THE ROAD OR THE DOOR TO EXPONENTCE?
EXAMINING SIMULTANEITY AT SPELL-OUT

Nicholas Rolle, Princeton University

Notion of ‘spell-out’ invoked in discussing linguistic interfaces across disciplines

a. Syntax  e.g. Minimalism/Generative syntax
b. Morphology  e.g. Distributed Morphology
c. Phonology  e.g. Match Theory, Direct vs. Indirect Interface debates

This has left the field of interface studies – and particular ‘interface-ists’, e.g. Scheer 2011 – wondering how to fit it all together

Big picture questions: what constitutes spell-out? and is spell-out (i) serial and rule-based, (ii) parallel and constraint-based, (iii) something else/in-between?

I examine these issues from a hybrid OT-DM framework, which has commitments both to a realizational, syntax-driven morphology but also constraint-based parallelism

But perhaps more interesting…: what can looking at post-syntax as a parallel and optimizing system get us? What are its predictions and how do they pan out?

Three predictions:

a. Outward-looking phonologically-conditioned allomorphy
b. No opacity at spell-out
c. No access to syntax post-spell-out

Roadmap:

a. What is an OT-DM framework?
b. A case study of Cilungu tonal allomorphy which looks like outward-looking phonologically-conditioned allomorphy

1 AN OT-DM FRAMEWORK

1.1 A rocky start…

OT & morphology theory: In many approaches to morphology, an OT model and parallelism have been welcomed
[Cophonology Theory - Inkelas & Zoll 2007; Optimal Construction Morphology - Caballero & Inkelas 2013; Stratal OT - Kiparsky 2015; see summary of OT approaches to morphology in Xu 2016]

1 Thank you to my colleagues Laura Kalin, Byron Ahn, Sam Zukoff, and Florian Lionnet for initial feedback, and many others at Princeton and Berkeley for talking to me over the years.
Optimality Theory and Distributed Morphology – emerging in the same (North American) generative period in the 90s – are assumed to be at odds with one another

- Embick (2010:ix) - DM “is incompatible with the dominant view in phonological theory, Optimality Theory (OT), which posits competition among infinite sets of complex objects” [emphasis mine; see also observations by Tucker 2011:200]

Since their respective inceptions, however, there have been many rumblings regarding the relationship between OT and DM (or at least some principle belonging to one or the other), and even some recent nascent debates


Optimality-Theoretic Distributed Morphology (OT-DM) [Trommer 2001a, Rolle 2019]

- Only constraints, no rules: Post-syntactic operations are decomposed into a series of constraints which apply in parallel

All aspects of DM are maintained, except rule-based seriality

- Morphology shows ‘distributedness’
- The syntactic module precedes morphology
- All morphemes are uniformly concatenated
- Vocabulary items realize feature bundles (late insertion)
- Syntax is phonology-free
- Words have internal complexity
- Syntactic bundles can be manipulated

h. Input-output mapping is serial and rule-based

Other than OT-DM, another name you could call it devoid of a DM designation is: (Modular) Item-Based Realizational Non-Lexicalist Syntax-Driven Phonology-Free Optimality-Theoretical Morphology [(M)IBRNLSDPFOTM]

1.2 The substance of spell-out

Broadly, the mapping of syntactic structure to a phonological representation

Its purpose can be understood to ‘externalize’ an internal linguistic construction for communicative intent (at least on the PF side of things)
Y-Model of grammar (or ‘T-model’)

Morpho-syntactic module maps to morpho-phonological module at spell-out

Input-output components of spell-out [Rolle 2018]
a. /S/ is the input - the ‘syntactic image’
b. \$\ is the output - the ‘phonological image’

Spell-out (and by extension morphology) itself is not a module
a. Cf. Paradigm Functional Morphology (PFM) where ‘morphology is an autonomous system’ [Bonami & Stump forthcoming]

Abridged:
Mapping of the syntactic image /S/ to a phonological image /贲/.

[21] [Rolle 2018]
Morpho-syntactic module:


Morpho-phonological module:


['Obligatory inheritance' of a previous cycle, i.e. that 'later evaluations [are forced] to inherit the results of earlier ones' Steriade 2012:4]

vocabulary insertion (taken from Vocabulary), in the curly bracketed objects { } – each labelled for reference {VI}, i.e. {DOG} [Articulated VI structure in Sande & Jenks 2017, Rolle 2018]

Spelling primarily involves the ‘actuation of phonology’

<table>
<thead>
<tr>
<th>Spell-out operation</th>
<th>Provides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary insertion</td>
<td>Phonological substance (primitives) [phonemes, tonemes, autosegments, etc.]</td>
</tr>
<tr>
<td>Linearization</td>
<td>Phonological precedence [basic morph order]</td>
</tr>
<tr>
<td>Prosodification</td>
<td>Phonological constituency [metrical structure, prosodic words, prosodic phrases, etc.]</td>
</tr>
<tr>
<td>Hierarchy exchange</td>
<td>Scope of phonological operations [scope/order of the application of phonological rules]</td>
</tr>
</tbody>
</table>

Morphology-in-parallel hypothesis (MIPH)
The substance of spell-out are a set of post-syntactic ‘operations’ which map a syntactic image / S / to an optimal phonological image \( Z \), applying in parallel within an OT architecture (involving morphological CON, EVAL, GEN, etc.)

2 Towards an OT-DM framework?

2.1 Stronger commitment to a modular conception of grammar – or…
Understanding the ‘translator’s office’ in ‘Modular no man’s land’

Nicholas Rolle
The road or the door to exponence?

a. “The modular perspective holds that grammatical activity – as other cognitive faculties – is organised in terms of a number of ontologically distinct, non-teleological and specialised computational systems: the modules. Modules are domain specific and encapsulated (§ 610). That is, they are devoted to a specific task, which they carry out using a specific vocabulary. Since they are ontologically distinct and speak different languages (of the mind), they are unable not understand, or even parse, what is going on in other modules.” [Scheer 2011:347]


a. Domain specificity with ‘specified vocabulary” (i.e. different primitives)

b. Information and operations are encapsulated (i.e. modules are autonomous)

[“[T]he output is produced in complete disregard of any module-external information such as high-level expectations, beliefs (coming from the central system), memory, inference and attention or results of other modules” Scheer 2011:524]

[29] The simplest conception (which I take to be the default / null hypothesis) is that there are two modules at this juncture of grammar: syntax and phonology

a. Spell-out itself is not a module, but rather a mapping between two modules, i.e. the ‘translator’s office’ within ‘modular no man’s land’ [Scheer p. 351-352]

[30] Scheer (p. 622) attempts to make sense of Minimalism/DM discussion of “PF”:

[31] Scheer discussing ‘PF movement’ in particular:

“…there is trouble with computation B…: computation B would have to access the morpho-syntactic labels of the tree, the tree geometrics and phonological vocabulary at the same time. Also, the tree labels would be the projection of nothing: on standard
assumptions hierarchical structure is a projection of terminal elements. In a PF movement tree, however, phonological terminals would *cohabit* with morpho-syntactic structure and labels: this does not make any sense. Computation B is thus a *modular alien.*” [Scheer 2011:622, emphasis mine]

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Concludes that “DM thus turns out to be a strong modularity offender” [p. 624]

In short, an intermediate representation at spell-out would require a mixed representation which is half-phonological information, half-syntactic information - this violates modularity

Cf. Embick 2015 Vocabulary insertion stages  [Embick 2015:99]

a. “A standard assumption in Distributed Morphology is that Vocabulary Insertion applies from the inside out. This means that Vocabulary Insertion applies first to the most deeply embedded structural position in a complex head and proceeds outwards, producing what is sometimes referred to as cyclic insertion.”

b. (1) “On the assumption that the Root has a phonological form underling, Vocabulary Insertion applies first at the v node, inserting -ize

c. (2) Vocabulary Insertion applies first at the T[+past] node, and inserts –ed”

d. (3) after this, Vocabulary Insertion applies at the T[+past] node, and inserts –ed”

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OT-DM circumvents this issue by making spell-out (and to a large extent, morphology itself) a mapping *between* modules, with no potential intermediate stages (at spell-out)

### 2.2 Morphological conspiracies

*Conspiracy*: where rules with dissimilar inputs, outputs, and/or environments result in surface forms which all converge on or avoid a specific structure

[Kisseberth 1970, 2011; Prince & Smolensky 2004 [1993]; Kager 1999: Sec. 2.1.1.2; McCarthy 2002: Sec.3.1.4.3, 2008: 1-12;

3 The critical issue: What are the different predictions?

Predictions of an OT-DM framework

a. **Simultaneous Insertion**
   - **Commitment 1** – Within a spell-out domain, all morphemes are replaced by vocabulary items simultaneously
   - **Prediction 1** - Outward-looking phonologically conditioned allomorphy (PCA) should in principle be allowed and empirically attested

b. **Opacity Restrictions**
   - **Commitment 2** – Within a spell-out domain, all morphological operations take place simultaneously in parallel
   - **Prediction 2** - Opacity is an artefact of cyclicity, and thus should be limited to (i) the syntactic module, (ii) the phonological module, or (iii) inter-cyclic spell-out domains (e.g. phases)
   There should be no opacity between morphological operations which take place during a given instance of spell-out

3.1 Prediction 1 - Outward-looking phonologically conditioned allomorphy (PCA)

A growing (but still small) body of literature devoted to the subject, and the jury is out… but more on ‘no’ than ‘yes’ side (and definitely on the ‘no’ side typologically-speaking)


**English a vs. an** – inward sensitive to phonological condition (i.e. C vs. V initial)

a. **English** (inward-sensitive)  
   - *a* cat
   - *an* upstanding cat
   - *an* ocelot
   - *a* terrible ocelot

b. **Martian** (outward-sensitive)  
   - one *at* / WAN / at
   - two cats /tu/ cat-s
   - three cats /θui/ cat-s
   - four ats /foi/ at-s

What to look for: cases where one cannot resolve inner allomorphy until something about an outer morph becomes activated/visible at spell-out
3.2 Tonal allomorphy in Cilungu  [Rolle & Bickmore in progress]

Virtually unexplored is examining directionality effects in PCA using tonal exponence, i.e. the realization of a grammatical category either totally or partially via tone/tonemes


Interaction between the exponents of TAM (tense/aspect/mood) [the target] and the SM (subject marker) [the trigger] within complex verbal structures

\[ \text{V SM NEG TAM [MS OM [S [B ROOT DERIV ] TAM FV ]] } \]
( [MS = macrostem ; [S = stem ; [B = base ; v = verb ; OM = object marker ] [See structure of the Bantu verb - Meeussen 1967]

Tonal contrasts: Cilungu has a basic H vs. Ø tonal contrast, used both lexically and grammatically (with L by default)

Major tonological rules (general across language, not morphologically conditioned

a. Unbounded spreading 1 (macro-stem) [B07:148]
   /tú-ku-[mu-páapaatík-a/]
   [tú-kú-mú-páapáátik-à] ‘we are flattening him/her’

b. Unbounded spreading 2 (word) [B07:148]
   /tú-ku-[mu-súkilil-a/]
   [tú-kú-mú-súkilil-à] ‘we are accompanying him/her’

Spreading when not at right edge [B07:156-158]

a. H within macro-stem
   /tú-ku-[yá-swél-il-a ningó/]
   [tú-kú-ꜝyá-swéél-il-á niingó] ‘we are brewing for them well’

b. H outside macro-stem
   /tú-ku-[mu-fúl-a ningó/]
   [tú-kú-mú-fúl-à niingó] ‘we are washing him/her well’

Otherwise, all spreading is bounded, binary, and automatic

/ťú-ku-sí-a Choola/ [ťú-kú-šá Chóólà]‘we are leaving Chola’ [B07:172]

Expressing TAM: TAM’s are exponed through a unique combination of:

a. 0, 1, or 2 prefixes
b. 0 or 1 suffix
c. The shape of the final vowel (-a/-e)
d. A unique grammatical tone pattern which appears on the verbal stem [‘Melodic Highs’]
Grammatical tone patterns

a. $\emptyset$  No grammatical tone  

b. $\text{H}_{\text{FIN}}$  ̀ tone docks to the final TBU of the stem  

c. $\text{H}_{\text{2-FIN}}$  ̀ tone docks to the 2nd to final TBUs of stem  

d. ( $\text{H}_{\text{2}}$  ̀ tone docks to the 2nd TBU of the stem  

TAM grammatical tone - minimal pairs  

a. Past Inceptive: \textit{aa-...-a-Ø}  

\begin{align*}
\text{yá-aa-sukilil-a-Ø} & / \text{yá-aa-sukilil-a} / \\
[ \text{yá-á-sükìlìl-à} ] & \leftarrow \text{Unbounded spreading} \\
\end{align*}  

‘and then they started to accompany’  

b. \text{yá-aa-sukilil-a-Ø Choola} /  

\begin{align*}
\text{yá-aa-sukilil-a Choola} & / \\
[ \text{yá-á-sükìlìl-à Chòòlà} ] & \leftarrow \text{Bounded spreading} \\
\end{align*}  

‘and then they started to accompany Chola’  

c. Recent Perfect: \textit{á-...-a-♀}  

\begin{align*}
\text{yá-á-sukilil-a-♀} & / \text{yá-á-sukilil-a} / \\
[ \text{yá-á-sükìlìl-á} ] & \leftarrow \text{Grammatical tone docking} \\
[ \text{yá-á-sükìlìl-à} ] & \leftarrow \text{Bounded spreading} \\
\end{align*}  

‘they have just accompanied’  

d. Remote Perfect: \textit{á-...-a-♀}  

\begin{align*}
\text{yá-á-sukilil-a-♀} & / \text{yá-á-sukilil-á} / \\
[ \text{yá-á-sükìlìl-á} ] & \\
\end{align*}  

‘they have already accompanied’  

<table>
<thead>
<tr>
<th>TAM</th>
<th>GT</th>
<th>'sukilil/ ‘accompany’</th>
<th>/sópolol/ ‘untie’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Inceptive</td>
<td>$\emptyset$</td>
<td>[ yá-á-sükìlìl-á ]</td>
<td>[ yá-á-sópòlól-á ]</td>
</tr>
<tr>
<td>Recent Perfect</td>
<td>$\text{H}_{\text{FIN}}$</td>
<td>[ yá-á-sükìlìl-á ]</td>
<td>[ yá-á-sópòlól-á ]</td>
</tr>
<tr>
<td>Remote Perfect</td>
<td>$\text{H}_{\text{2-FIN}}$</td>
<td>[ yá-á-sükìlìl-á ]</td>
<td>[ tú-á-sópòlól-á ]</td>
</tr>
</tbody>
</table>

“The first important thing to be noted is that the various TAMs … do not seem to have anything in common semantically. Thus, it does not seem possible to assign the MH any consistent meaning that it contributes the form.” [Bickmore 2007:254]
Tense/aspect expounded through several sub-exponents

<table>
<thead>
<tr>
<th>TAM</th>
<th>Exponence</th>
<th>TAM</th>
<th>Exponence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistive Potential</td>
<td>ngá-aa-…-a-Ø</td>
<td>Far Past</td>
<td>a-…-il-e-bishop²-FIN</td>
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<tr>
<td>Past Inceptive</td>
<td>aa-…-a-Ø</td>
<td>Far Past</td>
<td>a-…-ang-a-bishop²-FIN</td>
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<tr>
<td>Progressive</td>
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<tr>
<td>Contrastive Habitual</td>
<td>ma-áa-…-a-Ø</td>
<td>Remote Perfect</td>
<td>a-…-a-bishop²-FIN</td>
</tr>
<tr>
<td>Future Continuative</td>
<td>ka-áa-…-a-Ø</td>
<td>Narrative Past</td>
<td>…-a-bishop²-FIN</td>
</tr>
<tr>
<td>Future Progressive</td>
<td>la-áa-…-a-Ø</td>
<td>Remote Future</td>
<td>la-…-a-bishop²-FIN</td>
</tr>
<tr>
<td>Hortative</td>
<td>áa-…-a-Ø</td>
<td>Potential</td>
<td>ngá-…-a-bishop²-FIN</td>
</tr>
<tr>
<td>Immediate Future</td>
<td>máa-…-a-Ø</td>
<td>Recent Perfect</td>
<td>á-…-a-bishop²-FIN</td>
</tr>
<tr>
<td>Habitual</td>
<td>káa-…-a-Ø</td>
<td>Yesterday Past</td>
<td>á-…-ang-a-bishop²-FIN</td>
</tr>
<tr>
<td>Present Progressive</td>
<td>ku-…-a-Ø</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistive</td>
<td>cí-li-…-a-Ø</td>
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Co-exponents~sub-exponents
a. Meaning contributed by co-exponents of TAMs is not compositional
b. Floating grammatical tones are therefore equal co-exponents of TAMs

Hourglass exponence: Many heads in input (Asp⁰, T⁰, Mood⁰) which are mapped to a complex set of morphs in the output (a-, ci-, -il, -e, bishop), but in no one-to-one fashion

Subject markers in Cilungu:

| Subject Markers | 1SG | 2SG | 3SG | C1 | 1PL | 2PL | 3PL | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | ...
<table>
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<tbody>
<tr>
<td></td>
<td>ň-</td>
<td>ŭ-</td>
<td>u-/V</td>
<td>; a-/C</td>
<td>tū-</td>
<td>mú-</td>
<td>yá-</td>
<td>gú-</td>
<td>i-</td>
<td>li-</td>
<td>yá-</td>
<td>ci-</td>
<td>vi-</td>
<td>i-</td>
<td>zi-</td>
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</tbody>
</table>

Subject markers appear before verbs
a. Agree in noun class with the subject
b. All SMs except three bear a high tone underlingly
c. Those which do not consist of 3SG u-/a-, class 4 i-, and class 9 i-
d. These three markers do not form a morpho-syntactically natural class

There is evidence that these three SMs are actually toneless with a floating high tone, e.g.
/a⁰/ 3SG [Bickmore 2014:153]
a. / tū-ku-mu-ziik-a / [ tükümúziikà ] ‘we are burying him/her’
b. / a⁰-ku-mu-ziik-a / [ àkümúziikà ] ‘he/she is burying him/her’
Regardless, there remains to be a unique phonological criterion which unifies these three to the exclusion of other TAMs: floating-tone sponsoring non-toned SMs.

In the majority of TAMs, the tonal value of the subject marker does not affect the TAM’s associated grammatical tone.

a. However, in three TAMs, high tone SMs condition one pattern while low tone SMs another: the *Yesterday Past*, the *Recent Past*, and the *Perfect*.

**Outward-looking tone-conditioned PCA (?) :**

\[ [\text{\textit{SM}} \text{NEG} \text{TAM} [\text{\textit{MS}} \text{OM} [S [\text{\textit{B}} \text{ROOT} \text{DERIV}] \text{TAM FV} ] ] ] \]

A minimal pair with *Yesterday Past*:

a. High-toned *ú*- 2SG conditions a grammatical tone \(H_{\text{FIN}}\) at the right edge.

b. Non-high-toned *ú*- 3SG does not.

**Yesterday Past: \(\text{á} \ldots \text{il-e-} H_{\text{FIN}}\)** [Bickmore 2007:8]

No tone on root

a. \(/\text{ú-á-mu-fuk-il-e-} H_{\text{FIN}}\) → \([w-áá-mú-fúk-iíl\text{ë}]\)

b. \(/\text{ú-á-mu-fuk-il-e-} ŵ/\) → \([w-áá-mú-fúk-iíl\text{ë}]\)

\(\leftrightarrow \text{LH } [\text{LL}]\)

‘you (sg) harvested for him/her (yesterday)’

‘he/she harvested for him/her (yesterday)’

**Yesterday Past** – high tone root:

a. \(/\text{ú-á-mu-fúk-il-e-} H_{\text{FIN}}\) → \([w-áá-mú-fúk-iíl\text{ë}]\)

‘you (sg) turned up hem for him/her (yesterday)’

b. \(/\text{ú-á-mu-fúk-il-e-} ŵ/\) → \([w-áá-mú-fúk-iíl\text{ë}]\)

\([\text{I might be better understood as non-default }] ; \text{ask me}\]

‘he/she turned up hem for him/her (yesterday)’

**Parallel facts are seen for non-human noun-class markers**

[Bickmore 2007:246 ; first set from manuscript version only]

<table>
<thead>
<tr>
<th><strong>Class</strong></th>
<th><strong>\text{\textit{it/they}} washed’</strong></th>
<th>**\text{\textit{it/they}} was/were buried’</th>
<th><strong>\text{\textit{YP + Passive –u}}</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>C3</td>
<td>(/\text{gú-á-ful-il-e-} H_{\text{FIN}})</td>
<td>(/\text{wáá-fúz-il-ē} )</td>
<td>(/\text{gú-á-ziik-il-u-e-} H_{\text{FIN}})</td>
</tr>
<tr>
<td>C4</td>
<td>(/\text{i-á-ful-il-e-} ŵ/)</td>
<td>(/\text{yáá-fúz-il-ē} )</td>
<td>(/\text{i-á-ziik-il-u-e-} ŵ/)</td>
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<tr>
<td>C5</td>
<td>(/\text{li-á-ful-il-e-} H_{\text{FIN}})</td>
<td>(/\text{lyáá-fúz-il-ē} )</td>
<td>(/\text{li-á-ziik-il-u-e-} H_{\text{FIN}})</td>
</tr>
<tr>
<td>C6</td>
<td>(/\text{yáá-ful-il-e-} ŵ/)</td>
<td>(/\text{yáá-fúz-il-ē} )</td>
<td>(/\text{yáá-ziik-il-u-e-} ŵ/)</td>
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<tr>
<td>C7</td>
<td>(/\text{ci-á-ful-il-e-} ŵ/)</td>
<td>(/\text{cháá-fúz-il-ē} )</td>
<td>(/\text{ci-á-ziik-il-u-e-} ŵ/)</td>
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<tr>
<td>C8</td>
<td>(/\text{vi-á-ful-il-e-} ŵ/)</td>
<td>(/\text{vyáá-fúz-il-ē} )</td>
<td>(/\text{vi-á-ziik-il-u-e-} ŵ/)</td>
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<td>C9</td>
<td>(/\text{i-á-ful-il-e-} ŵ/)</td>
<td>(/\text{yáá-fúz-il-ē} )</td>
<td>(/\text{i-á-ziik-il-u-e-} ŵ/)</td>
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<td>C10</td>
<td>(/\text{zi-á-ful-il-e-} ŵ/)</td>
<td>(/\text{zyáá-fúz-il-ē} )</td>
<td>(/\text{zi-á-ziik-il-u-e-} ŵ/)</td>
</tr>
<tr>
<td>C11</td>
<td>(/\text{lú-á-ful-il-e-} ŵ/)</td>
<td>(/\text{lwáá-fúz-il-ē} )</td>
<td>(/\text{lúá-ziik-il-u-e-} ŵ/)</td>
</tr>
<tr>
<td>C12</td>
<td>(/\text{ká-á-ful-il-e-} ŵ/)</td>
<td>(/\text{káá-fúz-il-ē} )</td>
<td>(/\text{ká-á-ziik-il-u-e-} ŵ/)</td>
</tr>
</tbody>
</table>

… … … … … …
Other exceptional TAMs: Trigger of allomorphy is H vs. Ø tone, but outcome different

Allomorphy:

a. [YESTERDAY PAST] ↔ á- -il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽

b. [RECENT PAST] ↔ á- cí -il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽

c. [PERFECT] ↔ -il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽

Recent Past: á-cí-…-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽

a. H-toned SM /tú-á-cí-sópolol-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽 [tw-áá-cí-sópolw-ilé]
   ‘we recently untied’

b. Non-H-toned SM /u-á-cí-sópolol-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽 [w-àà-cí-sópolw-ilé]
   ‘he/she recently untied’

   ‘we recently buried for him/her’

   ‘he/she recently accompanied him/her’

Perfect: …-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽

a. H /tú-ful-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽 → [tú-fúz-ilé]
   ‘we have washed’

b. ¬H /a-ful-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽 → [à-fúz-ilé]
   ‘he/she has washed’

c. H /tú-mu-ziik-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽 [tw-áá-cí-mú-zììs-ilé]
   ‘we have buried him/her’

d. ¬H /a-sukilil-il-e ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ ⵜ �epam独角兽 → [à-sùkilil-ilé]
   ‘he/she has accompanied’

Obligatory note from the Larry Hyman (p.c.): “The Law of Initials and Finals”
“Yes, this is a pattern that Bantu tonologists have been aware of at least since Meeussen. I remember it coming up at the CALL meeting in 1972 (!) in Leiden at a time when we could all sit around one conference table! The general theory is that these derive from structures where the subject was repeated at the end of the verb, as you might expect from a relative clause or sometimes negatives (as per Makua, Nzadi etc.). François Nsuka talks about this in his dissertation on relative clauses. This may be only one source, but by ’insubordination’ à la Nick Evans the relative structure can become a main clause. I found it in Kirimi.” [See Nzadi relatives in Hyman 2012:109]

In synchronic Cilungu, we cannot attribute this to general tonology

a. Bickmore (2007, 2014, 2019) provides numerous contexts which all illustrate the exceptional interaction between SM tone and these TAMs: i.e. not spurious

b. I.e. no active rule (i.e. a synchronically active Law of Initials and Finals) in language which deletes H at end of word when no H at beginning of word
c. E.g. the tone of the SM has no effect on the co-varying grammatical tone with other similar TAMs

Far Past:  a-...-il-e-\( \text{ʔ}_{2,\text{FIN}} \)  

a. H  \( /u\text{-a-mu-fuk-il-e-} \text{ʔ}_{2,\text{FIN}} / \rightarrow [w\text{-áá-mú-fük-lé} \]  
‘you (sg) harvested for him/her (yesterday)’

b. ¬H  \( /u\text{-a-mu-fuk-il-e-} \text{ʔ}_{2,\text{FIN}} / \rightarrow [w\text{-àà-mú-fük-lé} \]  
‘he/she harvested for him/her (yesterday)’

Remote perfect:  a-...-a-\( \text{ʔ}_{2,\text{FIN}} \)  

a. H  \( /tú\text{-a-ziik-a-} \text{ʔ}_{2,\text{FIN}} / [t\text{w\text{-áá-zíík-á} \]  ‘we have already buried’

b. ¬H  \( /u\text{-a-ziik-a-} \text{ʔ}_{2,\text{FIN}} / [w\text{-àà- zíík-á} \]  ‘he/she has already buried’

Importance point 1:  

a. these uncontroversially show surface non-local effects between tonal exponents, regardless of analysis

Important point 2:  

a. Segmental TAM exponents are closer to the root than agreement exponents

b. Tonal TAM exponents (the floating \( \text{ʔ} \) these data tones) can also be understood as closer to the root because they target the stem-level morphological constituent (e.g. “dock to the second TBU of the stem”)

c. If TAM is more inward compared to subject agreement

d. And the realization of certain TAM exponence is sensitive to a phonological feature of this outer agreement

e. Then this constitutes a case of outward-looking phonologically-conditioned allomorphy

Complications from negative morphology: Tone on SM is deleted before negative prefix

Present progressive (non-exceptional TAM)  

/SM-NEG-.../  
/tú-táa-ku-ful-a/  
/tu-táa-ku-ful-a/  
/tù-táa-ku-ful-a/  
‘we are not washing’ [B07:184]

Future progressive (non-exceptional TAM)  

a. / tú-tá-la-áa-sukilil-a / \( \text{ʔ} \)-tá-la-áa-sukilil-a \]  [ tu-tá-lá-á-súkílíl-à \]  ‘we will not be accompanying’ [B07:206]

b. \( \text{ʔ} \)-tá-la-áa-mu-ziik-il-a / a-tá-la-áa-mu-ziik-il-a / [ a-tá-lá-á-mú-ziík-il-à ]  ‘he/she will not be burying for him/her’ [B07:206]
Consider one of the exceptional, allomorphy-triggering TAMs:

\[ \text{[RECENT PAST]} \leftrightarrow \text{á- cí -il-e } -\overline{\text{H}}_{\text{FIN}} / \text{if outer SM } H \]
\[ \text{á- cí- -il-e } -\overline{\text{H}}_{2} / \text{if outer SM } \neg H \]

Negative \( t\text{á-} \) + Recent Past \( \text{á-}c\text{-…-il-e } -\overline{\text{H}}_{\text{FIN}} \)

a. H tone root
   i. H tone SM /\text{tú-tá-páapaatik-il-e+} -\overline{\text{H}}_{\text{FIN}}/  
      \[\text{tu-tá-páapaatik-il-é } \]
      \[\text{tú-tá-páápatik-é} \]
      ‘they haven’t flattened’ [B14:50]
   ii. Non-H SM /\text{a-tá-páapaatik-il-e+} -\overline{\text{H}}_{\text{FIN}}/  
      \[\text{a-tá-páapaatik-il-é } \]
      \[\text{à-tá-páápatik-é} \]
      ‘he/she hasn’t flattened’ [B14:50]

b. Non-H tone root
   i. H tone SM /\text{yá-tá-mu-su}kílil-il-e+ -\overline{\text{H}}_{2}/  
      \[\text{ya-tá-mu-su}kíl-\text{iil-é } \]
      \[\text{yá-tá-mú-sùkíl-il-è} \]
      ‘they haven’t accompanied him/her’ [B14:50]
   ii. Non-H SM /\text{a-tá-mu-su}kílil-il-e+ -\overline{\text{H}}_{2}/  
      \[\text{a-tá-mu-su}kíl-il-\text{é } \]
      \[\text{à-tá-mú-sùkíl-ííl-è} \]
      ‘he/she hasn’t accompanied him/her’ [B14:50]

John Goldsmith’s idea (p.c.): Highly restricted sensitivity to root tone here is actually a remnant of an older system where these GT were conditioned by root tone more generally

Diachronic reinterpretation?

a. Stage 1) GT allomorphy was originally sensitive to root tone  
   Root tone can have underlying H tone only on initial TBU (stem initial)

b. Stage 2) GT allomorphy has ‘expanded’ outwards
   i. It is now allomorphy sensitive to the initial H of the word, not the stem
   ii. Negative is a ‘holdover’ of the older pattern

4 DISCUSSION POINTS

A final question: What are some alterative explanations for the clear typological rarity of outward-looking PCA?

a. Few plausible diachronic pathways?
   [Hayes 2018 – Recent discussion on appealing to diachrony vs. to restrictiveness in curtailing model overgeneration]

b. Not enough bigram frequency? [Ryan 2010]
If outward-looking phonologically conditioned allomorphy is truly non-existent, are these directions enough to predict its non-existence?

a. This would be a major problem simultaneous vocabulary insertion (i.e. as sketched for OT-DM) vs. inside-out vocabulary insertion

Returning to our Prediction 2 – Transparency and Opacity

Kiparsky (2017) criticizes Arregi & Nevins’ (2012) treatment of Basque auxiliaries as critically under-demonstrating opacity across sub-modules/post-syntactic operations, to which Arregi & Nevins (2017) respond by recognizing but qualifying and complicating this claim of a ‘lack of opacity’ by arguing for another case of opacity

One recurrent operation which shows opacity effects involves morph(eme) displacement, i.e. a morph in an unexpected linear position

a. Is dislocation different? If so, why?
b. Working hypothesis: such dislocation then happens within phonology - it does not happen at spell-out

Turoyo [tru] [Neo-Aramaic - Kalin 2018, emphasis mine]
“phonological displacement of an affix (e.g., infixation) counterbleeds morphological operations but feeds/bleeds phonological operations. While some of the Turoyo findings simply reaffirm previously-established findings (see especially Paster 2006, 2009), a novel argument comes from showing that phonologically conditioned allomorphy persists across a linearly-intervening (but not structurally-intervening) affix.”

Meadow Mari [mhr] [Uralic - Guseva & Weisser 2018]
Explicitly reject parallelism in their DM account of suspended affixation citing D-Metathesis counterfeeding Suspended affixation

“-lla displacement counterbleeds ni- insertion”

Caquinte [cot] [Arawak - Rolle & O’Hagan in press]
Second position clitics are not satisfied at spell-out, i.e. they vacuously lower even when they have an appropriate host in the input

Under OT-DM, which subcategorization requirements are satisfied at spell-out, and which are satisfied within the phonological module?

a. More ‘traditional’ phonological aspects which are subcategorized are satisfied at spell-out [Makonde (Bantu) prosodic idiosyncrasies satisfied at spell-out - Rolle & Hyman in press]

b. Phonologically Conditioned allomorphy (PCA) – sensitive to underlying representations, not output, e.g. Turkish –I vs. –sI [Paster 2006:98-100]
5 REFERENCES

On my website, next to link for this handout: www.nicholasrolle.com/output

6 APPENDICES

6.1 Appendix 1: Core tenets of DM

**Distributedness**: ‘Morphology’ (slash morphological components) are ‘distributed’, e.g. primitives exist in three separate lists: the feature lexicon, the vocabulary, and the encyclopedia

**Module Order**: Syntax precedes and feeds morphology and not vice versa (i.e. there is no linguistic pre-syntactic module)

Cf. Kiparsky 2017 ‘Lexicalist Morphology’ (LM) - “Since the auxiliary complex is formed as a word in the morphology, it enters the syntax as a single functional head”

[Baker’s 1985 ‘mirror principle’; see a thorough comparison in Siddiqi 2014]

**Uniform Concatenation**: Morphologically complex words are formed via the same operations (i.e. MERGE) concatenating words in clauses

[e.g. syntax-all-the-way-down – Marantz 2000, 2001, Bobaljik 2017, a.o.]

**Feature Realization**: Vocabulary Items realize feature bundles with phonological information (Late Insertion in DM terminology)

Cf. this Realizational model contrasts with an Incremental model, in which the morphemes themselves introduce relevant syntactic/semantic features [Stump 2001]

**Phonology-Free**: Syntax/semantics lack access to phonological features

“nodes consist entirely of morphosyntactic/semantic features and lack phonological features” (H&M 1993:121)

[earlier Zwicky & Pullum 1986a,b]

**Internal Complexity**: Internally complex words are the concatenation of morphosyntactic feature bundles


**Bundle Manipulation**: The output of feature bundles from syntax can be manipulated by later, ‘morphological’ operations

[e.g. Embick 2015:217 - “I will draw on an example in which Fission is applied before Vocabulary Insertion” (emphasis mine), made most explicit in Arregi & Nevins (2012)]

6.2 Appendix 2: Conspiracies and motivations for operations

**Conspiracy**: where rules with dissimilar inputs, outputs, and/or environments result in surface forms which all converge on or avoid a specific structure

Conspiracy to avoid bare verbs in Tiwa

[Several other conspiracies in Trommer 2001a, Rolle 2019, Murphy 2019, Foley to appear, a.o.]

a. In nearly all contexts, the verb appears with an overt suffix
b. One exception is with auxiliary verb constructions where an auxiliary selects a bare verb, in violation of a morphological constraint *BARE-V

Tiwa employs two repairs in free variation:

a. **Rebracketing**: an otherwise independent verb and auxiliary form a single complex phonological word, with the verb cliticizing to the right-adjacent auxiliary

   [Evidence: in V+Aux complexes, certain word medial consonants undergo intervocalic voicing]

b. **Dislocating**: a morpho-syntactically higher FOCUS head which canonically attaches to the right edge of the language attaches instead to the verb (Dawson’s ‘Focus Drift’)

   [Evidence: semantic argumentation that the verb is not focused]

<table>
<thead>
<tr>
<th>Language</th>
<th>Constraint</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiwa</td>
<td>*BARE-VERB</td>
<td>Rebracketing: <strong>Verb and auxiliary form one word</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NE India – Dawson 2017</td>
<td></td>
<td>Dislocating: <strong>Focus dislocates altruistically</strong></td>
</tr>
</tbody>
</table>

Tiwa repairs for constraint *BARE-V

a. **Rebracking (‘verb cliticization’)***

   \[(\omega \textit{lí}=\textit{thái-do}=\textit{sê}) \]

   \[\textit{lí}=\textit{thái-do}=\textit{sê} \]

   \[\textit{go}=\textit{AUX-IPFV}=\textit{FOC} \]

   ‘he is still going’

b. **Dislocating (‘Focus Drift’)***

   \[(\omega \textit{lí}=\textit{sê})(\omega \textit{thái-do}) \]

   \[\textit{lí}=\textit{sê}=\textit{thái-do} \]

   \[\textit{go}=\textit{FOC} \textit{AUX-IPFV} \]

   ‘he is still going’

The duplication problem

[See Kiparsky 2017 for historical context]

If we wish to formally incorporate markedness within grammar – in other words, directly encode the motivations for the operations – then constraints are our best bet, and if we allow for constraints, then we no longer need rules