Stratal Phonology
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Phonology's interactions with other components of grammar

- Are phonology and morphology actually distinct?

- Carry-over from previous derivational stages suggests interleaving of phonology and morphology

Phonology's interactions with other components of grammar

- Long monomorphemes suggest default English stress:

  - Tàtamagóuche
  - Pàssamaquóddy
  - Wìnnepesáukee
  - ròdomontáde
  - àbracadábra
  - Kàlamazóo

  generalization: first syllable secondary stress, penultimate primary stress

- So why these?

  - recìprocálity   *rèciprocálity   munìcipálity   *mùnicipálity
    apòlogétic   *àpologétic   relìgiósity   *rèligiósity

  second syllable secondary stress, penultimate or antepenultimate primary stress

Phonology's interactions with other components of grammar

- Reapply phonology after each morphological operation:

phonology	Wìnnepesáukee	apólogy	
morphology	–	apólogy + etic	/apology + etic/
phonology	–	apòlogétic	*àpologétic

Phonology's interactions with other components of grammar

- Several frameworks for handling this interaction
    - rule-based Lexical Phonology (Pesetsky 1979; Kiparsky 1982; Monahan 1982)
    - Constraint-based Stratal Phonology (Kiparsky 2000, 2015; Bermúdez-Otero 2010)
    - Output-output correspondence (Kenstowicz 1996; Burzio 1996; Steriade 1999)

- Focus of this paper is Stratal Phonology

Roadmap

- Defining Stratal Phonology
- Defending Cyclic Containment
- Morphological implications of Stratal Phonology

What is Stratal Phonology?

- A theory of how phonology interacts with other components of the grammar

- Phonology applies cyclically (as we saw with "apology") over domains defined by certain constituents in the morphosyntactic structure
  - Domains associated with constituents of different rank– stems, words, utterances– obey different phonological generalizations

- Combined with constraint-based parallelist models like Optimality Theory, Harmonic Grammar, or Maximum Entropy
  - Excludes serialist approaches: Harmonic Serialism and OT with Candidate Chains
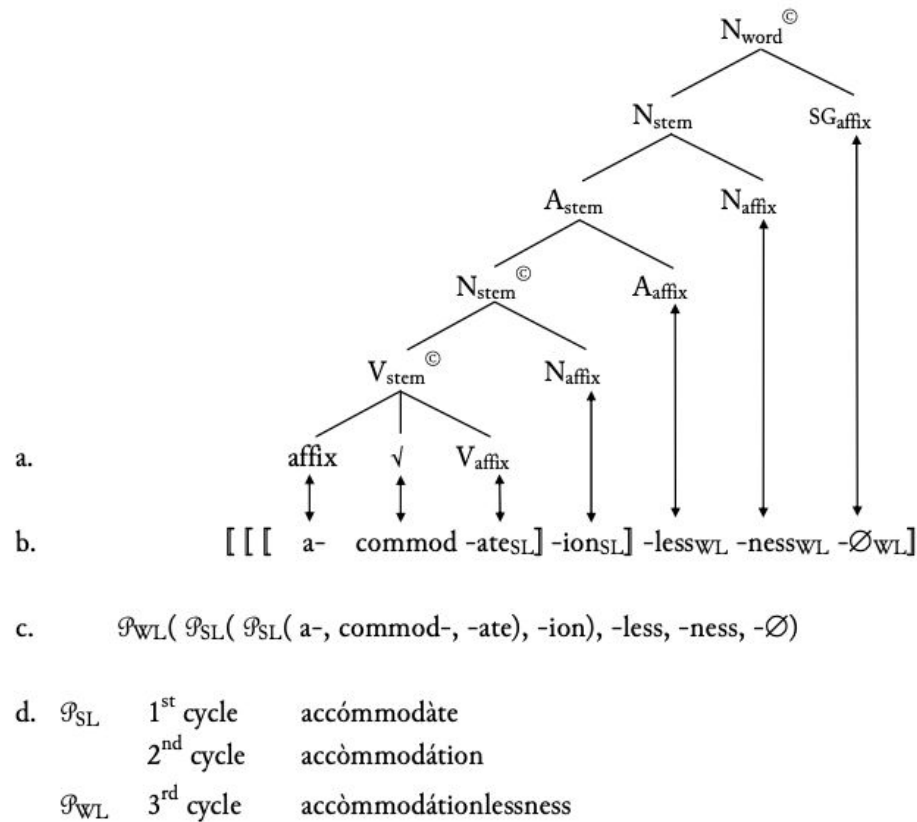
Cyclicity and stratification

- Morphology establishes relationships of exponence between nodes in a syntactic structure and phonological pieces in an underlying representation

- Phonology then maps the exponents built by the morphology onto a surface representation

- This mapping is specified by a composite function:
  - Phonological theory defines a set of $\mathscr{P}$-functions mapping any given phonological input representation i onto a corresponding output o
    - In OT, $\mathscr{P}_r(i) = Eval_r(Gen(i)) = o$

Cyclicity and stratification

- Certain nodes in the syntactic structure can be designated as 'cyclic'
  - Whereby the assembly of exponents associated with a cyclic node provides the argument of the application of a $\mathscr{P}$-function
  - $\mathscr{P}$-functions triggered by higher cyclic nodes apply to results of $\mathscr{P}$-functions triggered by lower cyclic nodes: surface representation of entire expression is obtained by function composition
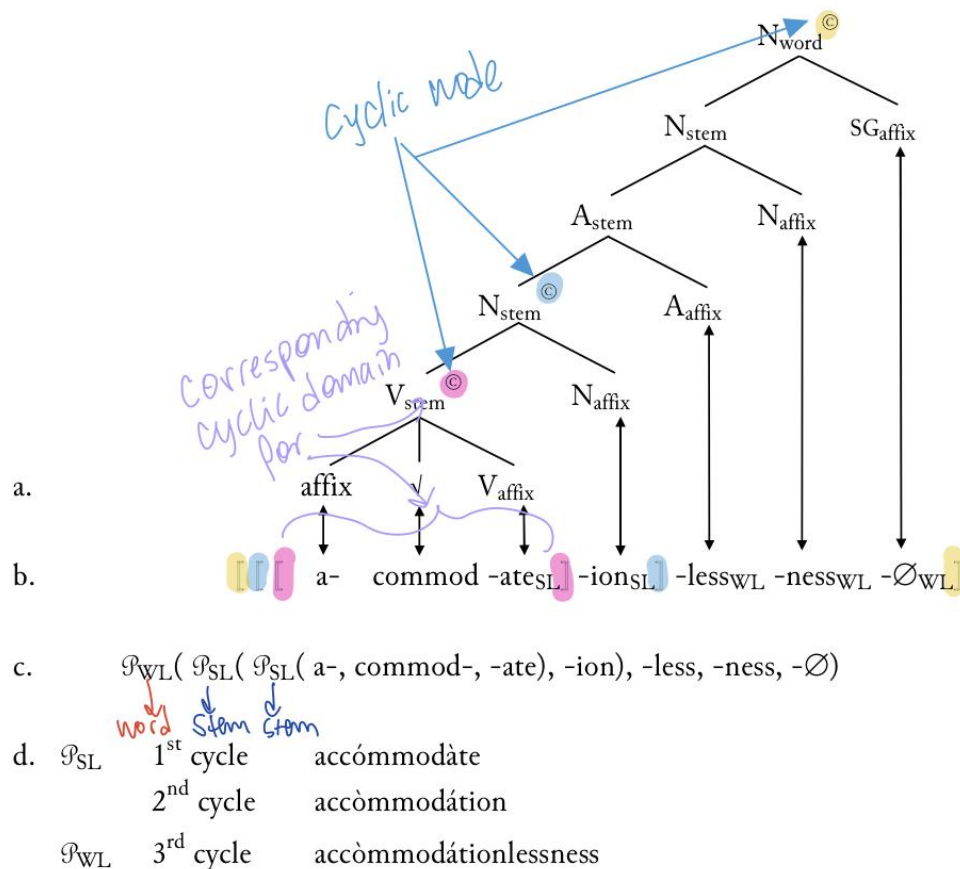
Cyclicity and stratification

(2)

a.

b. [[[a-   commod -ate$_{SL}$] -ion$_{SL}$] -less$_{WL}$ -ness$_{WL}$ -Ø$_{WL}$]

c. $\mathcal{P}_{WL}(\,\mathcal{P}_{SL}(\,\mathcal{P}_{SL}(\,$ a-, commod-, -ate), -ion), -less, -ness, -Ø)

d. $\mathcal{P}_{SL}$ 1st cycle   accómmodàte
          2nd cycle   accòmmodátion
    $\mathcal{P}_{WL}$ 3rd cycle   accòmmodátionlessness

Cyclicity and stratification

(2)

Order of $\mathscr{P}$-function application is determined by morphosyntactic constituency:

the computation of the phonological form of the parts **precedes and feeds** the computation of the phonological form of the whole

a.

b. [[[a-   commod -ate$_{SL}$] -ion$_{SL}$] -less$_{WL}$ -ness$_{WL}$ -$\varnothing_{WL}$]

c. $\mathscr{P}_{WL}(\,\mathscr{P}_{SL}(\,\mathscr{P}_{SL}(\,a\text{-}, \text{commod-}, \text{-ate}), \text{-ion}), \text{-less}, \text{-ness}, \text{-}\varnothing)$

d. $\mathscr{P}_{SL}$ 1st cycle   accómmodàte

   2nd cycle   accòmmodátion

   $\mathscr{P}_{WL}$ 3rd cycle   accòmmodátionlessness

Cyclicity and stratification

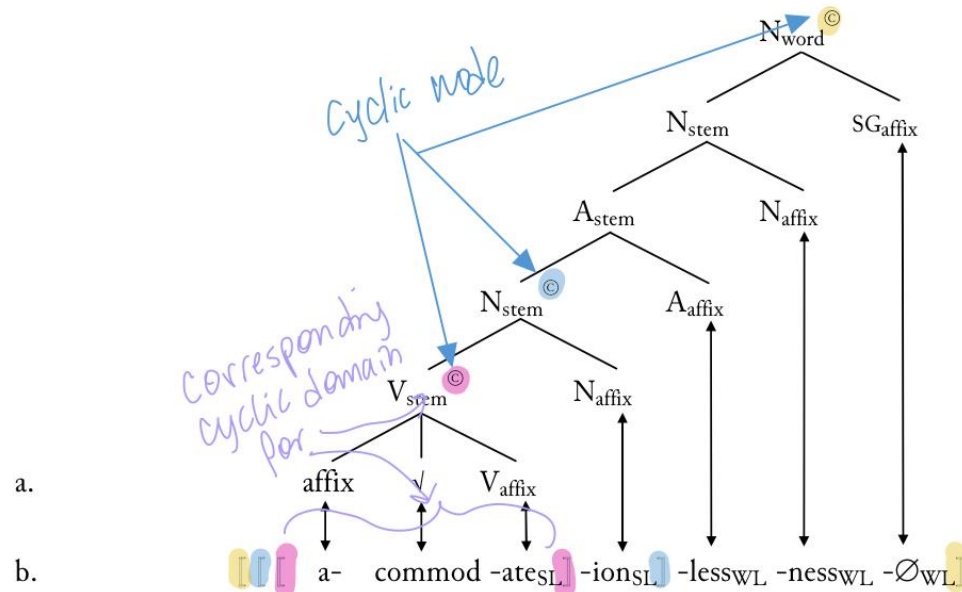- From this, Stratal Phonology predicts that morphosyntactically-induced opacity is subject to Cyclic Containment

Cyclic Containment
In cases of morphosyntactically-induced phonological opacity, a linguistic expression inherits its opaque phonological properties from a constituent defining an immediate cyclic subdomain.

Cyclicity and stratification

(2)

a. [tree structure with nodes: N_{word} (cyclic node ©), N_{stem}, SG_{affix}, A_{stem}, N_{affix}, N_{stem} (© cyclic node), A_{affix}, V_{stem} (© corresponding cyclic domain for), N_{affix}, affix, √, V_{affix}]

b. [[[a- commod -ate$_{SL}$] -ion$_{SL}$] -less$_{WL}$ -ness$_{WL}$ -$\varnothing_{WL}$]

c. $\mathscr{P}_{WL}(\ \mathscr{P}_{SL}(\ \mathscr{P}_{SL}(\ \text{a-, commod-, -ate}),\ \text{-ion}),\ \text{-less, -ness, -}\varnothing)$

d. $\mathscr{P}_{SL}$ 1st cycle   accómmodàte

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Cyclicity and stratification
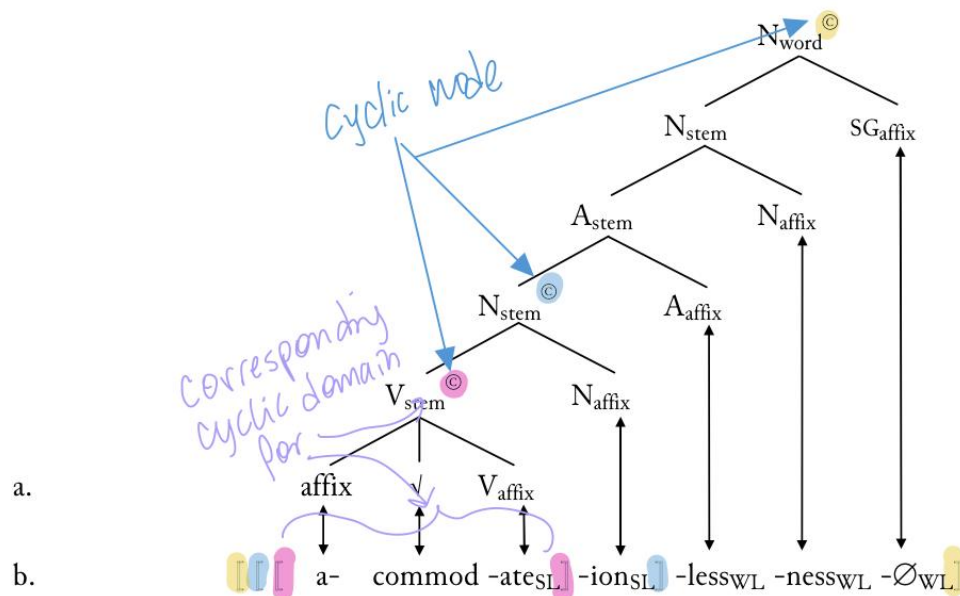
- The stress profile of *accòmmodátionlessness* is doubly opaque:
  - Primary stress is outside the final trisyllabic window
  - Secondary stress fails to fall on the initial syllable
- As shown in (2), *accòmmodátionlessness* inherits the metrical contour of the noun stem *accòmmodátion-*, which defines an immediate cyclic subdomain:
  - *accòmmodátion-* is a cyclic constituent, and no other cyclic node between *accòmmodátion-* and *accòmmodátionlessness*
  - *accòmmodátion-* then gets head foot on its second syllable from its own base, *accómmodàte-*, which again defines an immediate cyclic subdomain
- That *accòmmodátionlessness* is in an immediate cyclic relationship with *accòmmodátion-*, but not *accómmodàte-*, explains ungrammaticality of *accómmodàtionlessness*

Cyclicity and stratification

(2)

Cyclic node

corresponding cyclic domain for

N_{word} ©

N_{stem} SG_{affix}

A_{stem} N_{affix}

N_{stem} © A_{affix}

V_{stem} © N_{affix}

a.   affix   √ V_{affix}

b.   [[[a-   commod -ate$_{SL}$ -ion$_{SL}$ -less$_{WL}$ -ness$_{WL}$ -Ø$_{WL}$]

c. $\mathscr{P}_{WL}$($\mathscr{P}_{SL}$($\mathscr{P}_{SL}$(a-, commod-, -ate), -ion), -less, -ness, -Ø)

word Stem Stem

d. $\mathscr{P}_{SL}$ 1st cycle   accómmodàte

2nd cycle   accòmmodátion

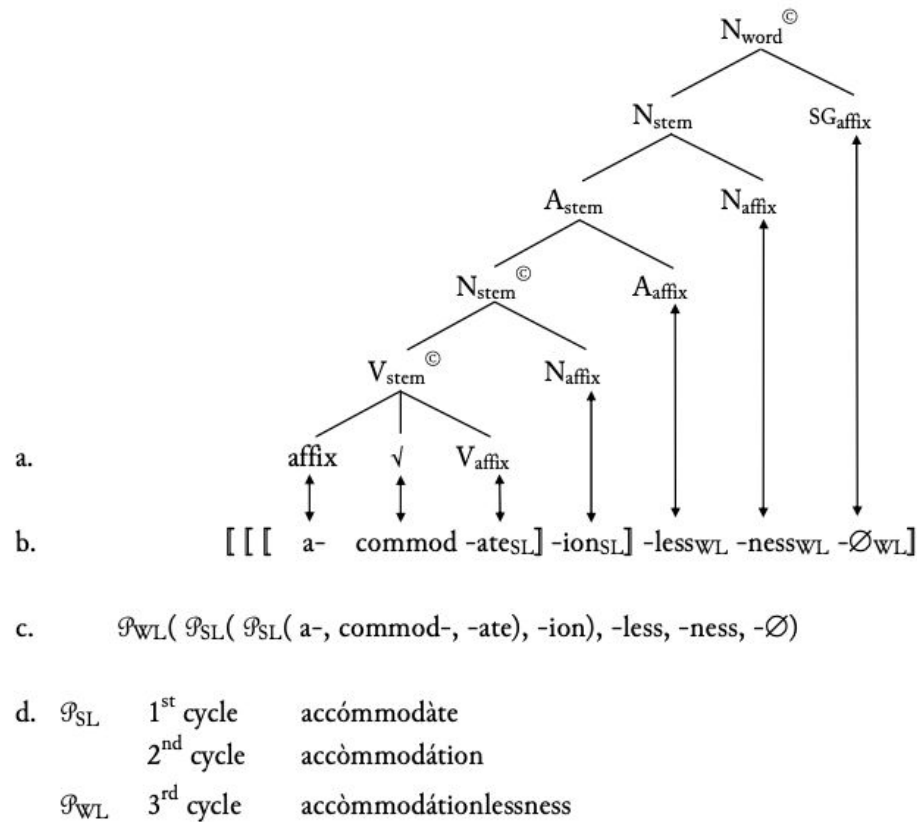$\mathscr{P}_{WL}$ 3rd cycle   accòmmodátionlessness

Unclear: how stress gets assigned in the first stem cycle (predicted *àccommódate*?) and what reassigns it in the second

Cyclicity and **stratification**

- Stratal Phonology adds two additional claims for cyclic frameworks
    - Cyclic domain structure is sparse: few morphosyntactic constituents trigger phonological cycle
    - There are different $\mathscr{P}$-functions for cyclic nodes of different rank

- Key terms for stratification

a. A **root** ($\sqrt{}$) is a minimal acategorial lexical item.

b. A **stem** is a lexical item specified for syntactic category (N, V, A, etc). In certain cases it is necessary to distinguish further between **derivational stems** and **inflectional stems,** where a derivational stem belongs to a syntactic category but must undergo some further morphosyntactic operation before it becomes inflectable.

c. A **word** is a syntactically autonomous lexical item bearing the full set of inflectional features required by its category.

Cyclicity and **stratification**

(2)

a.

b. [[[a- commod -ate$_{SL}$] -ion$_{SL}$] -less$_{WL}$ -ness$_{WL}$ -Ø$_{WL}$]

c. $\mathcal{P}_{WL}$($\mathcal{P}_{SL}$($\mathcal{P}_{SL}$(a-, commod-, -ate), -ion), -less, -ness, -Ø)

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Cyclicity and **stratification**

- Four generalizations:

    a. Roots do not define cyclic domains.

    b. Some stems define cyclic domains for the stem-level phonology ($\mathcal{P}_{SL}$).

    c. Words define cyclic domains for the word-level phonology ($\mathcal{P}_{WL}$).

    d. Utterances define cyclic domains for the phrase-level phonology ($\mathcal{P}_{PL}$).

Nonrecursiveness of word- and phrase-level domains

- Bermúdez-Otero admits that cyclic domain structures conforming to those generalizations are sparse

- For instance, a word-level domain is rarely found embedded within another word-level domain
  - Stems, when cyclic, undergo stem-level phonology, and grammatical word rarely behaves as recursive category
  - Only stem-level domains are ordinarily found nested within domains of the same time

Nonrecursiveness of word- and phrase-level domains

- Positive evidence from German shows that word-level phonology does not apply in cyclic domains smaller than the fully inflected grammatical word

- In German, word-final consonants occupy coda at word-level, but resyllabify into onset at phrase level before vowel-initial enclitics
  - *spiel* [.ʃpiːl.] 'play' ~ *spiel es* [.ʃpiː.ləs.] 'play it'

- Coda devoicing must be word-level phonological process, as it overapplies to word-final consonants resyllabified before enclitics
  - *leg es weg* [leː.kəs.vɛk] 'put it away'

Nonrecursiveness of word- and phrase-level domains

- In contrast, word-level adjectival suffix *-ig* **does** devoice when final consonant is syllabified into the coda at word level:
  - *fett-ig* [fɛ.tɪç] 'fat-y'

- However, when followed by additional vowel-initial word-level suffix, [g] resyllabifies into the onset and **escapes** devoicing:
  - fett-ig-es [fɛ.tɪ.gəs] 'fat-y-N.NOM/ACC.SG'

- Word-level phonology only applied **once** to *fett-ig-es*, despite containing **two** word-level suffixes

Nonrecursiveness of word- and phrase-level domains

- If *-ig* triggered a word-level cycle over the adjective stem, to the exclusion of *-es*, devoicing would overapply:

		a. *correct domain structure*	b. *incorrect domain structure*
		[WL *fett–ig–es*]	[WL [WL *fett–ig*] *es*]
$\mathcal{P}_{WL}$	1st cycle	fɛ.tɪ.gəs	fɛ.tɪç
	2nd cycle	—	*fɛ.tɪ.çəs

Recursiveness of stem-level domains

- In contrast to word- and phrase-level domains, stem-level domains may be subject to recursion
- Bermúdez-Otero posits this richer domain structure emerges from lexical decomposition and storage
    -

    Stem-level nonanalytic listing
    a. ACCOMMODATE ⟷ accómmodàte
    b. ACCOMMODATION ⟷ accòmmodátion

    Word-level analytic listing
    c. ACCOMMODATIONLESSNESS ⟷ [$_{WL}$ accòmmodátion –less –ness –Ø]

Recursiveness of stem-level domains

- Stem-level recursion falls out from morphological blocking
  - When noun *accommodation* created, prior existence of a lexical entry for the verb *accommodate* blocked derivation from the root *commod-*
  - Since this entry contained a head foot on the second syllable, first syllable secondary stress was also blocked   an explanation for *àccommodationléssness?
- Morphological blocking is also affected by token frequency, which is consequently correctly predicted to affect stem-level domain recursion:
  - Relative token frequency impacts whether derived forms *importation* and *transportation* cyclically preserve head foot on the second syllable of their bases

		tokens per million words in spoken section of COCA		
		base		derivative
a.	imp[ɔ́]rt ~ ìmp[ɔ]rt-átion	5.15	>	0.62
b.	trànsp[ɔ́]rt ~ trànsp[ə]rt-átion	7.23	<	23.54

more frequent derivative forms are less likely to preserve 2nd-syllable head foot

Recursiveness of stem-level domains

- This approach to stem-level domain recursion also explains Chung's Generalization (Chung 1983) (Third empirical prediction)

> *Chung's Generalization*
> If a phonological process misapplies within an outer stem-level domain owing to the presence of an inner stem-level domain, then the output of that process must be lexically contrastive.

- The faithfulness constraint that opaquely preserves second-syllable stress in derivation of stem-level *accòmmodátion-* from stem-level *accómmodàte-* contrasts from monomorphemic *àbracadábra*

OO-correspondence theory

In cases of morphosyntactically induced phonological opacity, a linguistic expression copies its opaque phonological properties from the surface representation of a morphosyntactically related expression.

In other words, The strings S1 and S2 are instantiated by two free-standing, morphologically related outputs (i.e. S1 and S2 end up having the same output) (Kager, 1999)

Properties of cyclic framework and OO-correspondence

OO-correspondence posits that the stress assignment in accòmmodátionlessness is acquired from the base accòmmodátion.

While Stratal OT posits that the stress assignment in accòmmodátionlessness is derived from the intermediate representation accòmmodátion-

Hence, both theories produce the same results.

		Cyclic frameworks	OO-correspondence
a.	Need opaque properties surface transparently in the base?	NO	YES
b.	Need the base be contained within the derived form?	YES	NO

English dual-level affixes

- Steriade (1999) challenges the cyclic approach with observation from the English dual-level affixes like –able.

- The adjective suffix -able sometimes affects stress assignment and sometime it does not as in

- 1. párody -- párodiable

- 2. rémedy -- remédiable

- According to Steriade, the asymmetry seen above is attributed to the pre-existing adjective *remédial* which provides a base for *remédiable*, while there is no such base for *paródiable (*paródial).

English dual-level affixes

- The way such observation challenges Cyclic Containment is as follows.

- Through frequency, lexical items such as *remédial* are stored in memory.

- Once such items are stored in memory, their surface representations are protected by lexical constraints (LEX).

- The constraint of interest for the forms *párodiable* and *remédiable* is LEX-stress.

- LEX-stress: for a candidate *c* containing a realization of a morpheme *m*, LEX-stress is violated if there is no stored surface realization of m containing the same sequence of stressed and unstressed syllables as the realization of *m* in *c*.

- Thus, *remédi-able* satisfies LEX-stress as it has the surface realization of the root "remedy" and its stress pattern matches that of the root "remédial".

- While *paródiable* violates LEX-stress as it lacks these properties (No *paródial).

English dual-level affixes

		LEX-stress	*POSTTONIC LAPSE
parody–able *surface support:* párody	(pá.ro.)di.a.ble ☞		**
	pa.(ró.di.)a.ble	*!	*
	pà.ro.(dí.a.)ble	*!	
remedy–able *surface support:* rémedy, remédial	(ré.me.)di.a.ble		(*) *!
	re.(mé.di.)a.ble ☞		(*)
	rè.me.(dí.a.)ble	*!	

English dual-level affixes

This analysis challenges Cyclic Containment as it posits that *remédiable* copies its stress contour from the surface representation of a lexical item, remedial, that is not contained within remediable.

English dual-level affixes

•Kiparsky (2005) provides an alternative analysis based on Stratal OT.

•Suffixes such as –able are dual-level suffixes; that is, they may occupy two different structural positions based on morphosyntactic status of the base.

•They can attach 'high' to an inflectional stem (**word**) or they can attach 'low' to root or derivational stem (**stem**).

•When the suffix attaches to the **word-level**, it becomes stress-neutral.

•When the suffix attaches to the **stem-level**, it becomes stress-affecting.

•Normally, suffixes are attached at the word-level.

•Thus, -able is normally attached to verbs at the word-level (e.g. párody → párodi-able).

•-able can also be added to verbs at the stem-level (e.g. rémedy → remédi-able).

English dual-level affixes

•The stratal analysis developed by Kiparsky posits that stress-shifting affixes are treated at the stem-level regardless of whether the base is free or bound.

•If the analysis is correct, then the phonological generalization of stress assignment in adjectives formed by bound stem + able should correctly describe the primary stress in stress-affecting uses of –able with free stem.

•When –able attaches to bound roots, the suffix –able behaves like a weak retractor: it places primary stress on the immediately preceding syllable if heavy; otherwise, stress goes to the preantepenultimate.

English dual-level affixes

a. *heavy antepenult*

    aménable

    coméstible

    deléctable

    inelúctable

b. *light antepenult*

    indómĭtable

    indúbĭtable

    inéxŏrable

    irréfrăgable

English dual-level affixes

- Weak retraction is not the default metrical pattern for disyllabic stem-level suffixes as such patterns are not induced by suffixes such as –ity.

- The weak retraction is obtained by specifying the first syllable of -able as a sister to a minimal foot projection.

- Once this mechanism is in place, the same stem-level constraints that build right-aligned bimoraic trochees will generate weak retraction.

- Also, it is important to mention that there is a faithfulness constraint for this specification which is enforced by the high ranking of IDENT-σ⌢Σ°.

English dual-level affixes
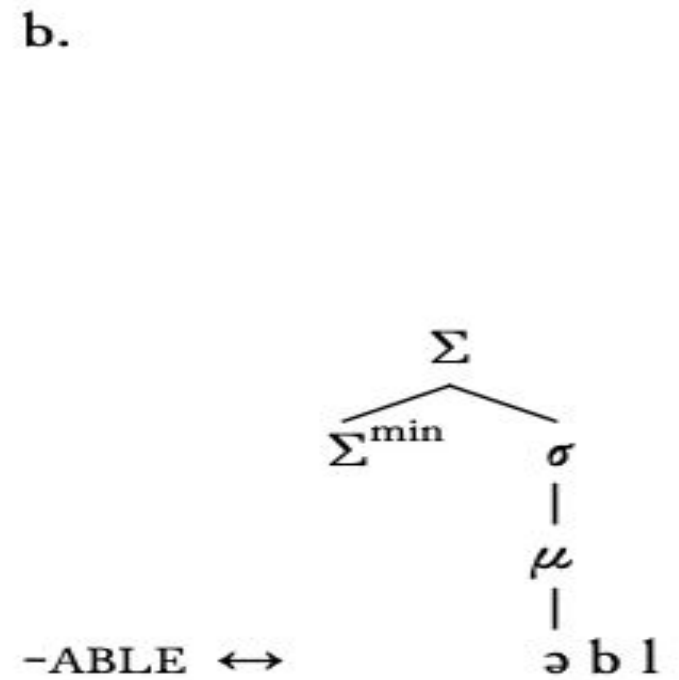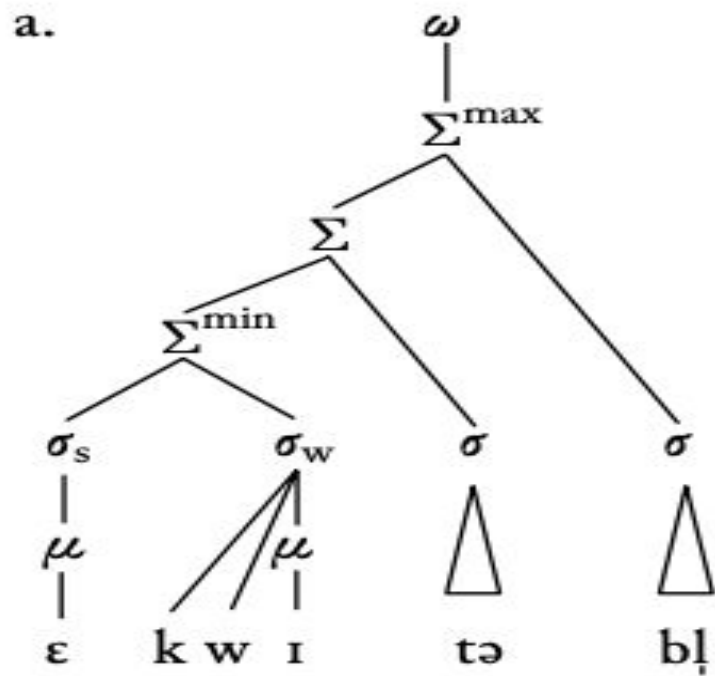
English dual-level affixes

		LEX-stress	IDENT-$\sigma\frown\Sigma^{\circ}$	*POSTTONIC LAPSE
indomit- Σ°)able	in.(dó.mi.)ta.ble ☞	(*)		*
surface support: Ø	in.do.(mí.ta.)ble	(*)	*!	
parody- Σ°)able	(pá.ro.)di.a.ble ☞		*	**
surface support: párody	pa.(ró.di.)a.ble	*!		*
	pà.ro.(dí.a.)ble	*!	*	
remedy- Σ°)able	(ré.me.)di.a.ble		*!	**
surface support: rémedy, remédial	re.(mé.di.)a.ble ☞			*
	rè.me.(dí.a.)ble	*!	*	
period- Σ°)able	(pé.ri.)o.da.ble ☹		(*)	**!
surface support: périod, periódic	pe.(rí.o.)da.ble	*!		*
	pè.ri.(ó.da.)ble 💣※		(*)	

Retraction in Stratal OT

•Stratal OT can solve such problem by ranking IDENT-σ´Σ° as inviolable at the stem-level penalizing stress retraction.

•At the word-level, it is dominated by IDENT-stress.

•Hence, at the stem-level, -able functions as retracting suffix and at the word-level, it is stress-neutral.

Conclusion

• The paper explains Stratal OT and provides empirical cases where Stratal OT seems best fit to handle.

• However, in my opinion, there are a few things the author could have done to make it clearer. Some of these things are: constraint definitions and the syllable pattern of English.

• The author uses constraints such as POSTTONIC LAPSE without clearly defining such constraint.

• Also, English Dual-level affixes revolve around the syllable pattern of English and how such opaque stress assignment is better accounted for using Stratal OT. Nonetheless, the author never explained the stress assignment pattern in English.