly an open syllable by virtue of having no fleeting C in its representation. Consequently, it triggers neither Consonant Gradation—as already seen in tables 1 and 2—nor gemination in sentence sandhi, as in (21):

Table 5

	'healthy'	'wrist'
a. nom. sg.	terve	ranne
part. sg.	tervet+tä	rannet+ta
b. nom. pl.	tervee+t	rantee+t
gen. sg.	tervee+n	rantee+n
iness. sg.	tervee+ssä	rantee+ssa
abl. sg.	tervee+ltä	rantee+lta
c. ess. sg.	tervee+nä	rantee+na
d. ill. sg.	tervee+seen	rantee+seen
e. iness. pl.	terve+i+ssä	rante+i+ssa
abl. pl.	terve+i+ltä	rante+i+lta
ess. pl.	terve+i+nä	rante+i+na
f. ill. pl.	terve+i+{hin, siin}	rante+i+{hin, siin}
g. part. pl.	terve+i+tä	rante+i+ta
h. gen. pl.	terve+i+{den, tten}	rante+i+{den, tten}

(21)

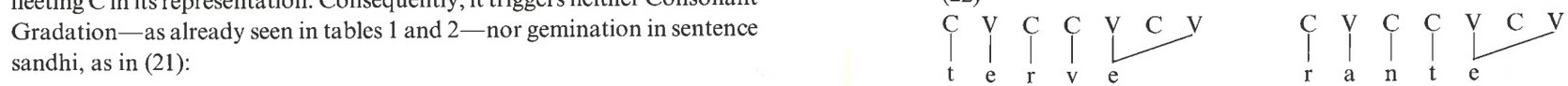


pientä lasta 'the little child' Output

2.2 Contracted Stems

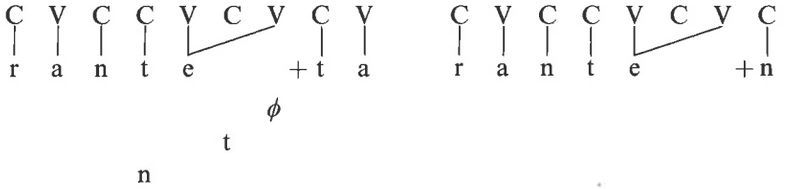
Reverting to nouns, we next examine the type of declension illustrated in table 5 by *terve* 'healthy', *ranne* 'wrist'. Since these stems geminate in sandhi (*tervel lapsi* 'a healthy child', *rannekkello* 'wristwatch'), we might expect them to end in underlying unspecified C. But we have already concluded that consonant stems in the nominal system arise by *e*-Deletion from underlying vowel stems (e.g., *sammal* from /sammale/, as in table 1). It follows that the underlying representation of *terve*, *ranne*, etc. must be /terveCe/, /ranteCe/. More precisely:[9]

(22)



If these underlying forms are assumed, the entire paradigm of table 5 can be derived by the rules already developed for the simpler paradigms of tables 1–4.

(23)



rannetta ranteen

e-Deletion (1)
Spreading
Consonant Gradation (14)
Output

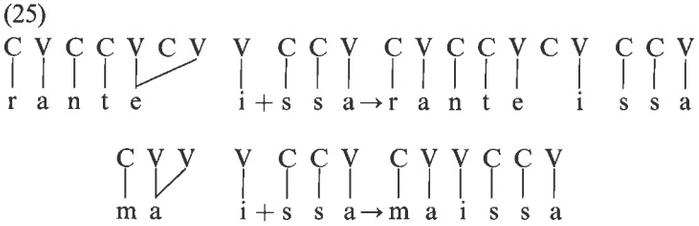
2.3 Shortening

Before the plural affix *i*, the stem is shortened by the following general rule of Finnish phonology, exemplified in (25):

(24)
Shortening

$$\overset{V}{\underset{[\ ]}{\vee}} \rightarrow \phi \,//\, [+\text{voc}]^{10}$$

(25)



Note that Consonant Gradation is inapplicable in these derivations since its structural description is never met.

2.4 *Vapaa* as a Contracted Stem Type

Paradigms of the type shown in table 5 are very common when the last specified stem vowel is *e*, but they barely occur otherwise. The two we know

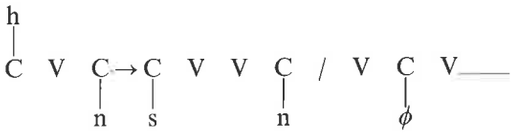
Table 6

	'free'
a. nam. sg.	vapaa
part. sg.	vapaa+ta
b. nom. pl.	vapaa+t
gen. sg.	vapaa+n
iness. sg.	vapaa+ssa
abl. sg.	vapaa+lta
c. ess. sg.	vapaa+na
d. ill. sg.	vapaa+seen
e. iness. pl.	vapa+i+ssa
abl. pl.	vapa+i+lta
ess. pl.	vapa+i+na
f. ill. pl.	vapa+i+{hin, siin}
g. part. pl.	vapa+i+ta
h. gen. pl.	vapa+i+{den, tten}

of are *kiiru* 'hurry' (dialectal for *kiire*) and *ori* 'steed', which are supposed to have the partitives *kiirutta*, *oritta*, the genitives *kiiruun*, *oriin*, and so on. What instead normally occur are stems in *-aa*, *-oo*, *-uu*, which in turn are not matched by stems in *-ee* (setting aside loans like *kamee* 'cameo'); see table 6.

The near-complementary distribution of the stem types in tables 5 and 6 invites setting up the latter as ending in underlying *-aCa*, etc, paralleling *eCe* for the former. The differences between the paradigms are then completely explained by *e*-Deletion. Unifying these paradigms permits a number of generalizations. In the first place, we can now distribute the two sets of allomorphs of the illative ending by the simple rule that *-sVVn* occurs after VCV, where C is empty:

(26)



For example, /terveCe+hVn/ → *terveeseen*, /vapaCa+hVn/ → *vapaaseen*.

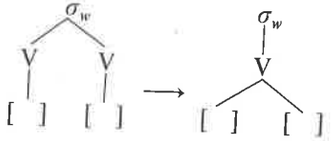
2.5 The *VV Prohibition

A second generalization that can now be sustained is that the Finnish lexicon permits no V sequences, whether long vowels or diphthongs, in unstressed syllables. A language whose lexicon is subject to such a constraint must deal with vowel combinations that arise in unstressed syllables as a result of morphological combinations. One method of adapting such sequences to the constraint is to delete one of the vowels. Another is to make them disyllables. A third is to associate the vowels with a single V slot, that is, to treat them as complex nuclei syllabically equivalent to single vowels, yielding a structure such as (27):

(27)

Finnish chooses this last course.[11] We assume that the mechanism is a rule that collapses two V elements in an unstressed syllable into one:

(28)



This assignment of unstressed diphthongs to single V positions is the key to V + *i* combinations derived in the morphology. These combinations display apparently exceptional behavior with respect to *t*-Deletion and Consonant Gradation, as well as the rule governing illative allomorphy (26). In each case, this behavior becomes regular on the assumption that these V + *i* combinations cannot be represented as VV sequences (branching rimes) because of rule (28) and must therefore be represented as filling a single V position, that is, as branching nuclei.

2.6 Diphthongs as Single V Slots: *t*-Deletion

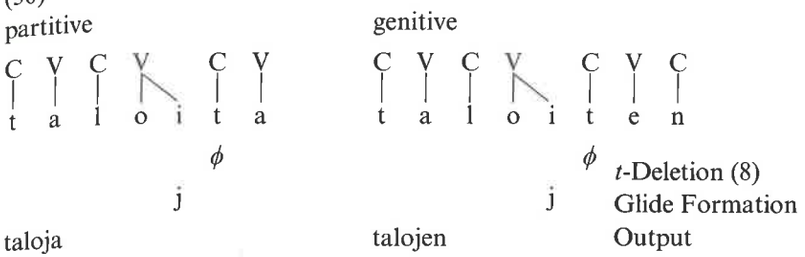
We have noted the puzzling fact that when the plural suffix *-i* is added to stems ending in nondeletable short vowels, the resulting diphthongs do not block *t*-Deletion. The diphthongs that arise from combining the short second syllable of a disyllabic noun stem with the plural suffix (see (g, h) of table 2) act exactly like short nuclei, as seen in (29):

(29)

partitive: talo+i+ta → talo+i+a → taloja
genitive: talo+i+ten → talo+i+en → talojen

Given the representation of unstressed diphthongs as single nuclei, the correct forms are derived as follows:

(30)



Far from being anomalous, the operation of *t*-Deletion in (29) is precisely what is expected given that (28) forces derived V + *i* sequences to be represented as single V positions. In the representation (30) the structural description of *t*-Deletion formulated in (8) is satisfied and the derivation therefore proceeds as shown there.

2.7 Diphthongs as Single V Slots: Consonant Gradation

The rule of Consonant Gradation (14) furnishes another diagnostic for syllable structure. If derived diphthongs in unstressed syllables occupy a single V position, it follows that they do not constitute branching rimes; that is, they do not by themselves close a syllable. That this is indeed true is demonstrated by the plural forms of such words as *lakko*, given in (31). They show that the *i* of the plural does not close the syllable and that the application of (14) depends instead on whether the diphthong is *followed* by a syllable-closing consonant or not (31b):

(31)

a. lako+i+ssa inessive
   lako+i+lta ablative

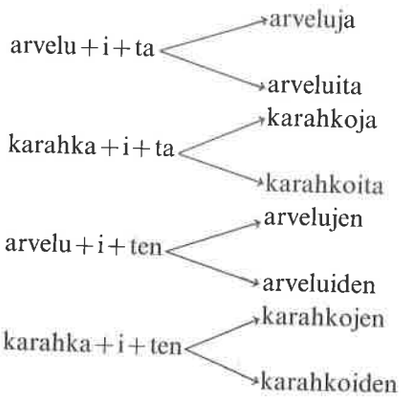
b. lakko+i+na essive
   lakko+i+hin illative

2.8 Consequences of Optional Secondary Stress

The analysis proposed here helps to explain a further set of facts. In *trisyllabic* stems the plural forms undergo *t*-Deletion *optionally* in most

cases. This results in systematic variations of the sort illustrated by the partitives in (32):

(32)

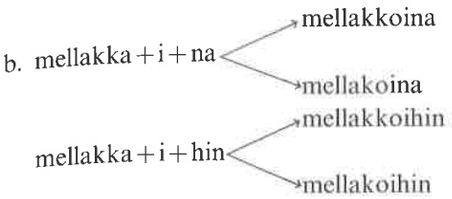


As has long been recognized in Finnish historical linguistics, the possibility of retaining *t* after diphthongs in the third syllable is connected with the fact that syllables in those positions can be assigned a secondary stress. This stress may be optionally assigned to nonhigh vowels, as shown by the optional *t*-Deletion in /karahka+ta/ → *karahkaa*, karahkata (table 1), though the latter form has a marginal status in the standard language. For diphthongs, the option is quite standard. Then, if stressed, the diphthongs will fail to satisfy the structural description of *t*-Deletion. If unstressed, they will undergo the rule. The option of stressing the third syllable therefore accounts for this case of optional *t*-Deletion.

The option of stressing the third syllable has a more remarkable consequence, however. Namely, given (28), if the third syllable is stressed, derived V + *i* diphthongs occurring there will constitute VV sequences (branching rimes); if not, they will constitute a single V. We can test this by means of Consonant Gradation, which we now predict will apply optionally before V + *i* diphthongs in syllable-final position in the third syllable. That this is indeed the case is shown by the paradigm of trisyllabic nouns like *mellakka* 'riot' in (33), where (33b) should be contrasted with the disyllabic case (31b):

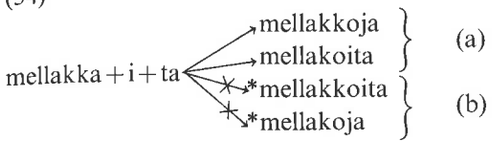
(33)

a. mellakka+i+ssa ——→ mellakoissa
   mellakka+i+lta ——→ mellakoilta



Consequently, in situations where both *t*-Deletion and Consonant Gradation can apply, we predict that one or the other must apply, depending on which syllable structure is chosen (see 34a)). The logically possible cases (34b) where both rules or neither rule applies are excluded because they require incompatible syllable structures, and in fact they do not occur:

(34)



This analysis accounts in the same way for the variants of the genitive plural, such as *lokerojen* and *lokeroiden* (see (h) of table 1). The underlying /lokero+i+ten/ is again assigned two syllable structures that respectively allow and block *t*-Deletion in the suffix. If *t*-Deletion is blocked, the suffix undergoes Consonant Gradation. It follows as before that *t*-Deletion is obligatory in disyllables (e.g., *talojen* but not **taloiden*) and that application of Consonant Gradation correlates with nonapplication of *t*-Deletion (e.g., *mellakkojen*, *mellakoiden* but not **mellakkoiden*, **mellakojen*). An additional allomorph *-tten* (*mellakoitten*) appears in all paradigms under the same conditions as *-den* and is perhaps derived from it by an optional allomorphy rule.[12]

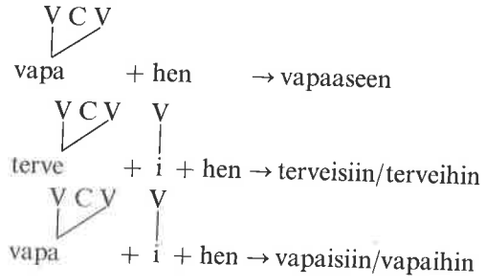
2.9 The Illative Plural

The analysis proposed here also offers a (synchronic)[13] account of the fact that the *-sVVn* allomorph of the illative, obligatory after contracted vowels VCV in the singular, is always *optional* in the illative plural

(where it receives the vowel *i*):

(35)

a. sing. terve + hen → terveeseen



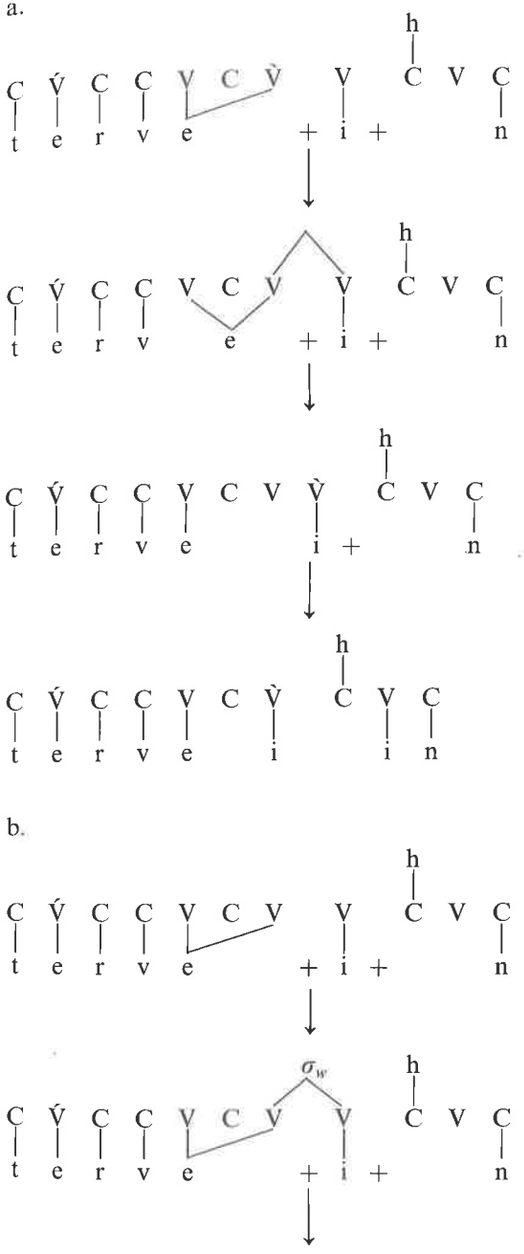
Given the illative allomorphy rule (26) this is exactly what must happen if the syllable structures are those we have just motivated. As before, the option of stressing the third syllable entails a treatment of the derived V + *i* sequence as VV or V. The VV treatment required in the stressed case yields the *-hVn* allomorph (see (36a)), and the V treatment required in the unstressed case yields the *-sVVn* allomorph (see (36b)), in accordance with the formulation of (26).

In (36a) the secondary stress prevents the VV sequence that arose as a result of the morphological introduction of the plural morpheme V from i being eliminated by (28), the rule that eliminates tautosyllabic sequences of unstressed V elements. Because of this, the structural description of (26), the illative allomorphy rule, is not met. Hence, the regular illative ending *hin* is derived.

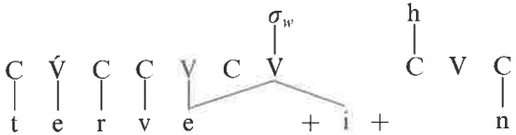
Derivation (36b) differs in that the optional rule of Secondary Stress Assignment does not apply. This gives rise to the inadmissable unstressed tautosyllabic sequence σ_w (V V). Rule (28) deletes one V and causes the remaining one to branch to the segmental tier. The effect of this operation is to produce the contracted vowel sequence V C V, which triggers rule (26), the rule that distributes the illative allomorphs. Because its structural description is now met, the *siin* allomorph is selected. The structural description of Shortening (24) is now met. Because the V branches as V (e i), only the link between the V and the *e* is deleted (in accordance with our interpretation of (1)).

(36)

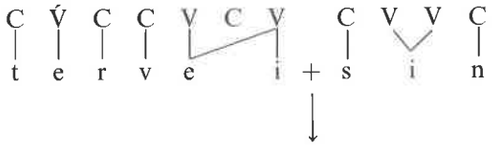
a.



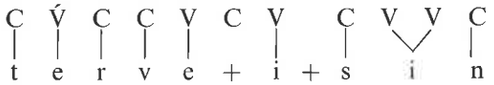
b.



(28)



(26)



Shortening (24)

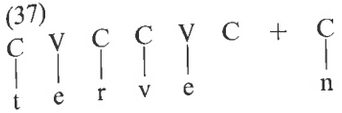
3. Conclusion

We have argued for an analysis of Finnish where all noun and verb stems end in underlying vowels and no contiguous V slots occur in unstressed syllables. On this basis we have demonstrated that several unsolved problems in Finnish phonology yield to a nonlinear analysis that makes use of multiple associations between segments and syllable structure slots. In particular, the bewildering proliferation of optional allomorphs in the genitive, illative, and partitive plurals can be traced to alternative syllable structures assigned to vowel sequences in polysyllabic words, depending on whether they are stressed or unstressed.

The advantages of the autosegmental theory used here also emerge in the treatment of the "empty" consonant as a syllabic position with no segmental substance of its own. This accounts for the occurrence of consonant gradation in such forms as the first infinitive, where previous analyses either have assumed some arbitrary consonant to be deleted or have turned to a morphological account of the facts.

The assumptions of lexical phonology eliminate some apparent problems in the autosegmental approach. Clements and Keyser (1981) assume that stems like *terve* end in an underlying C and that an epenthetic V is added in environments complementary to *e*-Deletion (1) in our account. In the derivation of *terveen*, a problem then arises. Given the representation reached before epenthesis—namely, (37)—why does the *n* not spread to the preceding empty C slot?

(37)



And after epenthesis, in the representation (38), why should the rightward spreading of *e* take precedence over the leftward spreading of *n*?

(38)

Given our assumption that the underlying stem ends in CV and that the rules, being lexical, apply cyclically, the correct outcome is predicted without recourse to ad hoc conventions. The final V slot of the stem (39)

(39)

must be associated on the first cycle; in effect, in the lexical entry itself. Hence, leftward spreading of *n* is precluded.

Notes

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We would like to thank G. N. Clements for giving us the benefit of a careful reading of our manuscript and for several valuable suggestions that we have incorporated into the text.

1. A precise theory of nonlinear phonology based on these assumptions is worked out in Clements and Keyser (1981), where Finnish material is also discussed and the use of empty C slots is proposed. See also chapter 11 for Prince's independent discussion of Finnish in a similar nonlinear framework. We are heavily indebted to Wiik's (1967) work on Finnish phonology, from which we have adopted the basic consonantal processes assumed in our analysis.

   Our treatment depends on a nonlinear approach to syllable structure but is compatible with most of the recently proposed versions of this approach. For practical purposes, our notation can be converted into that of Clements and Keyser (1981) by suppressing the binary branching in the syllable and into that of Kiparsky (1979, 1982) by taking "C" and "V" as denoting terminal "W" and "S," respectively.

2. The rule lowering *i* to *e* applies after *e*-Deletion (1); hence, *papereita* < *paperi*+*i*+*ta* beside *sammalia* < *sammale*+*i*+*ta*.

3. An exception is *mies* (gen. *miehen*) 'man'.

4. Like all the rules discussed in this paper, this is a lexical (cyclic) rule and is therefore subject to the Strict Cycle Condition (itself a special case of the Elsewhere Condition; see Kiparsky (1982)). This blocks its application in underlying *ti* sequences, as in *koti* 'home'.

5. Alternatively, the underlying vowel could be *-a* and (1) could be extended to delete stem-final *-a* in trisyllabic verbs.

6. In a fuller autosegmental account, the change of *s* to *h* (7aii) amounts to a deletion of the oral specification of *s*, leaving *h* on the laryngeal tier. As a result, Assimilation (7b) can be defined on vowels adjacent on the oral tier. Moreover, the vowel *e* can be treated as the unspecified ("default") vowel of Finnish, receiving its value automatically by Spreading if there is an adjacent vowel, and otherwise spelled out as *e*. On this account, (7b) is not a rule of Finnish.

```
                               h
                               |
7. Or, more precisely, from    C V C (see note 6).
                                   |
                                   n
```

8. Voiced geminate stops, which occur only in recent unassimilated loans, are also subject to Consonant Gradation: for example, *digata, diggaa, digannut* 'dig, appreciate'. The simplest formulation of the rule for the native vocabulary correctly predicts that the rule will extend to the foreign vocabulary in this way (see Halle (1977b) for a similar point).

9. These underlying forms are dictated by the Obligatory Contour Constraint.

10. Because (24) is formulated as a mirror-image rule, it will correctly apply in derivations such as the one for *koita* 'moths' (part. pl.), which we represent as follows:

(i)

```
C  V  V    V   C  V
|  |  |    |   |  |
k  o  i    i   t  a      Underlying representation

C  V  V  V  C  V
|  |   \/   |  |
k  o    i   t  a         Obligatory Contour Constraint

C  V  V  C  V
|  |  |  |  |
k  o  i  t  a            Shortening (24)
```

11. That diphthongs can be analyzed as branching nuclei on structural grounds has been suggested before; see Bloomfield (1933, 135) on English [yuw] and Rochette (1981) on French [wa].

12. The genitive plural involves several additional complications that we only mention here. The plural suffix *-i* may optionally be omitted in *e*-stems, in which case *-ten* reveals itself as an exception to Consonant Gradation. For example:

(i)
/tule + ten/ → tul + ten 'fire' (gen. pl.)
(not *tullen)

This deletion of plural *i* in the genitive is subject to the same consonantal constraints as *e*-Deletion; compare *tulten, vetten* beside *savien, nimien* in table 2. These facts suggest that this morphological deletion of *i* and *e*-Deletion (rule (1)) can be collapsed into a more general rule.

13. The illative allomorphs have a complex history and dialectal distribution (see Itkonen (1966a, b)); outside of the standard language analyzed here, they may be governed by different principles.