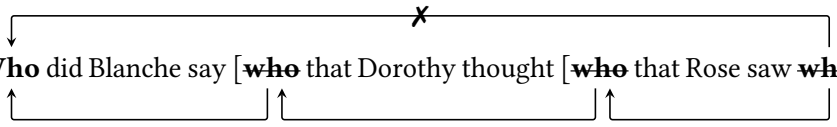
Georgi 2017

LING 200B · Ethan Poole · 8 November 2021

1 Introduction

- ***Background: Successive cyclicity***
  Movement out of a finite clause proceeds SUCCESSIVE CYCLICALLY, making pit stops in intermediate positions:



(1) **Who** did Blanche say [~~**who**~~ that Dorothy thought [~~**who**~~ that Rose saw ~~**who**~~]]?

- ***Reflexes of movement***
  - In many languages, $\overline{\text{A}}$-movement leaves REFLEXES along the path of movement, which manifest in a variety of ways:
    - Semantic: scope, binding, *de re/de dicto* (i.e. reconstruction effects)
    - Syntactic: copying, stranding, inversion
    - Morphological: morpheme changes
    - Phonological: tone changes
    - Addition, deletion, or replacement of an exponent
  - Reflexes can occur either (i) in the intermediate or final landing sites (PHRASAL REFLEXES) or (ii) on the head triggering the movement step (HEAD REFLEXES).
  - Phrasal reflexes can be analyzed as copy spell-out or stranding of parts of the moved XP, but such an analysis does not readily extend to head reflexes.

⇒ Georgi (2017) is concerned with head reflexes that involve an AGREE-relation between a head and the moving XP.[1]

[1] Sometimes this relation can be indirect: H triggers the movement of XP, H agrees with XP, H agrees with a lower Y, and this string of relations influences the realization of Y.

✳ ***Patterns of reflexes of long $\overline{A}$-movement***

(2) a. **P1: Reflex in the final and nonfinal clauses**
$[_{S_1} \dots [_{HP}\ XP\ [_{\overline{H}}\ \textbf{H-R} \dots [_{S_2} \dots \textbf{H-R} \dots [_{S_3} \dots \textbf{H-R} \dots \_\_\__{XP}\ ]\ ]\ ]\ ]\ ]$

b. **P2: Reflex only in the final clause**
$[_{S_1} \dots [_{HP}\ XP\ [_{\overline{H}}\ \textbf{H-R} \dots [_{S_2} \dots H \dots [_{S_3} \dots H \dots \_\_\__{XP}\ ]\ ]\ ]\ ]\ ]$

c. **P3: Reflex only in nonfinal clauses**
$[_{S_1} \dots [_{HP}\ XP\ [_{\overline{H}}\ H \dots [_{S_2} \dots \textbf{H-R} \dots [_{S_3} \dots \textbf{H-R} \dots \_\_\__{XP}\ ]\ ]\ ]\ ]\ ]$

d. **P4: No reflex in any clause**
$[_{S_1} \dots [_{HP}\ XP\ [_{\overline{H}}\ H \dots [_{S_2} \dots H \dots [_{S_3} \dots H \dots \_\_\__{XP}\ ]\ ]\ ]\ ]\ ]$

- In some languages, P4 involves a default agreement exponent, which signals that AGREE occurred and failed.[2]
- Capturing P2 and P3 will require some means of differentiating final and nonfinal landing sites (in the narrow syntax), which Georgi does in terms of EDGE FEATURES.
- There are also MIXED patterns and OPTIONALITY: P1 and P2 (mixed); P1 and P3 (mixed); P3 or P4 (optionality); P1 or P2 (optionality).

[2] Preminger (2011, 2014)

⇒ While there are analyses of *individual* phenomena involving movement reflexes in the previous literature, Georgi (2017) provides a *unified* analysis of them, in terms of ordering of MERGE and AGREE.[3]

[3] This paper is a summary of Georgi (2014).

- ***Roadmap***
  1. Georgi's (2017) proposal
  2. Examples of the various patterns and how the proposal accounts for them
  3. Alternatives analyses from the literature
  4. Broader implications

2 Proposal

- ***Assumptions***
  1. MERGE is triggered by [•F•], and AGREE is triggered by [⋆F:□⋆].[4]
  2. AGREE is between a head H and [Spec, HP] (therefore, upwards).
  3. Intermediate movement steps are driven by [•EF•].

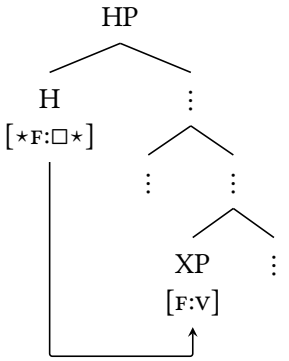
[4] Heck and Müller (2007)

- ***Aside: Upwards and downwards AGREE***
  - The PROBE initiates AGREE ([⋆F:□⋆]); the GOAL is what the probe targets ([F:V]).
  - Downwards AGREE: probe c–commands the goal, valuation is upwards[5]
  - Upwards AGREE: goal c–commands the probe, valuation is downwards[6]

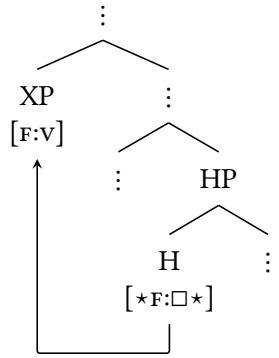
[5] e.g. Chomsky (2000, 2001)

[6] Baker (2008); Wurmbrand (2012); Zeijlstra (2012)

(3) **Downwards AGREE**



(4) **Upwards AGREE**



  - There is (was?) a debate about whether AGREE is upwards or downwards. As far as I can tell, the debate settled on AGREE being downwards.[7]
  - Georgi relies on Spec-Head AGREE, not true upwards AGREE. Spec-Head AGREE can be analyzed in terms of cyclic downwards AGREE.[8]

[7] Preminger (2013)

[8] Rezac (2003)

✳ ***Proposal***

- MERGE and AGREE are extrinsically ordered. More specifically, the features that trigger MERGE and AGREE are extrinsically ordered.
- MERGE > AGREE: feeding of agreement
- AGREE > MERGE: counterfeeding of agreement
- These ordering statements are *language-wide*, but can be overwritten by lexically-specified orderings.

✳ ***Possible orderings of internal Merge triggers and a probe feature***

(5)

Order of features	Interactions: Final step	Interactions: Nonfinal steps	Pattern
a. [•F•], [•EF•] ≻ [∗F:□∗]	feed(s) Agree		PI
b. [•F•] ≻ [∗F:□∗] ≻ [•EF•]	feeds Agree	counterfeed Agree	PII
c. [•EF•] ≻ [∗F:□∗] ≻ [•F•]	counterfeeds Agree	feed Agree	PIII
d. [∗F:□∗] ≻ [•F•], [•EF•]	counterfeed(s) Agree		PIV

- ***With downwards AGREE***
  The core of the analysis holds under downwards AGREE, but such an analysis must somehow block AGREE with an in-situ operator.

(6) a. P1: [⋆F:□⋆] > [•F•], [•EF•]

b. P2: [•EF•] > [⋆F:□⋆] > [•F•]

c. P3: [•F•] > [⋆F:□⋆] > [•EF•]

d. P4: [•F•], [•EF•] > [⋆F:□⋆]

3 Application

3.1 P1: Reflex in the final and nonfinal clauses

(7) $[_{S_1} \ldots [_{HP}\ XP\ [_{\overline{H}}\ \textbf{H-R} \ldots [_{S_2} \ldots \textbf{H-R} \ldots [_{S_3} \ldots \textbf{H-R} \ldots \_\_\__{XP}\ ]\ ]\ ]\ ]\ ]$

- ***Example: Wolof u-chains***
  Every C head along the path of $\overline{A}$-movement agrees in class with the moved XP:[9,10]

[9] For references for the data, see Georgi (2017).

[10] CL = class marker
FRC = force marker

(8) a. [$_{CP}$ $Ø_k$ **f**-u a defe [$_{CP}$ **f**-u Maryam wax [$_{CP}$ **f**-u ñu teg téére
Q CL-u 2SG think CL-u Maryam say CL-u 3PL put book
b-i _____$_k$]]]?
CL-DEF.PROX
'Where do you think Maryam said they put the book?'

b. [$_{CP}$ $Ø_k$ **k**-u Kumba wax [$_{CP}$ ne **k**-u Isaa defe [$_{CP}$ ne **k**-u Maryam
Q CL-u Kumba say FRC CL-u Isaa think FRC CL-u Maryam
dóór _____$_k$]]]?
hit
'Who did Kumba say that Isaa thought that Maryam hit?'
(Torrence 2012:1171)

(9) **Analysis**
[•WH•], [•EF•] > [⋆CLASS:□⋆]

a. **Features on C (nonfinal step)**

$$H\begin{bmatrix} [\bullet EF\bullet] \\ [\star CLASS{:}\square\star] \end{bmatrix}$$

b. **Features on C (final step)**

$$\mathrm{H}\begin{bmatrix} [\bullet \textsc{wh} \bullet] \\ [\star \textsc{class}{:}\square\star] \end{bmatrix}$$

- ***Other examples of P1***
  - Irish complementizer selection in *aL*-chains
  - Chamorro case agreement on the verb
  - Indonesian/Malay *meN-* deletion
  - Kikuyu downstep deletion
  - Spanish and Belfast English subject-auxiliary inversion

3.2 P2: Reflex only in the final clause

(10) $[_{S_1} \ldots [_{HP}\ \mathrm{XP}\ [_{\overline{H}}\ \textbf{H-R} \ldots [_{S_2} \ldots \mathrm{H} \ldots [_{S_3} \ldots \mathrm{H} \ldots \_\_\__{\mathrm{XP}}\ ]\ ]\ ]\ ]\ ]$

- ***Example: Duala no-marking***
  If a non-subject XP is $\overline{\text{A}}$-moved, the marker *no* is inserted after the first verbal element (in T), but only in the final clause:[11]

[11] FOC = focus marker

(11) a. Kuo a bodi nu moto kalati kiele.
Kuo 3SG give that man book yesterday
'Kuo gave a book to that man yesterday.' *declarative*

b. Kalati$_k$ nde Kuo a bodi **no** nu moto ____$_k$ kiele.
book FOC Kuo 3SG give NO that man yesterday
'It's a book Kuo gave to that man yesterday.' *DO extraction*

c. [$_{CP}$ Ni kalati$_k$ nde na ta **no** na kwalane Kuo [$_{CP}$ na a-angamente
that book FOC I PST NO I tell Kuo that 3SG-must
wana ____$_k$]].
bring
'That's the book I told Kuo that he should bring.' *long DO extraction*
(Epée 1976b:194, 196)

(12) **Analysis**
[•WH•] > [⋆OP:□⋆] > [•EF•]

a. **Features on C (nonfinal step)**

$$\mathrm{H}\begin{bmatrix} [\star \textsc{op}{:}\square\star] \\ [\bullet \textsc{ef} \bullet] \end{bmatrix}$$

b. **Features on C (final step)**

$$\mathrm{H}\begin{bmatrix} [\bullet \textsc{wh} \bullet] \\ [\star \textsc{op}{:}\square\star] \end{bmatrix}$$

- ***Other examples of P2***
  - Chamorro complementizer agreement
  - Ewe subject pronoun choice
  - Indonesian focus marking
  - Bùlì complementizer agreement

- Hausa relative tense marking
- Moore deletion of a verbal suffix
- Haitian Creole complementizer selection

3.3 P3: Reflex only in nonfinal clauses

(13) $[_{S_1} \ldots [_{HP}\ XP\ [_{\overline{H}}\ H \ldots [_{S_2} \ldots \textbf{H-R} \ldots [_{S_3} \ldots \textbf{H-R} \ldots \_\_\__{XP}\ ]\ ]\ ]\ ]\ ]$

- ***Example: Kiitharaka focus marking***
  The prefix *n-* attaches to the verb in all nonfinal clauses crossed by $\overline{\text{A}}$-movement, but never in the final clause:[12]

(14) a. $[_{CP}$ I-mbi$_k$ g-ug-ir-e $[_{CP}$ ati John **n**-a-ring-ir-e _____$_k$]]?
FOC-what 2SG-say-PERF-FV that John FOC-SM-beat-PERF-FV
'What did you say that John beat?'

b. $[_{CP}$ N-uu$_k$ u-ku-thugania $[_{CP}$ ati John **n**-a-ug-ir-e $[_{CP}$ Lucy **n**-a-ring-ir-e _____$_k$]]?
FOC-who 2SG-PRES-think that John FOC-SM-say-PERF-FV Lucy FOC-SM-beat-PERF-FV
'Who do you think that John said Lucy beat?'
(Muriungi 2005:47–48, 67–68)

[12] FOC = focus marker
FV = final vowel
PERF = perfective
SM = subject marker

(15) **Analysis**
[•EF•] > [⋆OP:□⋆] > [•WH•][13]

a. **Features on *v* (nonfinal step)**
$$\text{H}\begin{bmatrix}[\bullet\text{EF}\bullet] \\ [\star\text{OP:}\square\star]\end{bmatrix}$$

b. **Features on *v* (final step)**
$$\text{H}\begin{bmatrix}[\star\text{OP:}\square\star] \\ [\bullet\text{WH}\bullet]\end{bmatrix}$$

[13] [OP] is an abstract feature on operators.

- Interestingly, Kiitharaka allows for partial *wh*-movement. In this context, the preverbal focus marker cannot appear above the overt landing site of the *wh*-phrase:

(16) a. $[_{CP}$ G-ug-ir-e $[_{CP}$ ati n-uu$_k$ John a-ring-ir-e ___$_k$]]
2SG-say-PERF-FV that FOC-who John SM-beat PERF-FV
'What did you say that John beat?'

b. $[_{CP}$ U-ri-thugania $[_{CP}$ ati n-uu$_k$ John a-ug-ir-e $[_{CP}$ Lucy **n**-a-ring-ir-e ___$_k$]]]
2SG-PRES-think that FOC-who John SM-say-PERF-FV Lucy FOC-SM-beat-PERF-FV
'Who do you think that John said Lucy beat?'

- ***Other examples of P3***
  - Dinka *ke*-marking
  - Wolof complementizer agreement in *an*-chains
  - German obligatory extraposition

3.4 P4: No reflex in any clause

(17) $[_{S_1} \ldots [_{HP}\ XP\ [_{\overline{H}}\ H \ldots [_{S_2} \ldots H \ldots [_{S_3} \ldots H \ldots \_\_\_\ XP\ ]\ ]\ ]\ ]\ ]$

- In languages with no reflexes of movement, e.g. English, either:
  - there are no probes on movement-triggering heads, or
  - there are probes on movement-triggering heads, but [⋆F:□⋆] is ordered first:

(18) **Analysis**
[⋆F:□⋆] > [●F●], [●EF●]

a. **Features on C (nonfinal step)**

$$H\begin{bmatrix}[\star F{:}\square\star]\\ [\bullet EF\bullet]\end{bmatrix}$$

b. **Features on C (final step)**

$$H\begin{bmatrix}[\star F{:}\square\star]\\ [\bullet F\bullet]\end{bmatrix}$$

- ***Wolof an-chains***
  - In Wolof *an*-chains, nonfinal complementizers agree in class with the moved XP (P3), but this agreement is optional (P4). When the complementizer does not agree, there is a default class marker.[14]

[14] EXPL = expletive (default class marker)

(19) a. [CP K-an l-a-ñu wax [CP **k**-u jigéén j-i foog [CP **k**-u ma
CL-an EXPL-a-3PL say CL-u woman CL-DEF.PROX think CL-u 1SG
dóór]]]
hit
'Who did they say that the woman thinks that I hit?' *pattern III*

b. [CP K-an **l-a**-ñu wax [CP **l-a** jigéén j-i foog [CP
CL-an EXPL-a-3PL say EXPL-a woman CL-DEF.PROX think
l-a-a dóór]]]
EXPL-a-1SG hit
'Who did they say that the woman thinks that I hit?' *pattern IV*

  - The form of the complementizer 'root' is predictable: *a* is the default realization of C, and *u* reflects agreement with an indefinite.
  - Georgi takes the default class marker as an indication that AGREE happened, but failed. The failed AGREE results in a default exponent.[15]

[15] Following the framework of Preminger (2011, 2014).

(20) **Vocabulary Items for class on C**

a. /k-/ ↔ [CL:K] / ___ C

b. /f-/ ↔ [CL:F] / ___ C

c. /l-/ ↔ [CL:□] / ___ C

(21) **Vocabulary Items for C**

a. /i-/ ↔ C / ___ [DEF:INDEF,PROX]

b. /u-/ ↔ C / ___ [DEF:INDEF]

c. /a-/ ↔ C

⇒ Thus, the ordering in (18) must at least be an option.

3.5 Mixed patterns

- Some languages exhibit multiple reflexes of movement: A single instance of $\overline{\text{A}}$-movement has several reflexes which follow different patterns.

✳ ***Basic idea***
The reflexes are the result of different AGREE-relations. The AGREE-triggering features are ordered differently relative to the MERGE-triggering features.

- ***Chamorro: P1 and P2***
Wh-movement triggers a P1-reflex on the verb (case agreement), as well as a P2-reflex on the complementizer (category agreement):[16]

[16] AGR = agreement marker
OBL = oblique
L = linker

(22) $[_{CP_1}$ XP $[_{\overline{C}}$ **C-R** … ***v*-R** … $[_{CP_2}$ C … ***v*-R** … $[_{CP_3}$ C … ***v*-R** … ___ XP]]]]

(23) **Complementizer agreement for category**

a. Hafa$_k$ **Ø** malago'-mu ___$_k$
what C WH.OBL.want-AGR
'What do you want?' *[+N, –locat]*

b. Na'tungu' yu' [$_{CP}$ hafa$_k$ **Ø** malago'-mu ___$_k$]
make.know me what C WH.OBL.want-AGR
'Let me know what you want?' *[+N, –locat]*

c. [Ginin hayi]$_k$ **na** un-risibi katta ___$_k$
from who C AGR-receive letter
'From whom did you receive a letter?' *[–N]*

(24) **Mixed reflexes**
[Manu na lepblu]$_k$ Ø malagu'ñiha [$_{CP}$ na u-taitai _____$_k$]?
which L book C WH.OBL.want-AGR C WH.OBJ.AGR-read
Lit.: 'Which book do they$_i$ want that they$_i$ should read?'
(Chung 1998:230)

(25) **Analysis**
[•WH•] > [⋆CAT:□⋆] > [•EF•] > [⋆CASE:□⋆]

- A mixture of P1 and P2 is also found in Indonesian.

- ***Kiitharaka: P1 and P3***
In addition to the P3-reflex with preverbal focus marking, there is also a P1-reflex with allomorphy selection of the present-tense marker:[17]

[17] FOC = focus marker
FV = final vowel
PERF = perfective
SM = subject marker

(26) **Tense marker allomorphy**

a. [$_{CP}$ U-**ri**-thugania [$_{CP}$ ati John a-**ri**-ring-a uu]]
2SG-PRES-think that John SM-beat-FV who
'Who do you think that John is beating?'

b. [$_{CP}$ I-mbi$_k$ u-**ku**-thugania [$_{CP}$ ati John **n**-a-**ku**-ring-a ___$_k$]]
FOC-what 2SG-PRES-think that John FOC-SM-PRES-beat-FV
'What do you think that John is beating?'

(27) **Analysis**
[•EF•] > [⋆F:□⋆] > [•F•] > [⋆L:□⋆]

⇒ ***Prediction: No P2 and P3***
P2 and P3 require orderings that are mutually incompatible. Thus, the proposal predicts that P2 and P3 cannot cooccur, which appears to be borne out.

(28) a. P2: [•F•] > [⋆F:□⋆] > [•EF•]

b. P3: [•EF•] > [⋆F:□⋆] > [•F•]

- ***Lexically-specified orderings***
  - In Wolof, *u*-chains are P2 (alternating with P1), and *an*-chains are P3 (alternating with P4).
  - Crucially, these two chain types do not cooccur, and so do not disprove the above prediction.
  - However, with language-wide ordering statements, there is no way to capture this pattern in a single ordering statement.
  - To get around this problem, Georgi proposes that a language's general ordering statement can be overwritten by a *lexically-specified* ordering.
  - For example, in Wolof, the C head used in *an*-chains has a lexically-specified ordering statement that results in P3.

3.6 Optionality

⁕ ***Basic idea***
- The ordering of operation-inducing features is only PARTIAL, with some features not ordered relative to the others.
- Stacks of features on a given head must be TOTALLY ordered.
- If a head bears an operation-inducing feature whose order is not determined by the ordering statement, then a total order is imposed on it.

- ***Partial ordering for P1–P2 alternation***
For example: Wolof *u*-chains, Ewe subject pronoun choice[18]

[18] unordered = to the right of the pipe

(29) [•F•] > [⋆F:□⋆] | [•EF•]

a. [•F•], [•EF•] > [⋆F:□⋆] ⇝ P1

b. [•F•] > [⋆F:□⋆] > [•EF•] ⇝ P2

- ***Partial ordering for P3–P4 alternation***
For example: Wolof *an*-chains

(30) [⋆F:□⋆] > [•F•] | [•EF•]

a. [•EF•] > [⋆F:□⋆] > [•F•] ⇝ P3

b. [⋆F:□⋆] > [•F•], [•EF•] ⇝ P4

⇒ ***Free alternations***
- Note that nothing enforces [•EF•] to be ordered alike relative to AGREE in every nonfinal clause.

- The location of [•EF•] on the head's feature stack can in principle be chosen anew in each of them.
- Such patterns are in fact attested, like in Wolof *u*-chains, which has the partial ordering in (29):[19]

[19] EXPL = expletive (default class marker)

(31) a. [$_{CP}$ $Ø_k$ **k**-u Kumba wax [$_{CP}$ ne **l**-a Isaa defe [$_{CP}$ ne **k**-u Maryam
Q CL-u Kumba say FRC EXPL-a Isaa think FRC CL-u Maryam
dóór $\_\_\_\__k$]]]?
hit

b. [$_{CP}$ $Ø_k$ **k**-u Kumba wax [$_{CP}$ ne **k**-u Isaa defe [$_{CP}$ ne **l**-a Maryam
Q CL-u Kumba say FRC CL-u Isaa think FRC EXPL-a Maryam
dóór $\_\_\_\__k$]]]?
hit

c. *[$_{CP}$ $Ø_k$ **l**-a Kumba wax [$_{CP}$ ne **k**-u Isaa defe [$_{CP}$ ne **l**-a Maryam
Q EXPL-a Kumba say FRC CL-u Isaa think FRC EXPL-a Maryam
dóór $\_\_\_\__k$]]]?
hit
'Who did Kumba say that Isaa thought that Maryam hit?'
(Torrence 2012:1173)

- ***Why not optional probes?***
Georgi (2014:122) contends that the probe on intermediate heads being optionally present is feasible, but is only a restatement of the facts and thus is not very insightful.

4 Alternatives

- ***TL;DR***
  - P3 is problematic for most alternatives.
  - On the alternatives, optionality and mixed patterns require stipulative analyses, e.g. accidental homophony, zero exponents.
  - By contrast, the ordering approach is unified, simpler, and more elegant.

4.1 Absence of movement

∗ ***Basic idea***
Absence of reflex = absence of movement
  - P2: moved XP is actually base-generated in the final landing site
  - P2: one-fell-swoop movement
  - P3: moved XP does not actually move to the final position

- ***Problem: Conceptual***
  - This analysis requires $\overline{\text{A}}$-movement to differ drastically from language to language.
  - Given that decades of research have shown that in many typologically diverse languages, $\overline{\text{A}}$-movement is subject to the same locality restrictions (i.e. islands), this seems undesirable.

- ***Problem: Island sensitivity***
  - Duala has a P2-reflex, but $\overline{\text{A}}$-movement is island-sensitive:

(32) a. moto$_i$ [$_{CP}$ nyena$_{i,k}$ na mongole **no** [$_{CP}$ na o kwadi [$_{CP}$ na o
man who I think NO that you say that you
wen ____$_k$]]]
see
'the man who I think that you said that you saw'

b. *moto$_i$ [$_{CP}$ [nyena$_i$]$_k$ na neimbi **no** [$_{NP}$ mbo$_j$ [$_{CP}$ [nyenat$_j$]$_n$ ____$_n$ e
man who I recognize NO dog which SM
kuko ____$_k$]]]
bit
'the man who I recognized the dog which bit (him)' *CNP island*

c. *moto$_i$ [$_{CP}$ [nyena$_i$]$_k$ na nyaka **no** [$_{CP}$ [nja mmuto]$_n$ ____$_n$
man who I am.astonished NO who woman
bai ____$_k$]]
married
'the man who I wonder which woman married (him)' wh-*island*
(Biloa 1993:70–71)

⇒ Not all P2 can be base-generation.

  - Similarly, Kiitharaka has a P3-reflex, but an island cannot intervene between the final clause and the topmost nonfinal clause:

(33) ??[$_{CP1}$ N-ata$_k$ u-ku-ama [$_{CP2}$ kethira **n**-a-kar-ir-e ____$_k$]]?
FOC-what 2SG-PRES-wonder whether FOC-SM-behave-PERF-FV
'How do you wonder whether she/he behaved?'
(Muriungi 2005:63)

⇒ Not all P3 can be accounted for with no movement to the final position.

- ***Problem: Mixed P1 and P2***
  - Chamorro has mixed P1- and P2-reflexes:

(34) [Manu na lepblu]$_k$ Ø malagu'ñiha [$_{CP}$ na u-taitai ____$_k$]?
which L book C WH.OBL.want-AGR C WH.OBJ.AGR-read
Lit.: 'Which book do they$_i$ want that they$_i$ should read?'
(Chung 1998:230)

  - On this analysis, P1 would require movement through every clause, but P2 would require one-fell-swoop movement. ⊥

⇒ Not all P2 can be one-fell-swoop movement.

4.2 Absence of agreement

✳ ***Basic idea***
Absence of reflex = absence of AGREE

  - P2: no probe on intermediate movement triggers
  - P3: no probe on final movement trigger

⇒ This approach cannot handle a non-zero / non-zero alternation of exponents, like with Wolof *an*-chains.

4.3 Enriched representations

✳ ***Basic idea***
Opaque orderings are derived by reference to enriched representations in which abstract elements (i.e. traces) occupy nonfinal landing sites.

- ***Assumption: Two types of binding***
  - A-binding: Binder is in an A-position, e.g. [Spec, TP]
  - $\overline{\text{A}}$-binding: Binder is in an $\overline{\text{A}}$-position, e.g. [Spec, CP]
- ***Deriving P2***
  The reflex is an anaphor that must be locally $\overline{\text{A}}$-bound:

  (35) $[_{\text{CP}}\ \text{XP}_k\ [\text{C}'\ \ldots\ \mathbf{R}_{+anaph}\ \ldots\ \text{V}\ [\text{CP}\ \text{t}_k\ [\text{C}'\ \ldots\ \mathbf{R}_{+anaph}\ \ldots\ \text{V}\ \text{t}_k\ ]]]]$
  $\bar{\text{A}}$-binding ⤴ ; *$\bar{\text{A}}$-binding ⤴
- ***Deriving P1***
  The reflex is an anaphor that must be locally $\overline{\text{A}}$-bound, but traces can act as binders:

  (36) $[_{\text{CP}}\ \text{XP}_k\ [\text{C}'\ \ldots\ \mathbf{R}_{+anaph}\ \ldots\ \text{V}\ [\text{CP}\ \text{t}_k\ [\text{C}'\ \ldots\ \mathbf{R}_{+anaph}\ \ldots\ \text{V}\ \text{t}_k\ ]]]]$
  $\bar{\text{A}}$-binding ⤴ ; $\bar{\text{A}}$-binding ⤴
- Optionality arises if we allow languages to have both types of traces and to choose freely between them, even within a single sentence, giving rise to free alternations.

⇒ ***Problem: Mixed P1 and P2***
For P1, traces must be binders, but for P2, traces must not be binders. ⊥

⇒ ***Problem: P3***
To derive P3, traces must be binders, but the moved XP itself must not count as a binder, which is questionable.

4.4 PF realization

✳ ***Basic idea***
There is an AGREE-relation between the head H and the moving XP in every clause, but languages differ in whether the syntactic agreement is morphologically realized or not:[20]

(37) a. **P1**
/a/ ↔ [•EF•]
/b/ ↔ [•F•]

b. **P2**
/∅/ ↔ [•EF•]
/b/ ↔ [•F•]

[20] Georgi discusses other PF-analyses, all of which face similar problems to the particular analysis discussed here.

c. **P3**
/a/ ↔ [•EF•]
/∅/ ↔ [•F•]

- Optionality can be derived through an optional impoverishment rule:

(38) a. [•EF•] → ∅

b. [•F•] → ∅

⇒ To get a simple P1 reflex, the exponents /a/ and /b/ need to be homophonous, but such homophony does not follow from anything.

5 Implications

❶ ***Extrinsic vs. intrinsic ordering***

– For P1 and P2, [•F•] > [⋆F:□⋆], but for P3 and P4, [⋆F:□⋆] > [•F•].

– No principle can predict A > B and B > A at the same time.

⇒ Therefore, the order of operation-inducing features on a head must be EXTRINSIC.

❷ ***AGREE is syntactic***
P2–P4 require AGREE to apply before movement steps. If AGREE is post-syntactic (i.e. at PF), this is not possible because movement happens in the narrow syntax.

5.1 Edge features

⇒ ***Question***
How are [•EF•]s introduced?

- ***Chomsky's (2000, 2001) answer***
  – [•EF•]s can be inserted on the head of a phase if the phase has discharged all of its operation-inducing features.
  – Thus, nonfinal movement steps *are the last operation* triggered by a phase head.
  ⇒ This approach cannot derive P1 and P3, which require that nonfinal movement steps apply before AGREE. Thus, they are not the last operation in the phase.

- ***Müller's (2010, 2011) answer***
  – An [•EF•] can be inserted on a phase head as long as it still bears at least one operation-inducing feature.
  – Since features are ordered on a stack and since [•EF•] is put on top, [•EF•] must be discharged immediately after its insertion.
  – Therefore, nonfinal movement steps *cannot be the last operation* triggered by a phase head.
  ⇒ This approach cannot derive P2 and P3, which require nonfinal movement steps to be the last operation in the phase.

❸ The crosslinguistic variation in reflex patterns requires that the timing of edge feature discharge be more flexible, such that nonfinal movement steps can apply at various points of the derivation.

- ***Georgi's (2014) answer***
  - Edge-feature insertion applies dynamically according to the Numeration:

    (39) **Phase Balance**
    An edge feature [•EF•] is inserted on the selected phase head H for every feature [•F•] on a head Y in the Numeration if:

    a. Y ≠ H

    b. there is no accessible matching feature [F].

    (40) **Accessibility**
    A feature [F] is accessible if it is part of the workspace and not selected.[21]

  - [•EF•] is inserted on a head H selected for MERGE if there is another head Y in the Numeration that has a structure-building feature [•F•] and there is no element E with a matching feature [F] left in the workspace.
  - Georgi refers to this approach as 'in the Numeration', but this characterization is unclear (to me).

[21] WORKSPACE: lexical items in the numeration, previously generated trees that are unconnected to the current phrase marker

What to read if you want to learn more?

- Georgi (2014): The dissertation version with all the gory details!

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