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Gradient Harmonic Grammar

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Prelude: Strength in Grammar

An old idea (Rizzi (1986), Koster (1986)):
A functional category X can be strong or weak. Some syntactic operations require a weak X, others require a strong X.

(1) Complementizer-Trace Effects

a. $[_{\text{CP}}$ Who$_1$ do you think $[_{\text{CP}}$ t$'_1$ $[_{\text{C}}$ $\varnothing]$ t$_1$ saw John $]]$?
b. *$[_{\text{CP}}$ Who$_1$ do you think $[_{\text{CP}}$ t$'_1$ $[_{\text{C}}$ that$]$ t$_1$ saw John $]]$?

Assumption (Chomsky (2013)):
"Deletion of that [...] might leave only a weakened form of C."

Two problems:

- Assuming post-syntactic morphological realization of functional categories as in Distributed Morphology (Halle & Marantz (1993)), a complementizer that cannot be deleted in the syntax; that is in fact only inserted post-syntactically.
- If the difference between (1-a) and (1-b) only arises post-syntactically, how can it be the crucial factor for extraction?

More Strength

(2) Licensing of pro in Spanish vs. English:

a. [$_{\text{TP}}$ Hemos [$_{\text{vP}}$ *pro* trabajado todo el día]]
have-3.PL worked all the day

b. *I think [$_{\text{TP}}$ *pro*$_1$ have [$_{\text{vP}}$ t_1 worked all day]]

Assumption (Rizzi (1986; 2002)):
Strong T licenses *pro*, weak T does not.

A recent approach (Chomsky (2015)):
"T is too weak to serve as a label". "Italian T, with rich agreement, can label TP [...] for English, with weak agreement, it cannot"

(3) V-to-T movement in English vs. French:

a. John often kisses$_1$ Mary
b. Jean embrasse$_1$ souvent t_1 Marie

Assumption (Pollock (1989), Roberts (1993), Vikner (1997), Holmberg & Platzack (1995), Rohrbacher (1999)):
Strong T licenses V movement, weak T does not.

Encoding Strength

Problem (Bobaljik (2002)):
If inflectional morphology is post-syntactic, properties of the morphological inventory cannot be held responsible for V-to-T movement in syntax.

Conclusion:

1. Functional categories can have different degrees of syntactic strength.
2. Strength cannot follow from morphological realization because that information is not yet present in the syntax.
3. Strength is an abstract inherent property of functional categories that (a) determines whether or not syntactic operations can apply, and that (b) determines post-syntactic morphological realization.

Task:
Syntactic building blocks (operations, constraints, rules) must be made sensitive to different degrees of strength. Gradient Harmonic Grammar is a new grammatical theory designed to implement effects of this type.

Overview

Claim:
Gradient Harmonic Grammar (Smolensky & Goldrick (2016)) offers a new perspective on how to derive three different types of asymmetries as they can be observed with long-distance dependencies in the world's languages:

- asymmetries between movement types
- asymmetries between types of moved items
- asymmetries between types of local domain

Background assumptions:

1. Harmonic Grammar
2. Gradient Representations
3. Harmonic Serialism

Harmonic Grammar

Harmonic Grammar (Smolensky & Legendre (2006), Pater (2016)): A version of optimality theory that abandons the strict domination property and replaces harmony evaluation by constraint ranking with harmony evaluation based on different weights assigned to these constraints. This makes it possible to derive some (but not all) kinds of cumulative effects in syntax.

(4) Harmony (Pater (2009)):

$$H = \sum_{k=1}^{K} s_k \, w_k$$

w_k = weight of a constraint
s_k = violation score of a candidate

Assumption:
Constraints assign negative scores, and weights are nonnegative.

(5) Optimality: An output qualifies as optimal if it is the candidate with maximal harmony in its candidate set. A candidate has maximal harmony if it has the value closest to zero (i.e., the lowest penalty).

Harmonic Grammar at Work

(6) Non-Cumulative Interaction:

I	A w = 4.0	B w = 3.0	C w = 2.0	*H*
O_1	-1			-4.0
O_2		-1		-3.0
☞O_3			-1	-2.0

(7) Cumulative Interaction I:

I	A w = 4.0	B w = 3.0	C w = 2.0	*H*
O_1	-1			-4.0
☞O_2		-1		-3.0
O_3			-2	-4.0

(8) Cumulative Interaction II:

I	A w = 4.0	B w = 3.0	C w = 2.0	*H*
☞O_1	-1			-4.0
O_2		-1	-1	-5.0

Gradient Harmonic Grammar

Basic assumption (Gradient Harmonic Grammar; GHG; Smolensky & Goldrick (2016)):
It is not just the constraints that are assigned weights. Symbols in linguistic expressions are also assigned weights; they are not categorical either.
Predecessor: Squishy Grammar (Ross (1973a;b; 1975)) is a direct predecessor of GHG. Ross argues that there is constituent class membership to a degree, and presupposes that instead of standard category symbols like [X], there are weighted category symbols like [αX] (where α ranges over the real numbers in [0,1]). Rules, filters, and other syntactic building blocks are given upper and lower threshold values of α between which they operate.
Note:
This way, the concept of varying strength of syntactic categories can be formally implemented in the grammar.
Observation:
So far, most of the work on GHG has been in phonology (e.g., Zimmermann (2017), Faust & Smolensky (2017), Kushnir (2018)); but cf. Smolensky (2017), Lee (2018), Müller (2019) for syntactic applications.

Harmonic Serialism

Note:
Harmonic serialism is a strictly derivational version of optimality theory.

(9) Harmonic serialism (McCarthy (2008), Heck & Müller (2013)):

a. Given some input I_i, the candidate set $CS_i = \{O_{i1}, O_{i2}, \ldots O_{in}\}$ is generated by applying at most one operation to I_i.
b. The output O_{ij} with the best constraint profile is selected as optimal.
c. O_{ij} forms the input I_{ij} for the next generation step producing a new candidate set $CS_j = \{O_{ij1}, O_{ij2}, \ldots O_{ijn}\}$.
d. The output O_{ijk} with the best constraint profile is selected as optimal.
e. Candidate set generation stops (i.e., the derivation converges) when the output of an optimization procedure is identical to the input (i.e., when the constraint profile cannot be improved anymore).

Harmonic Serialism 2

Note:
From the very beginning (see Prince & Smolensky (1993; 2004)), HS has been identified as a possible alternative to standard parallel optimization:

> Much of the analysis given in this book will be in the parallel mode, and some of the results will absolutely require it. But it is important to keep in mind that the serial/parallel distinction pertains to Gen and not to the issue of harmonic evaluation per se. It is an empirical question [...] Many different theories [...] can be equally well accommodated in Gen, and the framework of Optimality Theory per se involves no commmitment to any set of such assumptions.
>
> Prince & Smolensky (2004, 95-96)

- Phonology: McCarthy (2008; 2010; 2016), McCarthy, Kimper & Mullin (2012), Kimper (2016), Pruitt (2012), Torres-Tamarit (2016), Elfner (2016), Hauser & Hughto (2018), Marquardt (2018), etc.
- Morphology: Caballero & Inkelas (2013), Müller (2018)
- Syntax: Heck & Müller (2013; 2016), Lahne (2008; 2009), Georgi (2012), Assmann, Georgi, Heck, Müller & Weisser (2015), and Murphy (2016; 2017)).

Observation:
Harmonic serialism in syntax is a version of minimalist, phase-based syntax (Chomsky (1995; 2001; 2014)) that explicitly incorporates optimization procedures (like Merge over Move).

Serial Gradient Harmonic Grammar

Harmonic Grammar + Gradient Representations + Harmonic Serialism:

⇒ Serial Gradient Harmonic Grammar.

Constraints

Assumptions:

- The Phase Impenetrability Condition is an inviolable constraint (part of Gen).
- The Merge Condition and the Anti-Locality Condition are violable constraints.

(10) Phase Impenetrability Condition (PIC; Chomsky (2001)):

For all heads Y: *Y that c-commands α_i of a dependency Δ but does not m-command α_{i-1} of Δ.

(11) Merge Condition (MC; Chomsky (1995; 2001),Heck & Müller (2013)):

For all structure-building features [•F•] and XPs with a matching F: [•F•] triggers Merge of XP.

(12) Anti-Locality Condition (AL; Bošković (1997), Abels (2003), Grohmann (2003a;b; 2011), Pesetsky (2016), Erlewine (2016)):

For all heads Y: *Y that (minimally) c-commands α_i of a dependency Δ and m-commands α_{i-1} of Δ.

Remarks on the Constraints

Note:

- The PIC in (11) is a strengthened version of Chomsky's original PIC since it acknowledges a potential barrier status of all XPs (see Müller (2011) and references cited there); in this respect, it implements related concepts proposed in Riemsdijk (1978), Koster (1978), Sportiche (1989), Koster (1987). Legendre et al. (1998): Assuming constraints to be violable makes it possible to maintain such general statements without introducing ad hoc exceptions (as in Chomsky (1986)).
- Given the PIC, all movement violates AL (movement originates either in the complement position of some head Y, or in the specifier position of Y's complement).
- Unlike a general economy constraint blocking movement (e.g., *Trace, as in Grimshaw (1997), Legendre et al. (1998; 2006)), AL has different effects depending on the nature of the head crossed in the course of movement.

Features for intermediate movement steps:

Intermediate movement steps are triggered by duplicates of criterial features (see Abels (2012)), which can freely be assigned to any head Y. E.g., [•wh•] can show up on C, T, V, v, etc.

Weights

Note:
Weight (relative strength) plays a role for three different items in (12-ab).

- Y: Some Y heads give rise to stronger violations of AL than other Y heads if movement takes place across them.

$\rightsquigarrow$ asymmetries between XP barriers

- [•F•] in MC: Some movement-related features give rise to stronger violations of MC (i.e., are stronger triggers for movement) than other movement-related features.

$\rightsquigarrow$ asymmetries between movement types

- XP: Some XPs give rise to stronger violations of MC than other XPs if they do not undergo movement.

$\rightsquigarrow$ asymmetries between moved items

Asymmetries between XP Barriers

(13) Local vs. long-distance scrambling in German – VP vs. CP:

a. dass sie $[_{VP}$ $[_{DP_2}$ das Buch] $[_{V'}$ $[_{DP_1}$ dem Karl] $[_{V'}$ t_2 $[_{V}$ gegeben hat]]]]
that she the $book_{acc}$ the $Karl_{dat}$ given has

b. dass $[_{vP}$ $[_{DP_2}$ das Buch] $[_{v'}$ $[_{DP_1}$ keiner] $[_{v'}$ $[_{VP}$ t'_2 $[_{V'}$ t_2 gelesen hat]] v]]]
that the $book_{acc}$ $no\text{-}one_{nom}$ read has

c. *dass sie $[_{DP_2}$ das Buch] gesagt hat $[_{CP}$ t_2 $[_{C'}$ dass] $[_{TP}$ sie gelesen hat]]
that she the $book_{acc}$ said has that she read has

Observation:
In the clausal spine, the weight increases from bottom to top. VP typically permits extraction from it; CP often does not. Similar considerations hold for the features that trigger movement, and for the moved items: The relative position in the tree is decisive.

Some Weight Assignments for German

(14) a. Strength of Y:
   (i) V: [0.45]
   (ii) $C_{[-\text{wh},+\text{fin}]}$: [0.8]
   (iii) $C_{[+\text{wh},+\text{fin}]}$: [1.0]
   (iv) $C_{[+\text{restr},-\text{fin}]}$: [0.6]

(15) a. Strength of [•F•]:
   (i) [•scr•]: [0.2]
   (ii) [•wh•]: [0.5]
   (iii) [•top•]: [0.65]

(16) a. Strength of XP:
   (i) DP_{obj}: [0.9]
   (ii) DP_{subj}: [0.8]

Local vs. Long-Distance Scrambling

(17) Object scrambling via VP:

I: [VP … $DP_{obj:[0.9]}$ $V_{[0.45],[•scr•]:[0.2]}$]	MC w = 2.0	AL w = 3.0	*H*
O_1: [VP … $DP_{obj:[0.9]}$ $V_{[0.45],[•scr•]:[0.2]}$]	-1.1		-2.2
☞O_2: [VP $DP_{obj:[0.9]}$ [V′ … t_{obj} $V_{[0.45],[•scr•]:[0.2]}$]]		-0.45	-1.35

(18) Object scrambling via finite declarative CP:

I: [CP $C_{[0.8],[•scr•]:[0.2]}$ [TP $DP_{obj:[0.9]}$ [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
☞O_1: [CP $C_{[0.8],[•scr•]:[0.2]}$ [TP $DP_{obj:[0.9]}$ [T′ … T]]]	-1.1		-2.2
O_2: [CP $DP_{obj:[0.9]}$ [C′ $C_{[0.8],[•scr•]:[0.2]}$ [TP t_2 [T′ … T]]]]		-0.8	-2.4

Note:

The CP output that leaves DP_{obj} in SpecT is optimal; consequently, the PIC is fatally violated on a subsequent cycle.

Restructuring

Observation:
If different kinds of Cs ([±finite], [±restructuring], [±operator], [±overt], etc.) can have different weights, one and the same movement type (e.g., scrambling) may leave CPs with a weak C head (restructuring infinitives) but not others.

(19) Restructuring vs. non-restructuring infinitives in German:

a. dass $[_{\mathrm{DP_{obj}}}$ das Buch $]$ keiner $[_{\mathrm{CP}}\ t'_2\ [_{\mathrm{C'}}\ \mathrm{C}\ [_{\mathrm{TP}}\ t_2$ zu lesen $]]]$
that the book$_{acc}$ no-one$_{nom}$ to read
versucht hat
tried has

b. *dass $[_{\mathrm{DP_{obj}}}$ das Buch $]$ keiner $[_{\mathrm{CP}}\ t'_2\ [_{\mathrm{C'}}\ \mathrm{C}\ [_{\mathrm{TP}}\ t_2$ zu lesen $]]]$
that the book$_{acc}$ no-one$_{nom}$ to read
abgelehnt hat
rejected has

Restructuring: Competition

(20) Object scrambling via restructuring infinitive CP:

I: [$_{CP}$ C$_{[0.6],[\bullet scr \bullet]:[0.2]}$ [$_{TP}$ DP$_{obj:[0.90]}$ [$_{T'}$ … T]]]	MC w = 2.0	AL w = 3.0	*H*
O$_1$: [$_{CP}$ C$_{[0.6],[\bullet scr \bullet]:[0.2]}$ [$_{TP}$ DP$_{obj:[0.9]}$ [$_{T'}$ … T]]]	-1.1		-2.2
☞O$_2$: [$_{CP}$ DP$_{obj:[0.9]}$ [$_{C'}$ C$_{[0.6],[\bullet scr \bullet]:[0.2]}$ [$_{TP}$ t$_{obj}$ [$_{T'}$ … T]]]]		-0.6	-1.8

Note:

A weight of [0.8] for non-restructuring infinitival C ensures that scrambling from the infinitive is blocked.

Evidence for C in Restructuring Contexts

Independent evidence for CP projections in German restructuring infinitives:
Baker (1988), Sternefeld (1990), Müller & Sternefeld (1995), Sabel (1996), Koopman & Szabolcsi (2000), Müller (2017)

(21) Local unstressed pronoun fronting indicates the presence of a CP:

a. *dass sie mir$_1$ schon letzte Woche [$_{VP}$ t$_1$ es$_2$ gegeben] hat
that she$_{nom}$ me$_{dat}$ already last week it$_{acc}$ given has

b. *dass sie mir schon letzte Woche [$_{VP}$ es$_2$ zu lesen] schien
that she$_{nom}$ me$_{dat}$ already last week it$_{acc}$ to read seemed

c. dass sie mir$_1$ schon letzte Woche [$_{CP}$ t$_1$ es$_2$ zu geben]
that she$_{nom}$ me$_{dat}$ already last week it$_{acc}$ to give
versucht hat
tried has

d. dass sie mir$_1$ schon letzte Woche versucht hat [$_{CP}$ t$_1$ es$_2$ zu
that she$_{nom}$ me$_{dat}$ already last week tried has it$_{acc}$ to
geben]
give

Principled Variation

Implicational universal I:
If an XP α can undergo Σ-movement across a Y head δ_1, and δ_1 has more weight than another Y head δ_2, then α can ceteris paribus undergo Σ-movement across δ_2.

Consequence:
This makes it possible to capture the substantial but principled variation among German speakers. (E.g., by slightly decreasing the weight of non-restructuring infinitival C, scrambling can take place from all infinitival complements.)

The Third Construction

(22) Scrambling from CP in the third construction (Besten & Rutten (1989), Santorini & Kroch (1991), Wöllstein-Leisten (2001)):

a. dass sie ihn$_2$ t$_1$ versucht [$_{CP_1}$ PRO t$_2$ zu küssen]
that she$_{nom}$ him$_{acc}$ tries to kiss

b. dass sie das Buch$_2$ t$_1$ versucht hat [$_{CP_1}$ PRO t$_2$ dem Mann$_{dat}$ zu geben]
that she$_{nom}$ the book tried has the man to give

c. dass es$_2$ Maria t$_1$ (dem Fritz$_3$)$_{dat}$ verspricht [$_{CP_1}$ PRO t$_1$ zu lesen]
that it$_{acc}$ Maria the Fritz promises to read

d. dass es$_2$ Fritz ihr$_3$ t$_1$ empfohlen hat [$_{CP_1}$ PRO t$_1$ zu lesen]
that it$_{acc}$ Fritz$_{nom}$ her$_{dat}$ recommended has to read

Paradox

Observation:
Negation is clause-bound in the third construction (Santorini & Kroch (1991)).

(23) Scope of negation in regular restructuring vs. third construction contexts:

a. dass ich seinen neuesten Roman $[_{CP}$ C nicht zu lesen beschlossen
that I his newest novel_{acc} not to read decided
habe] (ambiguous scope)
have

b. dass ich seinen neuesten Roman beschlossen habe $[_{CP}$ C nicht zu
that I his newest novel_{acc} decided have not to
lesen] (only narrow scope)
read

Note: Extraposed infinitives in restructuring contexts are transparent for scrambling but not transparent for scope of sentential negation.
Analysis: Extraposed CPs in the third construction involve a C that has more strength than restructuring infinitives (so that long-distance scope of negation is impossible) but less strength than non-restructuring infinitives (so that scrambling is possible).

Asymmetries between Movement Types

(24) Object wh-movement vs. object scrambling in German – [•wh•] vs. [•scr•]:

a. (Ich weiß nicht) [$_{CP}$ [$_{DP_{obj}}$ welches Buch] sie gesagt hat [$_{CP}$ t_{obj} [$_{C'}$ dass] [$_{TP}$ sie gelesen hat]]
I know not which book$_{acc}$ she said has that she read has

b. *dass sie [$_{DP_{obj}}$ das Buch] gesagt hat [$_{CP}$ t_{obj} [$_{C'}$ dass] [$_{TP}$ sie gelesen hat]]
that she the book$_{acc}$ said has that she read has

Competitions

(25) Object wh-movement via VP:

I: [VP … DP$_{obj:[0.9]}$ V$_{[0.45],[\bullet wh \bullet]:[0.5]}$]	MC w = 2.0	AL w = 3.0	*H*
O$_1$: [VP … DP$_{obj:[0.9]}$ V$_{[0.45],[\bullet wh \bullet]:[0.5]}$]	-1.4		-2.8
☞O$_2$: [VP DP$_{obj:[0.9]}$ [V′ … t$_{obj}$ V$_{[0.45],[\bullet wh \bullet]:[0.5]}$]]		-0.45	-1.35

(26) Object wh-movement via finite declarative CP:

I: [CP C$_{[0.8],[\bullet wh \bullet]:[0.5]}$ [TP DP$_{obj:[0.9]}$ [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
O$_1$: [CP C$_{[0.8],[\bullet wh \bullet]:[0.5]}$ [TP DP$_{obj:[0.9]}$ [T′ … T]]]	-1.4		-2.8
☞O$_2$: [CP DP$_{obj:[0.9]}$ [C′ C$_{[0.8],[\bullet wh \bullet]:[0.5]}$ [TP t$_{obj}$ [T′ … T]]]]		-0.8	-2.4

Principled Variation

Implicational universal II:
If an XP α can undergo Σ_1-movement across a Y head δ, and Σ_1 has less weight than another movement type Σ_2, then α can ceteris paribus undergo Σ_2-movement across δ.

Consequence:
Again, this makes it possible to capture the substantial but principled variation among German speakers. (E.g., by slightly increasing the weight of finite declarative C, wh-movement from CP will be impossible; this comes close to the situation in some Northern varieties of German.)

Asymmetries between Moved Items

Note:
In some environments, there are no asymmetries between subject and object extraction in German. E.g., there are no complementizer-trace effects with subject extraction in standard contexts.

(27) Subject and object wh-movement via finite declarative CP (Haider (2010)):

a. (Ich weiß nicht) $[_{\mathrm{CP}}$ $[_{\mathrm{DP_{obj}}}$ welches Buch] sie gesagt hat $[_{\mathrm{CP}}$ t_{obj}
I know not which book$_{acc}$ she said has
$[_{\mathrm{C'}}$ dass] $[_{\mathrm{TP}}$ sie gelesen hat]]
that she read has

b. (Ich weiß nicht) $[_{\mathrm{CP}}$ $[_{\mathrm{DP_{subj}}}$ welches Buch] sie gesagt hat $[_{\mathrm{CP}}$
I know not which book$_{nom}$ she said has
t_{subj} $[_{\mathrm{C'}}$ dass] $[_{\mathrm{TP}}$ sie beeindruckt hat]]
that she impressed has

Competitions

(28) Object wh-movement via finite declarative CP (= (26)):

I: [CP C[0.8],[•wh•]:[0.5] [TP DPobj:[0.9] [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
O1: [CP C[0.8],[•wh•]:[0.5] [TP DPobj:[0.9] [T′ … T]]]	-1.4		-2.8
☞O2: [CP DPobj:[0.9] [C′ C[0.8],[•wh•]:[0.5] [TP tobj [T′ … T]]]]		-0.8	-2.4

(29) Subject wh-movement via finite declarative CP:

I: [CP C[0.8],[•wh•]:[0.5] [TP DPsubj:[0.8] [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
O1: [CP C[0.8],[•wh•]:[0.5] [TP DPsubj:[0.8] [T′ … T]]]	-1.3		-2.6
☞O2: [CP DPsubj:[0.8] [C′ C[0.8],[•wh•]:[0.5] [TP tobj [T′ … T]]]]		-0.8	-2.4

Wh-Movement from Wh-Clauses

Observation:
Subject and object wh-movement from interrogative CPs also does not show any asymmetries; it is uniformly impossible.

(30) Subject and object wh-movement via finite interrogative CP (Müller & Sternefeld (1993)):

a. *$[_{\mathrm{DP_{obj}}}$ Was] weißt du nicht $[_{\mathrm{CP}}$ wie man $\mathrm{t_{obj}}$ repariert] ?
what$_{acc}$ know you not how one fixes

b. *$[_{\mathrm{DP_{subj}}}$ Wer] weißt du nicht $[_{\mathrm{CP}}$ wie $\mathrm{t_{subj}}$ das repariert] ?
who$_{nom}$ know you not how that fixes

Competitions

(31) Object wh-movement via finite interrogative CP:

I: [CP C[1.0],[•wh•]:[0.5] [TP DP$_{obj}$:[0.9] [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
☞O$_1$: [CP C[1.0],[•wh•]:[0.5] [TP DP$_{obj}$:[0.9] [T′ … T]]]	-1.4		-2.8
O$_2$: [CP DP$_{obj}$:[0.9] [C′ C[1.0],[•wh•]:[0.5] [TP t$_{obj}$ [T′ … T]]]]		-1.0	-3.0

(32) Subject wh-movement via finite interrogative CP:

I: [CP C[1.0],[•wh•]:[0.5] [TP DP$_{subj}$:[0.8] [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
☞O$_1$: [CP C[1.0],[•wh•]:[0.5] [TP DP$_{subj}$:[0.8] [T′ … T]]]	-1.3		-2.6
O$_2$: [CP DP$_{subj}$:[0.8] [C′ C[1.0],[•wh•]:[0.5] [TP t$_{obj}$ [T′ … T]]]]		-1.0	-3.0

Wh-Islands without Intervention?

Question:
Wh-islands have often been derived by assuming that a moved wh-phrase blocks a single escape hatch (Chomsky (1977; 1986)). Isn't it therefore a step backwards to postulate that wh-islands simply go back to increased strength of C?

Answer: No.

- Embedded polar questions are also wh-islands even though it is not obvious why SpecC should be unavailable if C is headed by a whether or if clause.
- Minimalist analyses typically rely on the assumption that multiple specifiers are freely available (Chomsky (2001; 2014)). For instance, otherwise there would be no extraction from a vP containing an external argument DP, given the PIC.
- As shown below, wh-islands can in fact be circumvented under certain conditions in German. Given a constraint like the PIC (or the Subjacency Condition), this implies that SpecC must be available in principle in embedded interrogative CPs.

Topicalization from Wh-Clauses

Observation:
With topicalization from interrogative CPs, there is an asymmetry between subjects and objects.

(33) Subject and object topicalization via finite interrogative CP (Fanselow (1987), Müller & Sternefeld (1993)):

a. $[_{\mathrm{DP_{obj}}}$ Radios] weiß ich nicht $[_{\mathrm{CP}}$ wie man $\mathrm{t_{obj}}$ repariert]
radios$_{acc}$ know I not how one fixes

b. *$[_{\mathrm{DP_{subj}}}$ Linguisten] weiß ich nicht $[_{\mathrm{CP}}$ wie $\mathrm{t_{subj}}$ das reparieren]
linguists$_{nom}$ know I not how that fix

Competitions

(34) Object topicalization via finite interrogative CP:

I: [CP C[1.0],[•top•]:[0.65] [TP DPobj:[0.9] [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
O1: [CP C[1.0],[•top•]:[0.65] [TP DPobj:[0.9] [T′ … T]]]	-1.55		-3.1
☞O2: [CP DPobj:[0.9] [C′ C[1.0],[•top•]:[0.65] [TP tobj [T′ … T]]]]		-1.0	-3.0

(35) Subject topicalization via finite interrogative CP:

I: [CP C[1.0],[•top•]:[0.65] [TP DPsubj:[0.8] [T′ … T]]]	MC w = 2.0	AL w = 3.0	*H*
☞O1: [CP C[1.0],[•top•]:[0.65] [TP DPsubj:[0.8] [T′ … T]]]	-1.45		-2.9
O2: [CP DPsubj:[0.8] [C′ C[1.0],[•top•]:[0.65] [TP tobj [T′ … T]]]]		-1.0	-3.0

Principled Variation

Implicational universal III:
If an XP α_1 can undergo Σ-movement across a Y head δ, and α_1 has less weight than another XP α_2, then α_2 can ceteris paribus undergo Σ-movement across δ.

Consequence:
Yet again, this makes it possible to capture the substantial but principled variation among German speakers. (E.g., by slightly decreasing the weight of subject DPs, subject/object asymmetries in the form of complementizer-trace effects are predicted to arise with extraction from finite declarative CPs in German.)

Complementizer-Trace Effects in English

(36) Complementizer-Trace Effects

a. $[_{CP}$ What$_1$ do you think $[_{CP}$ t$'_1$ $[_C$ $\varnothing]$ John saw t$_1$ $]]$?
b. $[_{CP}$ Who$_1$ do you think $[_{CP}$ t$'_1$ $[_C$ $\varnothing]$ t$_1$ saw John $]]$?
c. $[_{CP}$ What$_1$ do you think $[_{CP}$ t$'_1$ $[_C$ that$]$ John saw t$_1$ $]]$?
d. *$[_{CP}$ Who$_1$ do you think $[_{CP}$ t$'_1$ $[_C$ that$]$ t$_1$ saw John $]]$?

Recall:

- Standard approaches to complementizer-trace effects rely on the presence or absence of that in the syntax.
- However, if the realization of C is post-syntactic (e.g., vocabulary insertion as in Distributed Morphology), how can it determine syntactic complementizer-trace effects?

New analysis:

Subject/object extraction asymmetries are derived on the basis of the interaction between different strengths of Cs (weak vs. strong) and different levels of activity of DPs (subject vs. object).

Subject Movement and Object Movement across Weak C

(37) Wh-Movement of $DP_{Obj:[0.8]}$ via weak C:[0.5]

I: $[_{CP}\ C_{[0.5],[\bullet wh\bullet]:[0.8]}\ [_{TP}\ DP_{[0.8],[wh]}\ [_{T'}\ \ldots\ T]]]$	MC w = 2.0	AL w = 3.0	*H*
O_1: $[_{CP}\ C_{[0.5],[\bullet wh\bullet]:[0.8]}\ [_{TP}\ DP_{[0.8],[wh]}\ [_{T'}\ \ldots\ T]]]$	-1.6		-3.2
☞O_2: $[_{CP}\ DP_{[0.8]}\ [_{C'}\ C_{[0.5]}\ [_{TP}\ t_{DP}\ [_{T'}\ \ldots\ T]]]$		-0.5	-1.5

(38) Wh-Movement of $DP_{Subj:[0.4]}$ via weak C:[0.5]

I: $[_{CP}\ C_{[0.5],[\bullet wh\bullet]:[0.8]}\ [_{TP}\ DP_{[0.4],[wh]}\ [_{T'}\ \ldots\ T]]]$	MC w = 2.0	AL w = 3.0	*H*
O_1: $[_{CP}\ C_{[0.5],[\bullet wh\bullet]:[0.8]}\ [_{TP}\ DP_{[0.4],[wh]}\ [_{T'}\ \ldots\ T]]]$	-1.2		-2.4
☞O_2: $[_{CP}\ DP_{[0.4]}\ [_{C'}\ C_{[0.5]}\ [_{TP}\ t_{DP}\ [_{T'}\ \ldots\ T]]]$		-0.5	-1.5

Subject Movement and Object Movement across Strong C

(39) Wh-Movement of $DP_{Obj:[0.8]}$ via strong C:[1]

I: $[_{CP}\ C_{[1],[\bullet wh \bullet]:[0.8]}\ [_{TP}\ DP_{[0.8],[wh]}\ [_{T'}\ \ldots\ T]]]$	MC w = 2.0	AL w = 3.0	*H*
O_1: $[_{CP}\ C_{[1],[\bullet wh \bullet]:[0.8]}\ [_{TP}\ DP_{[0.8],[wh]}\ [_{T'}\ \ldots\ T]]]$	-1.6		-3.2
☞O_2: $[_{CP}\ DP_{[0.8]}\ [_{C'}\ C_{[1]}\ [_{TP}\ t_{DP}\ [_{T'}\ \ldots\ T]]]$		-1	-3

(40) Wh-Movement of $DP_{Subj:[0.4]}$ via strong C:[1]

I: $[_{CP}\ C_{[1],[\bullet wh \bullet]:[0.8]}\ [_{TP}\ DP_{[0.4],[wh]}\ [_{T'}\ \ldots\ T]]]$	MC w = 2.0	AL w = 3.0	*H*
☞O_1: $[_{CP}\ C_{[1],[\bullet wh \bullet]:[0.8]}\ [_{TP}\ DP_{[0.4],[wh]}\ [_{T'}\ \ldots\ T]]]$	-1.2		-2.4
O_2: $[_{CP}\ DP_{[0.4]}\ [_{C'}\ C_{[1]}\ [_{TP}\ t_{DP}\ [_{T'}\ \ldots\ T]]]$		-1	-3

Post-Syntactic Vocabulary Insertion

Side Remarks

- Asymmetric patterns of subject/object extraction are modelled by assigning different levels of activity.
- As Cs with different strengths are assumed to be selected from the lexicon, the GHG analysis does not encounter a look-ahead problem and it need not refer to the PF form of Cs in the syntactic derivation
- Gradient Harmonic Grammar also gives an insight into iconicity between linguistic symbols and their realization.
  The more weight a category has, the more likely its lexical realization is.

(41) Constraints

a. Vocabulary Insertion (VI):
   *X^0 if X^0 is not realized by vocabulary insertion.

b. Dep:
   All material that shows up in the output is present in the input. (Here: Any instance of vocabulary insertion violates DEP.)

Competitions

(42) Vocabulary Insertion for C:[1]

I: [. . . C:[1]]	VI w = 2	Dep w = 1.5	*H*
☞ O_1: [. . . that]		-1	-1.5
O_2: [. . . ∅]	-1		-2

(43) Vocabulary Insertion for C:[0.5]

I: [. . . C:[0.5]]	VI w = 2	Dep w = 1.5	*H*
O_1: [. . . that]		-1	-1.5
☞ O_2: [. . . ∅]	-0.5		-1

Idioms

Note:
The new perspective offers surprising accounts of some well-known phenomena. For instance, a ban on even very local movement of parts of semantically opaque idioms follows as a PIC effect, assuming that they have extremely little strength. (This approach to transformational deficiency of idioms is in fact essentially pursued in Ross (1973a).)
Observation (Fraser (1970), Nunberg et al. (1994), Jackendoff (1997), O'Grady (1998), Burger (1973), Fleischer (1982), Wierzba (2016), Bargmann & Sailer (2018) for German; but also cf. Fanselow (2015), Bruening (2018) for a different view):
Idioms resist syntactic transformations that split them up to various degrees.
Implicational generalization:
If an idiom α dominates an idiom β on the opacity scale, and transformation δ can affect α, then δ can also affect β.

(44) Opacity scale:
$\text{XP}_{\text{opaque}} > \text{XP}_{\text{semi-opaque}} > \text{XP}_{\text{semi-transparent}} > \text{XP}_{\text{transparent}}$

Variation

Variation:

- "Our intuitions in this domain are ... robust and ... consistent across speakers" (Nunberg, Sag & Wasow (1994, 507)).
- "Idioms, more than most aspects of language, vary enormously from speaker to speaker. [...] What is important is that the general claims about idioms ... hold true for each speaker" (Fraser (1970, 23)).
- Data are difficult to judge in many cases (creative use of language, meta-linguistic use, playing with language, ...), and there is a lot of variation.

Four Types of Idioms

(45) VP idioms in German (decreasing semantic opacity):

a. opaque
   Fersengeld geben (‘give heel money’, ‘flee’)
b. semi-opaque
   den Stier bei den Hörnern packen (‘the bull by the horns grab’)
c. semi-transparent
   einen Korb geben (‘a basket give’, ‘turn someone down’)
d. transparent
   (i) light verb constructions: zur Aufführung bringen (‘to performance bring’, ‘perform’)
   (ii) reanalysis: Buch lesen (‘book read’) (vs. Buch zerstören, ‘book destroy’)

Topicalization

(46) Topicalization:

a. ?Fersengeld$_1$ hat der Fritz am Ende t_1 gegeben
heel money has the Fritz at the end given

b. Den Stier$_1$ hat sie t_1 bei den Hörnern gepackt
the bull has she by the horns grabbed

c. Einen Korb$_1$ hat sie ihm t_1 gegeben
a basket has she him given

d. Das Buch$_1$ hat keiner t_1 gelesen
the book has no-one read

Wh-Movement

(47) Wh-movement:

a. *Was für ein Fersengeld$_1$ hat der Fritz t_1 gegeben ?
what for a heel money has the Fritz given

b. *Was für einen Stier$_1$ hat sie t_1 bei den Hörnern gepackt ?
what for a bull has she by the horns grabbed

c. ?Was für einen Korb$_1$ hat sie ihm t_1 gegeben ?
what for a basket has she him given

d. Was für ein Buch$_1$ hat keiner t_1 gelesen ?
what for a book has no-one read

Scrambling

(48) Scrambling:

a. *dass der Fritz Fersengeld$_1$ am Ende t_1 gab
that the Fritz heel money at the end gave

b. *dass sie bei den Hörnern$_1$ den Stier t_1 packte
that she by the horns the bull grabbed

c.?*dass sie einen Korb$_1$ dem Karl t_1 gab
that she a basket the Karl gave

d. dass das Buch$_1$ keiner t_1 gelesen hat
that the book no-one read has

Topicalization vs. Scrambling of Opaque Idiom Parts

Assumption: A DP of an opaque idiom has a strength of [0.1].

(49) Topicalization of a weak DP of an opaque idiom via VP:

I: $[_{VP}$ … $DP_{idiom:[0.1]}$ $V_{[0.45],[\bullet top \bullet]:[0.65]}]$	MC w = 2.0	AL w = 3.0	*H*
O_1: $[_{VP}$ … $DP_{idiom:[0.1]}$ $V_{[0.45],[\bullet top \bullet]:[0.65]}]$	-0.75		-1.5
☞O_2: $[_{VP}$ $DP_{idiom:[0.1]}$ $[_{V'}$ … t_{obj} $V_{[0.45],[\bullet top \bullet]:[0.65]}]]$		-0.45	-1.35

(50) Scrambling of a weak DP of an opaque idiom via VP (cf. (17)):

I: $[_{VP}$ … $DP_{idiom:[0.1]}$ $V_{[0.45],[\bullet scr \bullet]:[0.2]}]$	MC w = 2.0	AL w = 3.0	*H*
☞O_1: $[_{VP}$ … $DP_{idiom:[0.1]}$ $V_{[0.45],[\bullet scr \bullet]:[0.2]}]$	-0.3		-0.6
O_2: $[_{VP}$ $DP_{idiom:[0.1]}$ $[_{V'}$ … t_{obj} $V_{[0.45],[\bullet scr \bullet]:[0.2]}]]$		-0.45	-1.35

Note:
For an extremely weak DP, even a VP may thus turn into a barrier for extraction (if the feature triggering the movement type is also weak).

Principled Variation

Implicational universal IV (cf. II):
If a DP α that is part of a VP idiom can undergo Σ_1-movement across a Y head δ, and Σ_1 has less weight than another movement type Σ_2, then α can ceteris paribus undergo Σ_2-movement across δ.

Consequence:
Speaker variation is straightforwardly derived by postulating slightly different weights for features triggering movement types; the grammar as such stays exactly the same.

Wh-Movement of Opaque vs. Semi-Transparent Idiom Parts

Assumption: A DP of a semi-transparent idiom has a strength of [0.x]; as before, a DP of an opaque idiom has a strength of [0.1].

(51) Wh-movement of a weak DP of a semi-transparent idiom via VP:

I: $[_{VP}$ … $DP_{idiom:[0.2]}$ $V_{[0.45],[\bullet wh\bullet]:[0.5]}]$	MC w = 2.0	AL w = 3.0	*H*
O_1: $[_{VP}$ … $DP_{idiom:[0.2]}$ $V_{[0.45],[\bullet wh\bullet]:[0.5]}]$	-0.7		-1.4
☞O_2: $[_{VP}$ $DP_{idiom:[0.2]}$ $[_{V'}$ … t_{obj} $V_{[0.45],[\bullet wh\bullet]:[0.5]}]]$		-0.45	-1.35

(52) Wh-movement of a weak DP of an opaque idiom via VP:

I: $[_{VP}$ … $DP_{idiom:[0.1]}$ $V_{[0.45],[\bullet wh\bullet]:[0.5]}]$	MC w = 2.0	AL w = 3.0	*H*
☞O_1: $[_{VP}$ … $DP_{idiom:[0.1]}$ $V_{[0.45],[\bullet wh\bullet]:[0.5]}]$	-0.6		-1.2
O_2: $[_{VP}$ $DP_{idiom:[0.1]}$ $[_{V'}$ … t_{obj} $V_{[0.45],[\bullet wh\bullet]:[0.5]}]]$		-0.45	-1.35

Principled Variation

Implicational universal V (cf. III):
If a DP α_1 that is part of a VP idiom occupying some position on the opacity hierarchy can undergo Σ-movement across a Y head δ, then a DP α_2 that is part of a less opaque VP idiom can ceteris paribus undergo Σ-movement across δ. (Here, α_1 has to have less weight than α_2.)

Consequence:
Variation is accounted for by postulating minimally different weight assignments to DP parts of VP idioms – i.e., by postulating slightly different positions of VP idioms on the opacity scale. As before, the grammar as such remains exactly the same.

Outlook

- How is ineffability (absolute ungrammaticality) eventually derived in cases where first the output without local movement wins, and subsequently the PIC blocks movement on the next cycle? See Müller (2015) for various options.
- The analysis has been silent so far as regards barriers by lack of L-marking/selection, including subject and adjunct islands (see Chomsky (1986), Cinque (1990); but also Chaves & Dery (2018) and references cited there for arguments against a modelling of these locality effects in the grammar as such). All the evidence presented here involves restrictions on extraction from complements.
- The features triggering movement via MC have mostly been relevant for intermediate movement steps, not so much for criterial movement steps. To model the difference, additional assumptions may be required. (E.g., movement to the specifier of an interrogative C is often ok, movement via an interrogative C sometimes is not.) Possibly, criterial versions of [•F•] are associated with more weight.
- The approach is categorical as concerns outputs; but it can be combined with MaxEnt grammars (or stochastic OT) yielding non-categorical, gradient output decisions (Hayes (2001)).

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