Inclusiveness, the Interface, and the Prosodic Hierarchy

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The issue

- The Prosodic Hierarchy (PH) is known to be of dubious compatibility with a Strictly Modular architecture of grammar (Scheer 2008)
  - Yet two recent approaches to the PH **do attempt to address this**: Selkirk's *MSO-PI-PO model* and Sande et al.'s *Cophonologies by Ph(r)ase*

- Our claim: such approaches move in the right direction, but Modularity problems still arise—notably from **Inclusiveness** (Chomsky 1995)
  - Inclusiveness, a condition on (linguistic) modules, bars the addition of new input items mid-computation
  - These novel attempts to build and/or label the PH within the phonology violates Inclusiveness (at least)

- In keeping with a recent push toward **applying Minimalist principles to the phonology** and its interface with syntax (Samuels 2011, Scheer 2012, Newell & Sailor to appear)

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Outline

- The issue
- Background and assumptions
- What is Inclusiveness?
- How the PH violates Inclusiveness
- Case studies, and how a system without the PH impacts our analyses
    - Ellipsis
    - Intrusive-R
- Conclusions

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Background & assumptions

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- *Late Insertion* (Halle and Marantz 1993, et seq.)
  - phonological features are absent from the input to syntax; they are added post-syntactically during Vocabulary Insertion.

- *Strict Modularity* (inc. the feed-forward *inverted-Y* model)
  - the language faculty comprises discrete modules, including at least **distinct syntax and phonology modules** (Chomsky 1965, et seq.; Jackendoff 1997, Scheer 2011, Curtiss 2013, a.o.).

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Properties of modules

- A *module* is a specialized cognitive system dedicated to carrying out a narrowly-construed computation (Fodor 1983)
- Two important properties (see Scheer 2011:§610 for an overview):

  A. **Domain Specificity:** each module works only with its own proprietary alphabet; one module cannot understand the alphabet of another module
     - As a result, intermodular communication is impossible without *Translation*, which must be non-computational, presumably the result of Vocab Insertion (Scheer 2012:§160, Scheer 2020)

  B. **Encapsulation:** a module's computation is input-bounded; no new input can be added during the course of the computation

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Prior arguments against the PH

- Existing arguments against the PH from a Minimalist perspective:
  - Building bespoke pseudo-syntactic constituents just for use in the phonology is intolerably redundant (Pak 2008, Samuels 2009)

- Existing arguments against the PH from Modularity:
  - From PWd up, the constituents of the PH are *diacritics* (Scheer 2011:§399)
    - Their only job is to sneak non-phonological information into the phonology
  - Mainstream OT implementations only make matters worse:
    - Mapping (e.g. Match) is computed alongside purely phonological processes, requiring syntactic information to be legible within the phonology (against Domain Specificity)

- **Today:** the relevance of Inclusiveness (*qua* Encapsulation) to the PH

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What is Inclusiveness?

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Inclusiveness = Encapsulation

- Chomsky (1995:209) proposes Inclusiveness as a condition on **syntax**:
  - "no new objects are added in the course of computation apart from rearrangements of lexical properties (in particular, no indices, bar levels in the sense of X-bar theory, etc…)"

- "In syntax, Encapsulation is called Inclusiveness" (Scheer 2012:§174)

- But Encapsulation is a property of **all** cognitive modules (Fodor 1987)
  - Phonology is a module; ergo, phonology is Encapsulated (Iosad 2017: ch. 2)

- So Inclusiveness holds of the phonological module as well.
  - Problem: "Standard theories take [Inclusiveness] to be **radically false** for the computation to PF" (Chomsky 1995:209).
    - Why? (Partly depends what the "computation to PF" is…)

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How <u>not</u> to define Inclusiveness

- "outputs [of C_{HL}] consist of nothing beyond properties of items of the lexicon (lexical features)" (Chomsky 1995:206)
- **Plainly false:** C_{HL} generates nested constituency, but that isn't a feature of lexical items—it's a product of the syntactic computation itself, i.e. Merge
  - Merge(X, Y) = {X, Y}, where {X, Y} is **not** a lexical feature of X, or a lexical feature of Y
  - Merge can add **set membership / recursive hierarchical structure** not present in its own input (indeed, see Chomsky 2001:3 on just what Merge adds to the output beyond lexical properties)

- If the nature of a computation is such that it adds new information by dint of its very application (as Merge does with hierarchy)...
  - ...then **it simply won't do** to have a definition of Inclusiveness that prohibits addition of any and all new information mid-computation: this actually prohibits Merge.
  - In brief: Inclusiveness must allow for the computation itself to be information-adding.

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How to define Inclusiveness

- Inclusiveness should prohibit addition of ***context-dependent*** objects—those that aren't predictable, invariant outputs of the computation

  - The nature of Merge is to add new information to the derivation in the form of hierarchy (set membership), so this must be ruled in…
    - …but this is predictable and invariant: it's the product of **each iteration** of Merge (regardless of the LIs being Merged)

  - By contrast, the insertion of traces, indices, bar-levels, etc. would necessarily depend on the context, and thus would not be invariant computational output
    - Their addition wouldn't automatically follow from every iteration of Merge;
    - Rather, the state of the computation would have to be examined mid-stream to see whether insertion was warranted.

- **This** is what Inclusiveness should prohibit.

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Interim summary A: Inclusiveness, revised

- So Inclusiveness **isn't** "radically" violated by the derivation to phonology if:
    i.   Intermodular Translation is non-computational, meaning Inclusiveness doesn't hold of it
    ii. We update our definition of Inclusiveness to allow qualified information-adding computations (necessary even on syntax-internal grounds)

- Adopting (i) allows Translation (i.e. Vocab Insertion) to be information-adding in a restrictive way, adding only what can be stored in the lexicon / List 2

- Adopting (ii) allows the phonological computation to be information-adding in a restrictive way, i.e. at each iteration (e.g. association lines, syllables, government relations etc.)
  - (So Inclusiveness might not even be violated by the derivation *in* phonology, not just *to* phonology)

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How the Prosodic Hierarchy violates Inclusiveness

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(Not) Inserting the Prosodic Hierarchy

- Most current implementations of the PH as an interface-inserted representational structure are anti-modular (Match, Align, etc. in a single ranking with, ex., *Coda).
  - We exclude these implementations on Modular grounds.

- Two recent proposals aim for a **Modularity-friendly PH**:
  - **MSO-PI-PO** models, a.k.a. Neo-Selkirkianism
    - (Kratzer & Selkirk 2020, Lee & Selkirk 2022, Elordieta & Selkirk 2022)
  - **Cophonologies by ph(r)ase**
    - (Sande et al. 2020)

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Neo-Selkirkianism

- The MSO-PI stratum:

  - Here we have Match constraints, but they are proposed to not be ranked with purely phonological constraints.
    - Indeed, this is billed as an advantage of the proposal: **segregation of Match from "phonology per se" is meant to be Modularity-friendly**

  - They are, however, ranked with 'phono-syntactic' constraints (ex. Destress Given>>Match XP, PPh, Match$_{LEX}$ >> Match)

  - There is therefore **computation** at the point of PH-insertion, meaning that it is part of **a Modular vocabulary**.

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Neo-Selkirkianism

- The PI-PO stratum is where the real phonology happens.

  - The PH is part of this computation as well, violating Domain Specificity
    - While Mapping takes place at MSO-PI, constituents of the PH can nevertheless be referenced within PI-PO

  - By its own standard, Neo-Selkirkianism holds that the PH is part of the input vocabulary to the phonological computation;
    - Thus, adding new PH items mid-computation (not from Translation) violates Inclusiveness.

- Conclusion: Neo-Selkirkianism is not a viable Modular implementation of the PH as an interface object.

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Cophonologies by ph(r)ase

- The proposal in a nutshell:
  - There are no Match constraints. The PH is inserted in the phonology proper.
  - Phonological domains are built around the output of a phase.
    - MAXIMIZE PROSODIC DOMAINS
      All phonological content should be parsed into a single prosodic domain (e.g. word,
      prosodic phrase, intonational phrase).   (Sande et al. 2020:1222)

    - Removes Mapping entirely: just encase every Spell-Out domain in a prosodic domain.

  - We agree that phonology operates over strings that emerge due to Vocab Insertion upon spell-out of a phase;

  - We disagree that the PH may be inserted in the phonology (or referenced in lexical items)

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Cophonologies by ph(r)ase

- Problems with a purely phonological projection of the PH:

  - MAX-PH encases each Spell-Out domain in a prosodic domain, but without labels : **a problem for Inclusiveness.**
    - If the PH is inserted in the phonology (MAX-PH), then the labels of each iteration of MAX-PH are new information that do not emerge predictably from the computation via the re-arrangement of lexical properties.
      - Echewing labeling might help CPbP get around this problem, but
      - CPbP makes crucial reference to the PH in lexical entries, and therefore cannot avoid the labeling problem.

  - As well documented in the literature (e.g. Scheer 2012:§139), it is also true that the PH at the PWd level and above is **not projected by any lower level of representation**.
    - Re-evaluating the PH as a non-interface object requires a fully fleshed out theory of how it might be projected in the phonology, which does not seem plausible.

- Conclusion: CPbP violates Inclusiveness and is not a viable Modular implementation of the PH as an interface object.

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Interim summary B

- No implementation of the PH as an interface object satisfies Modularity (Domain Specificity and/or Inclusiveness)

- The PH is not a phonological object.

- Analyses that use the PH must be rejected in favour of analyses that do not, giving us a tool to adjudicate among competing analyses in the literature.

- Up next: "But don't we <u>need</u> the PH?"
  - With a couple representative case studies, we hope to show that we don't.

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Case studies, and how a system without the PH impacts our analyses

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Ellipsis

Ellipsis = "deletion at PF"?

• Since Merchant (2001), it is widely held that ellipsis is **"deletion at PF"** (henceforth *DPF*).

• Follows from Merchant's [E]-feature:
  • Ellipsis is syntactically licensed when a head bearing [E] undergoes AGREE with a higher ellipsis-licensing head (e.g. VP-ellipsis, licensed by T)

• Beyond syntactic licensing, [E] also has interface properties:
  a. Carries instructions for LF to impose conditions on identity/recovery (left aside here);
  b. Carries **instructions for PF to impose *elliptical silence*** (i.e., DPF).

• Let's unpack what's meant by (b).

Deletion at PF (DPF)

- How does DPF actually work? What mechanism(s) might be involved?
  - Surprisingly few attempts to be explicit. To the extent that it is defined at all:
  - **Phonological deletion of a prosodic constituent** mapped from the elided XP

- DPF: $\phi_{XP} \rightarrow \emptyset \ / \ [E] \ \underline{\ \ }$ (Merchant 2004:671)

  - "…entirely controlled by the actual phonology…in ways familiar from studies of morphologically determined **syncope** phenomena, here merely applied to a larger prosodic unit."
  - (See Lipták & Güneş 2022: §2.3.5-6 for similar approaches & references)

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Problems for DPF: size

- **Problem 1:** ellipsis sites can be arbitrarily large (recursive embedding)
  - *…but Susan won't* [~~$_{VP}$ *tell anyone* [$_{CP}$ *that Pat said* [$_{CP}$ *that we heard* [$_{CP}$ *that…*~~
  - DPF = deletion of an arbitrarily-large prosodic unit?
    - "No phonological theory is suited for the manipulation of this kind of object, which phonologists look at like an ant looks at a jumbo jet." (Scheer 2011:616)

- Even if we grant the PH (which we don't),
  - Do we want to endow phonology with the power to **syncopate strings of unbounded length** just to account for ellipsis?

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Problems for DPF: diacritics

- **Problem 2:** [E]'s PF instructions are *diacritic* (thus anti-modular)
  - According to DPF, [E] smuggles instructions through the syntax into phonology
  - **Instructions:** trigger a phonological deletion rule for purely non-phonological reasons
    - (These instructions are thus clearly **not** the result of Translation / lexical insertion on [E]: no LI has the ability to trigger such a rule)

- This aspect of [E] clearly violates Modularity (see Scheer 2012:§95 on the anti-modular status of diacritics in general)
  - DPF (*qua* [E])'s anti-modular character is symptomatic of a larger problem:
    - The PH itself is incompatible with a modular architecture.

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Problems for DPF: wrong predictions

- **Problem 3:** DPF incorrectly predicts that elliptical silence arises 'late'
  - **Observation:** elliptical silence in fact arises 'early', at/before Vocab Insertion

- <u>Exhibit A:</u> ellipsis can repair cases of *morphological ineffability* (Merchant 2015, Abels 2019, Mendes & Nevins 2021):

  (1) When I see him on the street I just stride away, and indeed...
       a. *I always have {stridden/strided/...} away.
       b.   I always have [$_{vP}$ √STRIDE away].

- The problem in (1a) clearly isn't phonological, so it can't be repaired in the phonology.

  - Thus: ellipsis can't be DPF.

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Problems for DPF: wrong predictions

- **Problem 3:** DPF incorrectly predicts that elliptical silence arises 'late'
  - **Observation:** elliptical silence in fact arises 'early', at/before Vocab Insertion

- <u>Exhibit B:</u> elliptical silence is relevant for allomorph selection (see Sailor 2022 on ellipsis-tone sandhi interactions in Taiwanese; here bold = sandhi syllable)

  a. **A**-Ying chang **b-o** khi **hak**-hau, **tan-si A**-Ha **u** khi **hak**-hau.
     A-Ying yesterday NEG-PERF go school but A-Ha PERF go school
     'A-Ying didn't go to school yesterday, but A-Ha did go to school.'
  b. **A**-Ying chang **b-o** khi **hak**-hau, **tan-si A**-Ha { u / *u } [khi hak-hau].
     A-Ying yesterday NEG-PERF go school but A-Ha PERF
     'A-Ying didn't go to school yesterday, but A-Ha did.'

- If ellipsis were DPF, the order of operations would have to be: [Vocab Insertion » Mapping » DPF]

- But allomorphy is the product of Vocab Insertion, which means...
  - **DPF would always apply too late** to ever bear on allomorphy (counterfeeding)
  - Thus: elliptical silence must arise before Mapping, so cannot involve DPF.

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Ellipsis isn't "deletion at PF"

- In sum, several fatal problems with a PH-based account of elliptical silence (e.g. DPF):
  - Forces phonology to work with unboundedly-large objects
  - Allows diacritics to sneak through syntax into phonology to trigger rules
  - Predicts elliptical silence should have no morphophonological effects, contrary to fact

- Conclusion regarding ellipsis and the PH:
  - Ellipsis isn't "deletion at PF".
  - The right theory of elliptical silence should **eschew the PH entirely**.
    - (See Sailor *in progress* for a Modularity-friendly alternative)

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Intrusive R

R, you crazy or not?

- There is a debate in the literature regarding whether R-insertion in certain dialects of English is phonologically natural or not.
    - **Unnatural** (epenthesized via rule) : Halle & Idsardi (1997), Hale & Reiss (2000), Vaux (2002), Samuels & Vaux (2017), etc...
    - **Natural** (r is a glide derived from the underlying phonology of low, lax vowels) (Broadbent 1991, Gnanadesikan 1997, Ortmann 1998, Gick 1999, Krämer 2005)

- Ex: Broadbent (1991) r-insertion occurs after low lax vowels with an |A| head
    2. a.   [spɑɹɪz]   'spa is'
        b.   [kɔməɹɪn]   'comma in'
        c.   [sɔɹɛd]   'saw Ed'

- **This is related to whether intrusive and linking R are underlying.**
    - Unnatural : no
    - Natural : yes
                    ...

Functional vs Lexical environments

The basic assumptions of whether R is too marked to be underlying interact with the pattern below:

No intrusive r after function words in non-rhotic American English

3.   a. Didja eat   *didja r eat
     b. I wanna eat   *I wanna r eat
     c. He went to eat   *he went to r eat
     d. the apples   *the r apples

(Ito & Mester 2009)

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Analyses of Fnc vs Lex environment

McCarthy (1993): Function words are exempt from **the requirement that a PWd end in a C**, as they do not project a PWd.

Ito & Mester (2009):

> **Major PWds want Onsets**. As Function words are inside the
> PWd to their right, the Major PWd boundary precedes them,
> and so R-epenthesis does not occur in a Func-Lex sequence.

4.   a.   The [$_{MajPWd}$ spa] [$_{MajPWd}$ r acts] up   b.   [$_{MajPWd}$ Didja [$_{MinPWd}$ eat]]
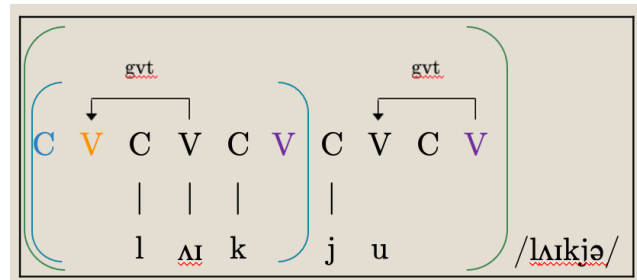
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But, what if there is no Prosodic Hierarchy? Underlying 'R'

- Why function words (usually) don't trigger R-epenthesis

    - **Full forms of *you, to*, and *the* are [juw] [tuw] and [ðiy].** The schwa-realizations are due to 'reduction' and are not underlying vowels, but the pronunciation of an empty vowel position. If R-insertion is |A|-gliding, then of course it won't be triggered by an empty vowel.

    - **CV unlinked position is pronounced as schwa, but has no underlying features/elements.** It therefore cannot 'glide'

Newell & Scheer 2021

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Underlying 'R'

- But some reduced vowels do trigger R-epenthesis!

    - In Cockney English, one can propose that the **reduced vowel includes default-insertion of |A|,** leading to 'give [jəɹə] job' (give you a job).

    - Empty schwa can have phonetic variation : see the rounding of an 'empty' vowel in Quebecois French.

    - Reduced schwa may also display phonological variation : If an epenthetic vowel contains |A|, it will behave like an underlying |A|-vowel and R-insertion will occur.

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What about linking R?

- As McCarthy (1993) points out, while it is true that in non-rhotic American accents function words reject intrusive r (*gonna reat), they do not reject linking r, and in fact require it: (for eating [fə ɹiːɾɪŋ], *fo' eating [fə iːɾɪŋ]). **It is therefore only the epenthetic nature of intrusive r that excludes it after function word in the onset of a non-maximal ω**."

- In other words, all underlying Rs get linked, and non-underlying Rs are just **not there**.
  - Reference to the PWd overcomplicates the analysis.
  - Even if the PH were a licit phonological object, it is not a necessary tool in the analysis of this pattern.

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Intrusive-R is not sensitive to the PH

- In sum, the **exclusion of the PH as a licit phonological object** allows for a **decisive comparison** of alternate theories, here of Intrusive-R.
  - The account that appeals to the PH describes the distribution of Intrusive-R but does not offer a satisfying explanation of this distribution.

- Conclusion:
  - In the case of R, especially within Element Theory, there is a nice, 'underlying-R' account.
  - **Intrusive-R is not sensitive to the PH.**

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Conclusions

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Conclusions

- **Determining the exact status of our representational tools is a crucial task for interface-linguists.**
  - Recent theoretical modifications that aim at saving the PH from criticisms with regards to modularity have not been successful: they violate Inclusiveness.
  - We must reject the PH as a representational tool.

- **Excluding the PH as an analytical tool aids in deciding among proposed explanations.**

- **It's time to re-analyze *all* of the phonological domain data, *again,* paying special attention to the theoretical implications of our representational objects.**
  - # (Chomsky & Halle 1968)
  - PH (Selkirk 1986, Nespor & Vogel 1986)
  - Left-edge CV (Lowenstamm 1999, Scheer 2004, 2009, D'Alessandro & Scheer 2015)

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Appendices

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Does phon. violate Inclusiveness prima facie?

- With this revision in place, we can reassess Chomsky's repeated claims that the mapping to SM "radically" violates Inclusiveness…
(Chomsky 1995:216, 2007:fn. 8, 2019:275)
    a) "[because] syllabic and intonational structure are not contained in lexical items" (1995:351, fn. 10)
    b) "…even more so in strong versions of Distributed Morphology that take all phonological features of LIs to be inserted in this mapping" (2007:fn. 8)
- Let's take (b) first. Given that Inclusiveness holds of computations…
    - if lexical insertion is non-computational (Scheer 2012:§169), then Inclusiveness has nothing to say about it, and (b) doesn't attach.

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Does phon. violate Inclusiveness prima facie?

- What about (a)? (addition of syllabic and intonational 'structure')
  - If these are also the product of Vocab Insertion (qua Translation), then (a) reduces to (b) as a set of phenomena not subject to Inclusiveness.
    - While this is surely the case for at least some such phenomena (e.g. intonational morphology: Wakefield 2020)…
    - …others may well be the result of a computation (e.g. some syllabification).
  - However: our revised notion of Inclusiveness only rules out context-dependent additions that aren't an invariant product of the computation itself
    - Now the question arises: what is the nature of the phonological computation?
    - If (part of) its job is to build syllables (e.g.) based on its input – a job it performs exceptionlessly on each iteration – then Inclusiveness is respected

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