MOVE as AGREE and I(nternal) MERGE in Phonology

Abstract:

In this paper we will claim that CV-metathesis is best understood as a compound of two basic operations: AGREE and I-MERGE. These produce the surface effect of movement (cf. Chomsky 1998) but without an aggressive and over-generative operation (i.e. MOVE). Like Wh-Movement, we claim that CV-metathesis' derivation could he halted at two logical points: post AGREE and pre I-MERGE, *and* post AGREE and post I-MERGE. The latter is full CV-metathesis while the hypothesised intermediate step surfaces as an *echo vowel*. After hypothesising this link, we proceed to locate the trigger for these processes with the understanding that two derivational analogues should be triggered identically. Looking at Leti and Balantak we come to the firm conclusion that CV-metathesis and echo vowel formation are *both* triggered by violations of the ECP, where un-p-licensed empty nuclei are always the locus of *both* echo vowels and CV-metathesis. We then turn to diachrony, where Southern Nyungar and Tsou show us, (respectively) that CV-metathesis can be triggered by an ECP violation and that echo vowels *have* been an intermediate step in the acquisition of full CV-metathesis. We conclude with some implications our theory has for the careful examination of phonological operations.

Keywords: Government Phonology, Phonological Operations, MOVE, AGREE, Internal MERGE, Metathesis.

1. Introduction (Schwa-Zero as CV-Metathesis?)

The literature on CV-metathesis often includes what Government Phonology (GP) would term: *schwa-zero alternations* which if we take a surface-only approach do look like CV-metathesis. We will not include these in our discussion of CV-metathesis as schwa-zero alternations are effectively explained in GP as sequences of empty nuclei and their interaction with proper government (2). Any theory which allows *empty categories* must have strong restrictions on these categories in order to prevent hyper-generation of impossible structures. We take the following theoretical assumptions as axioms.

1) Empty Category Principle[1] (Kaye et al. 1990; Charette 1990):

a) A category may be empty and phonetically uninterpreted iff it is p-licensed.

b) A category may be p-licensed by being word-final (parametrically specified) or in a good proper government relationship.

2) Proper Government[2] (ibid):

a) A nucleus may properly govern an adjacent (rightward) empty category iff it is itself not p-licensed (by any means).

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[1] slightly modified from the source
[2] Also slightly modified from source

(3) is a case which shows typical schwa-zero alternation and (4) demonstrates how in certain contexts schwa-zero alternations can indeed look superficially identical to CV-Metathesis.
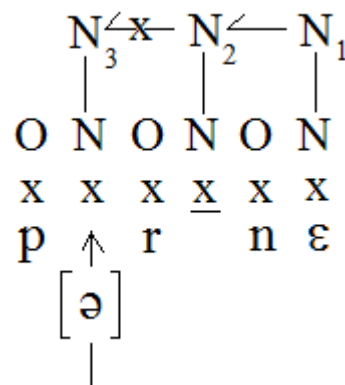
3) Tocharian A (Koller 2008)

a.   wəs   →   ws-a: 'give'

b.   pər - tər   →   prantər   'carry'

c.   nəs   →   ns-ac   'I'

4) Cajun French (Lyche 1995)

a.   grəɲe   →   gərɲe   'attic'

b.   prənɛ   →   pərnɛ   'took'

5) Schwa-Zero in Cajun French (4b)

In (5) we can see the basic operation which leads to a schwa epenthesis. N1 is not itself p-licensed and therefore may properly govern N2 in accordance with (2). N2 is properly governed and therefore *may* be p-licensed. If N2 becomes p-licensed it is no longer a good proper governor; therefore N3 may not be properly governed and not have the option of being p-licensed. Because N3 is a non-p-licensed empty nucleus it may not remain phonetically unexpressed and so must surface with some default phonetic material (a schwa).

If *for any reason* a language has a stem with an empty nucleus and this empty nucleus finds itself p-licensed in one context and non-p-licensed in another the surface effect will be one of apparent 'switching between the positions of C and V' (see N3 in (4)). However, the vocalic selection of the vowel is determined *globally* by the grammar in question: [ə] in French and Tocharian and European Portuguese, [ɨ] in Turkish and Moroccan Arabic, [i] in Yawelmani (and so on). However, in what we will term true CV-metathesis, the vowel quality of the 'switched' vowel is *lexically specific* which means we cannot generate it from as simple a global generalisation (as we can with schwa-zero alternations):

6) Klallam (Stonham 1994)

a.   tʃkʷu   →   tʃukʷ   'shoot'

b.   xtʃ'i   →   xtʃ'i   'scratch'

(c.   tʃkʷə   →   tʃəkʷ   'burn'[3])

The above process gives the surface appearance of lexically-specific vowel *movement*.

2. Can we formally explain it?

(CV-)Metathesis has never been explained in GP; presumably because it was perceived to challenge the *projection principle* (licensing relationships remain constant throughout the derivation (Kaye et al. 1990)). Without immaturely discarding the projection principle (*contra* Park 2004) we are obliged to explain what in CV-metathesis looks like a manipulation of phoneme linearity which may skip over phonemes on the melodic tier:

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[3] We shall turn specifically to this example in the conclusion

7) Hypothetical example of CV-metathesis

a.   amti   →   mati

b.   amit   →   amti

There are various intuitive notions to explain the process although as I will show none of the intuitive notions lead anywhere but toward gross over-generation of predicted data.
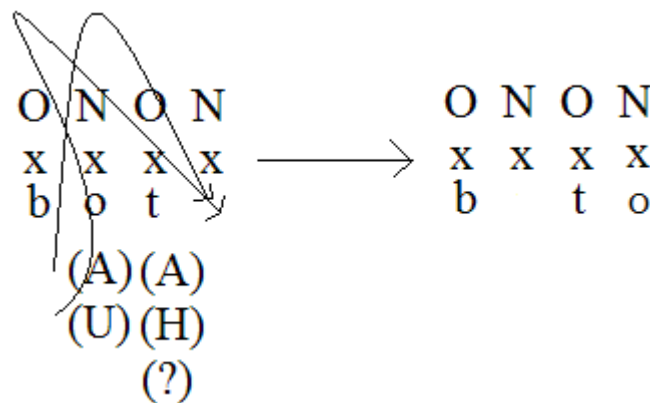

Perhaps the *whole* nucleus is re-aligned as we might imagine by adopting a sort of connectionist model of phonology (8):

8) The nucleus literally changes its linear order (re-linearisation)
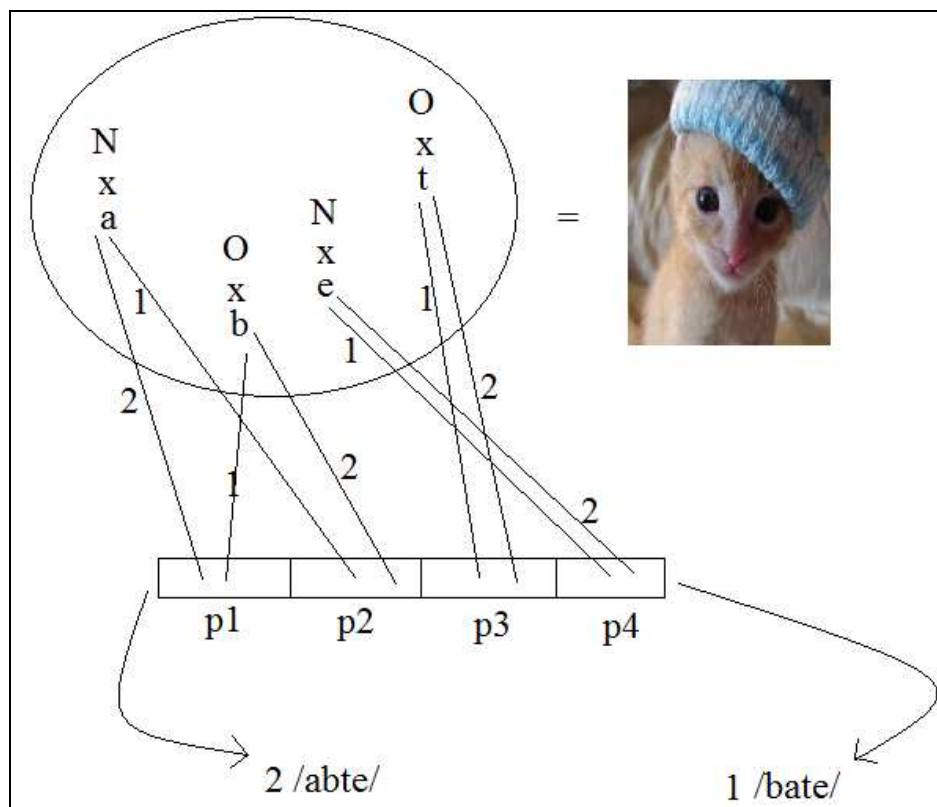
Although, perhaps, what is happening is elements from a nucleus *moving* to another nucleus (9):
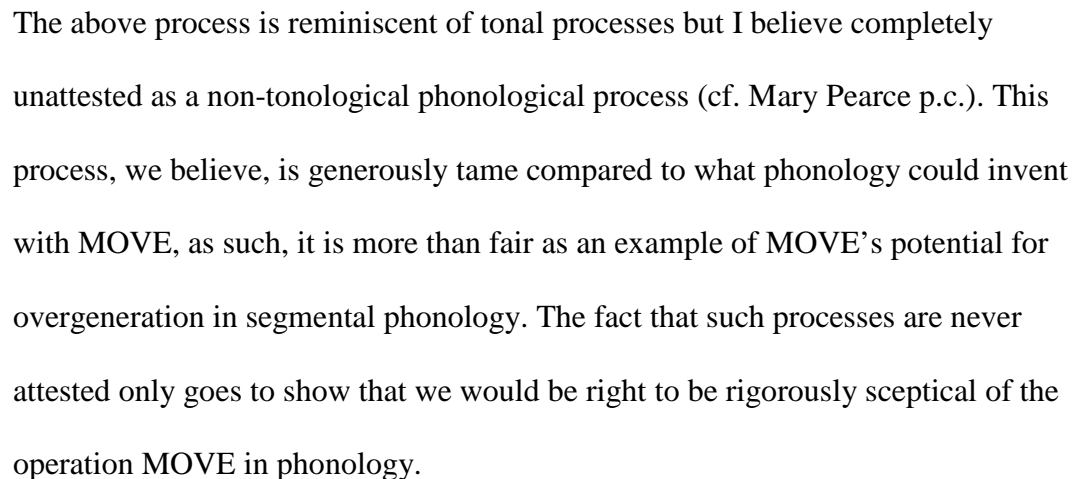
9) The elements are moving to the final nucleus:

O N O N   O N O N
x x x x   ⟶   x x x x
b ɔ t   b   t o

(A) (A)
(U) (H)
(?)

In (8) and (9) we come up against two problems; the first is that both movement explanations can be formulated in absolute isolation of any specified/formal, non-ad-hoc trigger for such a movement. The second problem is that in (8) and (9) we see melodic or constituent movement mirroring what looks like movement on the surface (6a/b). But to represent what looks like movement with actual movement is very dangerous because of the over-generation of phonological processes we would predict to exist if we posited the operation MOVE in phonology. This, for us, is absolutely non-trivial.

To our mind, we are obliged, as phonologists, to discuss not only the formal details of phonological objects as we do in representational phonology but also *the formal details of the operations* that manipulate these objects, as we do in optimality theory (OT). GP's parameter-based model largely ignores the latter assuming that parameters are *how* phonology works, but if we are to be formally rigorous, it is only true to say that parameters are the *causes/triggers* of the manipulation of phonological objects. So in phonology, a parameter would trigger the need for a manipulation/repair which would be associated to a specific operation which acts on a specific phonological object (cf. a focus on repair strategies in Calabrese 2005:ch2). This said, explorations

of the formal operations of phonology, acting on a predominantly representational framework, are only very recently being explored (Ulfsbjorninn forth.; Samuels forth). But if we were to accept that CV-metathesis was to be analysed in a way consistent with its semblance of movement, one would imagine that an operation such as MOVE would be involved (cf. Kayne p.c.). My claim would be that this move would be wildly over-generative as the following hypothetical example of a predicted MOVE-operation goes to show:

10) MOVE applied to all the vowels in a hypothetical word

The above process is reminiscent of tonal processes but I believe completely unattested as a non-tonological phonological process (cf. Mary Pearce p.c.). This process, we believe, is generously tame compared to what phonology could invent with MOVE, as such, it is more than fair as an example of MOVE's potential for overgeneration in segmental phonology. The fact that such processes are never attested only goes to show that we would be right to be rigorously sceptical of the operation MOVE in phonology.

3. Unpacking MOVE in Syntax

In syntax the operation MOVE has 'recently' been unpacked into two more basic operations: AGREE and I(nternal)-MERGE (Chomsky 1998). These operate in the following way:

11)

a. X^{+Q} a chaffinch [is] [what]$^{-Q}$

b. Probe is activated and searches for its goal (Identify +Q and –Q)

c. AGREE

d. X a chaffinch [is] [what]$^{+Q}$

e. I-MERGE

f. what a chaffinch is [*what*]

g. PF deletes copies

h. what a chaffinch [is] [~~*what*~~]^{4}

Ignoring (most) of the issues surrounding the derivation in (11) we notice that the AGREE and I-MERGE combination (along with the deletion of copies by PF) produces the *effect* of movement without invoking an operation specifically for this purpose.

4. Unpacking MOVE in Phonology

What the break down of MOVE in (3) allows us to understand is that there is no basic operation in syntax which could be termed MOVE, rather, it is a composite of basic operations which together produce the *mirage of movement*.

Crucially for our purposes, the derivation in (11) can be theoretically stopped at two points, previously impossible with a basic MOVE operation. One stop in the derivation could be made immediately after AGREE (where the unvalued feature has

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[4] Ignore the copula

become valued: [a chaffinch is what][5]) or you could stop the process after the I-MERGE which would result in: [what a chaffinch [is]][6]. Our argument is that the same logic could apply to phonology: where MOVE was an aggregation of AGREE and I-MERGE (12):

12) AGREE + I-MERGE in CV-Metathesis

a. ok → ko

b. ok → AGREE → oko → I-MERGE (+ delete copies) → ko

The above claim that AGREE and I-MERGE are could producing CV-Metathesis is particularly beneficial because we are able to create a derivation for something that looks like movement without having to posit an operation that leads to overgeneration or violating the projection principle (*contra* Park 2004). AGREE and I-MERGE could both, in isolation, be perfectly normal operations of phonology and not introduced simply to explain a difficult phonological phenomena. AGREE and I-MERGE as phonological operations could also help us understand differences we see in the operation of other phonological processes which are superficially similar while being operationally very different, e.g. *spreading*.

13) AGREE in Phonology

a. k + ia → tʃia

b. i + a → ie

14) I-MERGE in Phonology

a. k + ia → tʃa

b. i + a → e

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[5] this is equivalent to in situ question formation in Mandarin
[6] this is equivalent to the question formation of English

In (13) the onset or nucleus would simply be agreeing for the element /I/ while in (14) we would see I being literally merged with the onset or nucleus (along with the deletion of the redundant element copies)[7].

We here formalise the two operations as follows:

15) **AGREE**

Establish a relationship of similarity between category X and element(s) Y (in a restricted search space (domain).

16) **I(nternal)-MERGE**

Takes element(s) Y and category X and permanently fuses them into Z in the location of X and leaving only a copy of Y in the location of Y (automatically deleted).

5. Predictions from MOVE as AGREE >> I-MERGE

If our hypothesis is correct we are pleasantly forced to predict that the derivation for CV-metathesis creates an intermediate stage in addition to the final output[8]. This would be *post* AGREE and *pre* I-MERGE (17):

17) post AGREE, pre I-MERGE

a. ak $\rightarrow$ AGREE $\rightarrow$ aka   **end**

b. ok $\rightarrow$ AGREE $\rightarrow$ oko   **end**

c. ek $\rightarrow$ AGREE $\rightarrow$ eke   **end**

We will now show that this intermediate stage exists, both diachronically and synchronically as the little studied but not rare process called 'echo vowel' formation.

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[7] The common diachronic process of i + a $\rightarrow$ ie and then ie $\rightarrow$ a would also be an example of AGREE >> I-MERGE

[8] Although GP is inherently anti-derivational, it still upholds GP's insistence that any representation has a corresponding output (i.e. there are no un-outputtable representations) Kaye (1995).
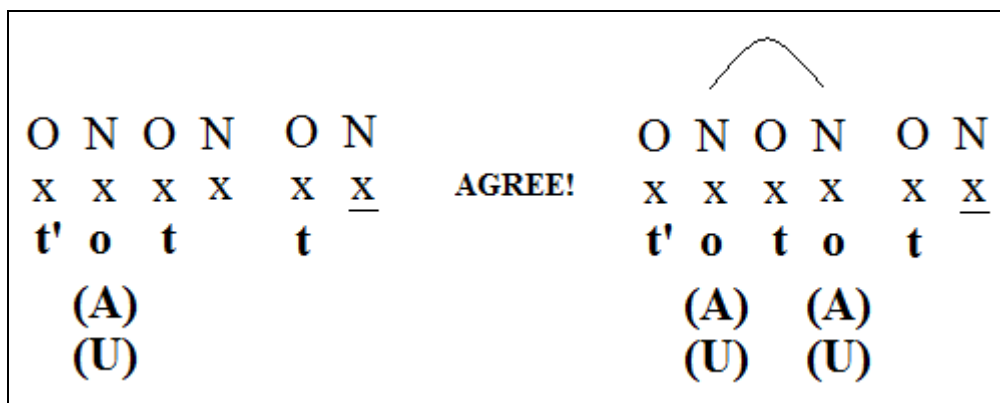
6. Echo Vowels

In echo vowel formation we see the exact copy of a preceding vowel being realised in another position (often leftwards) in a phonological word (18):

18) Mainland Comox (Kroeber 1989:110 in Rowicka 2006)

a.   t'ot-ot   'shoot it'

b.   ʔep-et   'wipe it'

c.   tʃ'ag-at   'help him'

The above process also found in Munda languages (Peterson 2007) and Shoshoni (Matsumoto 2008), we see that the nucleus of a suffix (in this case) becomes totally assimilated with a non-adjacent nucleus within the main verb. Such cases, we argue, are both precursors to CV-Metathesis and are diachronically and synchronically analogous to half of full CV-Metathesis. We would argue the following derivation for (18a) is as follows:

19) Representation of (18a)

From here to full metathesis one would simply have to I-MERGE the underlying /o/ with the empty nucleus and delete the copy producing: /t'(ɵ)tot/.

We believe that this is the first formal *theoretical* link between echo vowels and CV-metathesis. Our hypothesis, therefore, is that CV-Metathesis is a product of the

combination of AGREE and I-MERGE with echo vowels functioning as an intermediate step to the full process. However, we have not yet provided a trigger for either process.

7. The Trigger

If our hypothesis is correct the trigger for echo vowel formation and CV-metathesis would have to be unified and luckily even a short excursus into CV-Metathesis seems to yield a convincing answer to the question: why should echo vowels and CV-Metathesis exist at all. We argue that the trigger in both cases is the Empty Category Principle (ECP).

8. The Evidence for ECP driven CV-Metathesis in Leti

In Leti (Hume 1997:3) we have two contexts for CV-metathesis: before the second member of a compound beginning with a CC (20) and word-finally (21). In both cases, we will demonstrate the environment for the manifestation of CV metathesis is an un-p-licensed empty nucleus[9].

20) Before a #CC in a Compound

	URs		SFs		
a.	ukar + ppalu	→ ukrappalu	finger/toe + bachelor	index finger
b.	ukar + mwani	→ ukramwani	finger/toe + man	middle finger
cf. c.	ukar + lavan	→ ukarlavna[10]	finger/toe + big	thumb

21) Word-Finally

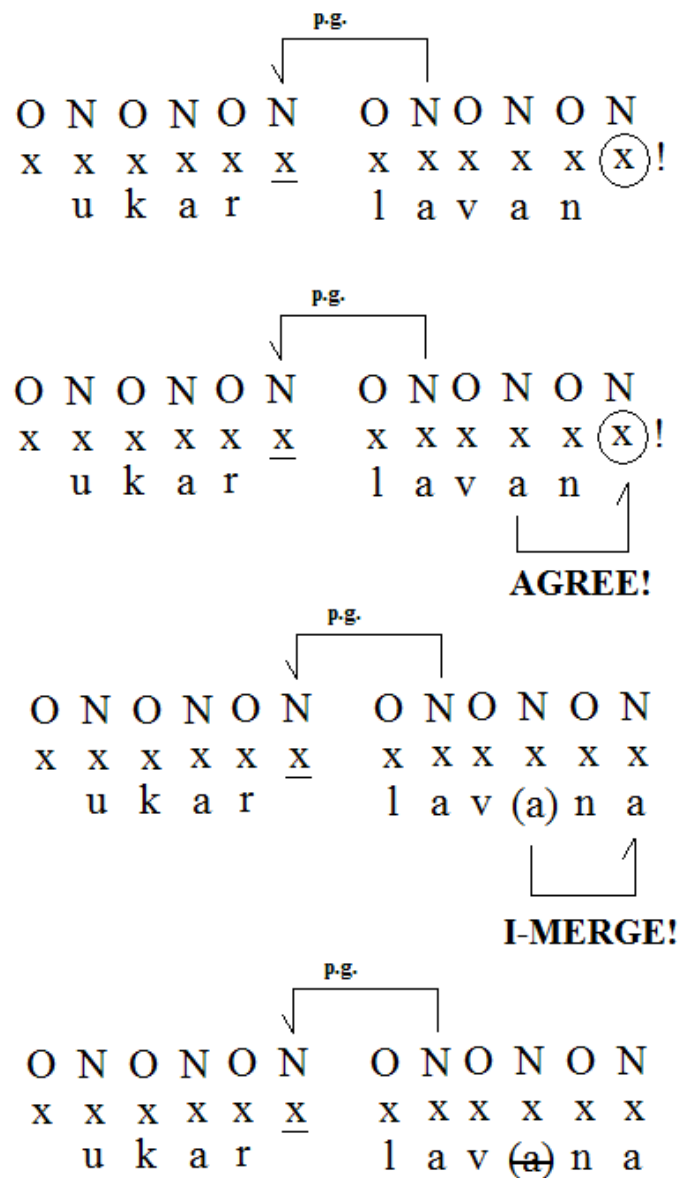|	URs		
a.	urun	→ urnu	breadfruit

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[9] Leti, like its Austronesian relatives is best analysable as a 'CV-language', ie. Obligatory ONON.
[10] We will discuss the word-final CV metathesis seen here as well.

b. bubur → bubru porridge

c. lavan → lavna big

Within (20) we see a clear contrast between (20a-b) and (20c), the critical difference as we will show is that in (20c) there are no word-medial non-p-licensed empty nuclei and also no CV-metathesis. While in (20a-b) we have un-p-licensed empty nuclei and it is these which are the environment for the CV-metathesis (see 22).

22) ECP as the Trigger for CV-metathesis (based on 20a)

O N O N O N   O N O N O N
X X X X X X   X X X X X X
  u k a r   p p a l u

O N O N O N   O N O N O N
X X X X X X   X X X X X X
  u k a r   p p a l u

AGREE!

O N O N O N   O N O N O N
X X X X X X   X X X X X X
  u k (a) r a   p p a l u

I-MERGE!

O N O N O N   O N O N O N
X X X X X X   X X X X X X
  u k (a) r a   p p a l u

13

The CV-metathesis in (21) can also be explained in terms of the ECP. In Leti, the Word-Final Parameter is set to OFF (Kaye 1990 no words may end in a consonant) and, as such, the word-final nucleus is un-p-licensed and again we see an un-p-licensed nucleus triggering CV-metathesis (see 23).

23) ECP as the Trigger for CV-metathesis (based on 20c and 21c)

p.g.

O N O N O N   O N O N O N
x x x x x x   x x x x x (x)!
    u k a r   l a v a n

p.g.

O N O N O N   O N O N O N
x x x x x x   x x x x x (x)!
    u k a r   l a v a n

AGREE!

p.g.

O N O N O N   O N O N O N
x x x x x x   x x x x x x
    u k a r   l a v (a) n a

I-MERGE!

p.g.

O N O N O N   O N O N O N
x x x x x x   x x x x x x
    u k a r   l a v (a̶) n a

These two pieces of data strongly point to the ECP as the trigger for CV-metathesis. But as we said in (7) it is very important that we can show the identical trigger for

both echo vowel formation and CV-metathesis as these are claimed to be derivational (part) analogues. Evidence from Balantak echo vowel formation seems to support the hypothesis that the ECP is the driving force for echo vowel formation.

9. ECP Driving Echo vowel formation in Balantak

Balantak (Pater 2003) presents vowel assimilation highly reminiscent of echo vowel formation. In the following data, we see the verbal prefixes /mVŋ/ and /nVŋ/ combining with a verbal stem. The nucleus of these prefixes appears to be completely underspecified, or in GP terms, the suffixes contain two empty nuclei, one medially and one finally (cf. Kaye 1990):

24) Representation of suffixes in GP /CVCv/

$$
\begin{bmatrix}
\text{O} & \text{N} & \text{O} & \text{N} \\
\text{X} & \text{X} & \text{X} & \text{X} \\
\text{m/n} & & \text{ŋ} &
\end{bmatrix}
$$

25) Balantak vowel assimilation

a. mVŋ + bala → mambala

b. mVŋ + keke → meŋkeke

c. mVŋ + goop → moŋgoop

d. nVŋ + tuluŋ → nuntuluŋ

We argue that the requirement for this vowel assimilation to occur comes from the fact that V, an empty nucleus, must be p-licensed to remain phonetically uninterpreted. However, as all consonant-final words end in an empty nucleus (Kaye 1990; Harris and Gussmann 2002), the V in the Balantak prefixes cannot not be properly governed:

26) Proper Government in (25a)
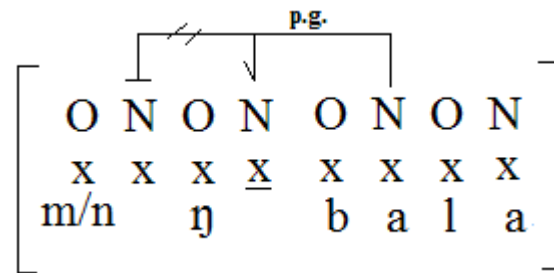
The first nucleus of (26) requires proper-government in order to remain un-interpreted but it will never be able to acquire it with the structure remaining as it is. Therefore, it is forced to be phonetically interpreted. The phonetic interpretation it receives is not a schwa or another grammar specific epenthetic vowel or a product of vowel harmony (see Pater 2003:9); rather, as we see in (25a-d), it is the first vowel of the verb that determines the phonetic realisation of the suffix's unlicensed empty nucleus.

We can see this as completely analogous with echo vowel formation and under our hypothesis it is *the* beginning stage of CV-Metathesis[11], as one of grammar's possible repair strategies; although why some grammars opt for such laborious repair strategies is something that is not well understood[12], but thinking back to Calabrese (2005) we *could* construct the following 'violation and repair strategy' link:

27) ECP Violation

a) Phonetically interpret default vocalic material (from the grammar).

b) AGREE with local nucleus; possible I-MERGE.

d) Delete offending empty category 'reduction' Kaye and Gussmann (1993)[13].

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[11] Hinted at in Blevins and Garrett 1996; Pater 2003

[12] Possibly we totally do not understand economy and we certainly do not have a metric to establish it (Biberauer p.c.).

[13] Largely theoretically obsolescent due to the projection principle, but not practically 'unuseful'

We do not claim to strictly and universally rank the above repair strategies like Calabrese (cf. Ulfsbjorninn 2008 for problems) but to list possible *and* attested repair strategies open to grammar does give us a view of what phonological grammar looks like (contra OT where most things are possible and therefore predicted). So, we claim that the total vowel assimilation is the repair strategy (27b) and also the beginnings of CV-Metathesis (see 28):

28) The Derivation of (25a)
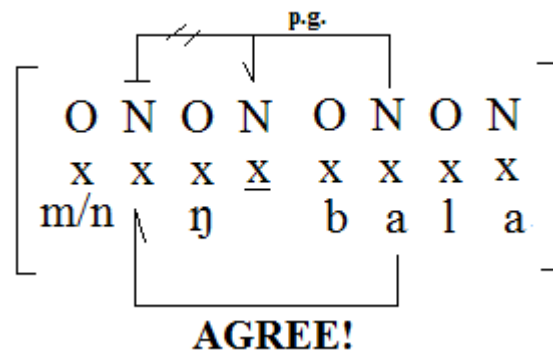
In (28) we see the operation AGREE coming into effect in order to repair the structure. Formally then, (referring back to our definition of AGREE) we have created 'a relationship of similarity between element Y /a/ and category X /empty nucleus/l these surface as agreement so in (28) the first and third nuclei are pronounced /a/.

What we learn from Balantak is that even our hypothesised first stage of CV-metathesis, the echo vowel stage, can be understood to be triggered by the ECP. This evidence in Balantak is converegent with the data in Leti which shows, perhaps even more clearly, the link between the ECP and CV-metathesis is sound. Even more encouragingly, there is also evidence of the ECP triggering CV-metathesis diachronically, in Nyungar (Dench 1990) and Tsou (Zeitoun 2005).

10. The Diachronic Evidence

In Southern Nyungar it appears that the historical loss of word-final vowels may have triggered CV-metathesis (compare to the conservative Northern variety):

> *"Nyungar words which look like having undergone a metathesis process are the result of two phonological processes, the general loss of final vowels (and impermissible codas)"* (Hume 2000, based on Dench 1990)

29) Nyungar

	Northern	Southern	
a.	janka	janak	'devil'
b.	nurrku	nurruk	'egg'

If we translate Dench's (1990) thoughts into GP we could say that Southern Nyungar passed into a phase where it lost the melodic *content* of its word-final vowels. The result of this would have created the following illicit structure:

30) Representation of the illicit version of (29a)
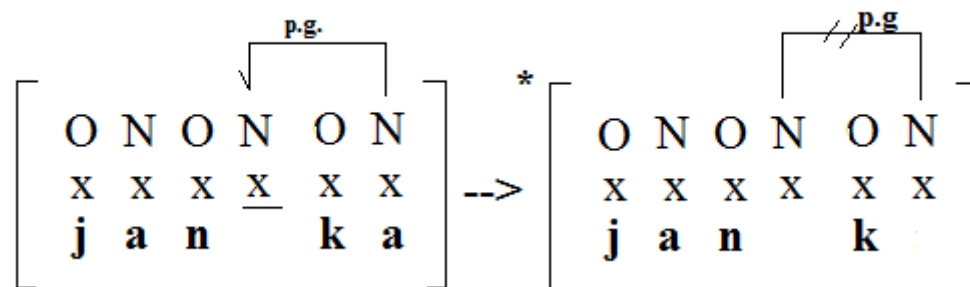
The above is not permissible, it creates a structure with two adjacent empty and phonetically uninterpreted nuclei which is a violation of ECP. We would hypothesise from this that the grammar had previously AGREEd the melodic content of the word-final nucleus with the preceding empty nucleus, creating the intermediate stage

/janaka/[14]. Then the CV-Metathesis would have completed itself by applying I-MERGE which would result in the copies being deleted and the following structure.

31) Derivation of CV-Metathesis in Southern Nyungar (29a)
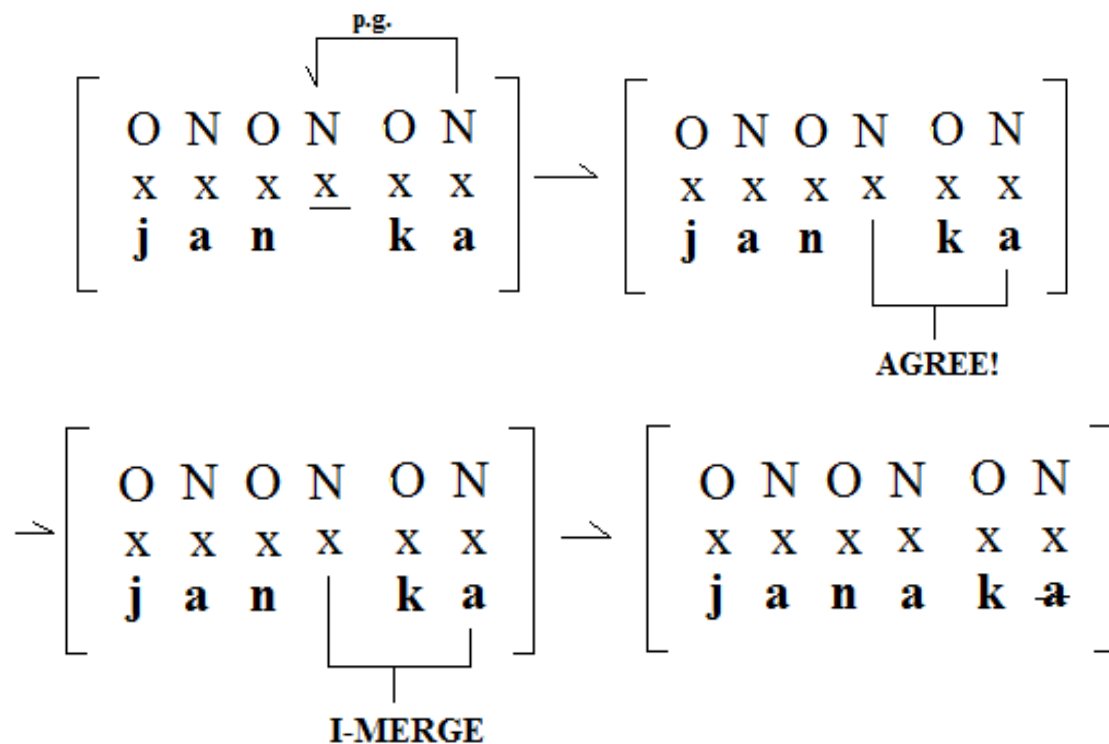
(31) shows us that our view of MOVE as AGREE and I-MERGE makes the intermediate stage /janaka/ an obligatory and predicted stage of the derivation, post-AGREE and pre-I-MERGE. We also note that the literature on the Austronesian language Tsou reports that an echo vowel stage preceded CV-Metathesis (Zeitoun 2005):

32) Historical Development of Word-Structure in Tsou

a. CVxCv

b. CVxCVx

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[14] whether this was ever pronounced I would not guess, but it is our echo vowel stage 1 of CV-metathesis

c. C~~Vx~~CVx

d. CCVx

This historical development runs along the predictions we would make from our hypothetical derivational model for CV-Metathesis.

These diachronic facts strongly support our view that CV-Metathesis is a product of AGREE and I-MERGE which creates a cognitive intermediate stage which we predicts could surface at SF (producing echo vowels).

11. Conclusion

If we look at the Klallam data again, we see (6c) which shows simple schwa-zero alternation, although (6c) is labelled as if it were the same process as CV-Metathesis (Stonham 1994).

6) (repeated) Klallam (Stonham 1994)

a.	tʃkʷu	→	tʃukʷ	'shoot'
b.	xtʃ'i	→	xtʃ'i	'scratch'
c.	tʃkʷə	→	tʃəkʷ	'burn'

In our view of the events which lead to CV-metathesis, (6c) does could never have the same derivation as (6a-b), this is because there is probably nothing in (6c)'s final nucleus to agree with, while in (6a-b) the word-final and medial nuclei AGREE and then the content of the final nucleus is merged into the medial nucleus (deleting the copy).

This odd situation, where two distinct operations fall under the same process, is part and parcel of our general research project which seeks to understand, formally, how

phonological processes actually operate; as opposed to limiting ourselves to labelling processes: metathesis or spreading.

If the Klallam data makes the reader wonder how such a situation could arise, one where the same process is operated in radically different ways, we need only refer to hiatus repair strategies within the same speakers' phonology.

If one of these vowels contains the element [I] or [U] the grammar may spread this element associating it with an onset producing a glide. While if one of these vowels contains no [I] or [U] the grammar uncouples the phonological material of the offending nucleus rendering it unparsable (cf. Calabrese 2005). The same context would produce different hiatus repairs depending exactly on the possibility of a preferred repair strategy being taken. If it is impossible the grammar finds another way. All this is strong nod to Calabrese (2005) who lists repair strategies.

Crucially, what we have shown is that CV-metathesis is best understood without the operation MOVE, which does not lend itself to discussion of a trigger and which would violently overgenerate possible but completely unattested phonological processes. We believe, however, that if we unpack MOVE into AGREE and I-MERGE we can still produce the mirage of movement all the while positing only operations which could make themselves highly useful in a dissected analysis of phonological operations. If we understand MOVE as AGREE and I-MERGE we automatically create the hypothesis of an intermediate cognitive stage of CV-metathesis, one post AGREE and pre I-MERGE. We have shown or reported that there is evidence for this intermediate stage at SF in Balantak, Munda languages etc… thus creating the first fully fledged theoretical link between echo vowel formation and CV-metathesis. We also showed that diachronic evidence supported the hypothesis of there being an intermediate echo vowel stage on the path to metathesis (Tsou). All the

while we have provided a naturalistic trigger to explain why CV-metathesis *and* echo vowels should be found at all. Leti, Balantak showed us synchronically that the ECP was always implicated in their CV-metathesis and the diachrony of Southern Nyungar also provided evidence for an ECP motivated CV-metathesis process.

In short, we believe that the evidence for CV-metathesis being driven by the ECP is beyond reasonable doubt while the operation for CV-metathesis can finally be explained without positing dangerous operations such as MOVE.

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