Strength in the nominal domain

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Abstract

Phenomena which suggest that morphology feeds syntax, such as complementizer trace effects or the correlations discussed under the Rich Agreement Hypothesis, clash with the popular current view that spell-out happens post-syntactically. A solution offered in a recent presentation by Müller (2022) is to derive these interactions as a consequence of the intrinsic weight a linguistic object is assigned to, which then influences its activity in different modules of grammar. In the spirit of Squishy Grammar (Ross 1973), Müller develops a model within the framework of Gradient Harmonic Grammar (Smolensky & Goldrick 2016), which derives such interactions keeping the late insertion hypothesis intact. As most of the presentation focuses on clausal phenomena, this paper explores in how far similar predictions can be made for the nominal domain. I will discuss to what extend the rationale implies whether noun phrase internal movement is due to head movement or phrasal movement.

1. Strength in Grammar

Recently, Müller (2022) proposed that morphological realization correlates with the strength of a syntactic object. Based on a number of observations that imply an interaction of morphology and syntactic movement, Müller argues for an Optimality-based framework, i.e. Gradient Harmonic Grammar (Smolensky & Legendre 2006, Smolensky & Goldrick 2016), where functional categories are assigned abstract *weights*, which on the one hand determine whether syntactic operations can apply, and on the other influence their degree of morphological realization. Leaving most of the technical details aside, we will first summarize a case study involving head movement (section 1.1), where the presence of movement correlates with rich morphological output.

*Eine kleine Fußnote kann vermutlich nicht ausdrücken, wieviel ich von Gereon gelernt habe in den fast fünf Jahren, die ich in Leipzig verbringen durfte. Deshalb belasse ich es einfach bei den Gedanken, die mir zu seinem letzten Vortrag gekommen sind und die in diesem Papier niedergeschrieben sind. Danke für alles, Gereon!

Strict Cycling: A Festschrift for Gereon Müller, 75–88
Silke Fischer, Doreen Georgi, Fabian Heck, Johannes Hein, Anke Himmelreich, Andrew Murphy & Philipp Weisser (eds.)
STRICT CYCLING, Universität Leipzig 2024

We then move on to present his view on phrasal movement (section 1.2), where overt morphological realization of a head seems to block movement, more concretely the extraction of constituents out of the phrase the head projects.

1.1. The Rich Agreement Hypothesis

A close connection between morphology and syntax can be observed with V-to-T movement, as it seems to be conditioned by rich subject agreement morphology on the verb across languages (Pollock 1989, Holmberg & Platzack 1995, among many others). For instance, V-to-T movement is required in Icelandic (1), but prohibited in Danish (2).

(1) *V-to-T movement in Icelandic*

a. *að Anna T oft [$_{vP}$ [$_{\text{V-V}}$ borðar] [$_{VP}$ *t* tómata]]
that Anna often eats tomatoes
'that Anna often eats tomatoes'

b. að Anna [$_{\text{T}}$ [$_{\text{V-V-T}}$ borðar]] oft [$_{vP}$ *t*$_{\text{V-V}}$ [$_{VP}$ *t* tómata]]
that Anna eats often tomatoes
'that Anna often eats tomatoes'

(2) *No V-to-T movement in Danish*

a. at Anna T ofte [$_{vP}$ [$_{\text{V-V}}$ spiser] [$_{VP}$ *t* tomater]]
that Anna often eats tomatoes
'that Anna often eats tomatoes'

b. *at Anna [$_{\text{T}}$ [$_{\text{V-V-T}}$ spiser]] ofte [$_{vP}$ *t*$_{\text{V-V}}$ [$_{VP}$ *t* tomater]]
that Anna eats often tomatoes
'that Anna often eats tomatoes'

Accordingly, the Icelandic conjugation paradigm displays rich variation, whereas the paradigm for Danish shows almost no morphological distinctions, exemplified with the inflection paradigms in (3) and (4).

(3) Icelandic *borða* 'eat'

	present	past
1SG	borða	borðaði
2SG	borðar	borðaðir
3SG	borðar	borðaði
1PL	borðum	borðaðum
2PL	borðið	borðaðuð
3PL	borða	borðaðu

(4) Danish *spise* 'eat'

	present	past
1SG	spiser	spiste
2SG	spiser	spiste
3SG	spiser	spiste
1PL	spiser	spiste
2PL	spiser	spiste
3PL	spiser	spiste

The implication that morphology drives syntax is at odds with current views of generative syntax, which often include a post-sytactic module of inflectional morphology, e.g. as in Distributed Morphology (Halle & Marantz 1993). At the point in the derivation where it is decided whether V-to-T movement takes place, the relevant morphological information is not yet available. However, it is not impossible to model the data with a late insertion model, e.g. by the assumption that rich morphology in Icelandic is simply a reflection of the number of functional projections which in turn trigger V-to-T movement, whereas inflectional heads in Danish are bundled leading to poor morphological output (Bobaljik & Thráinsson 1998, Bobaljik 2002). But the link between syntax and morphology can be modeled more directly, as Müller (2022) argues, by the assumption that T is strong in Icelandic resulting in head movement and rich morphology, while T is weak in Danish not triggering head movement and leading to comparatively poor agreement morphology. The proposal is implemented in Gradient Harmonic grammar (Smolensky & Goldrick 2016), an offshoot of Harmonic Grammar (Smolensky & Legendre 2006), where the competition between output structures is not only conditioned by weighted constraints but also by the interaction with weights assigned to linguistic objects contained in the structures. Essentially, movement and realizational constraints are sensitive towards the strength of the objects they talk about, as is schematically demonstrated in (5) where T is assigned a numerical weight of [0.7] and in (6) where the weight of T is at [0.4].

(5) *Strong T in Icelandic*

a. að Anna $T^{[0.7]}_{\textit{-ar}}$ oft [$_{vP}$ [$_{\text{V-V}}$ borð] [$_{VP}$ *t* tómata]]

b. /-ar/ $\leftrightarrow$ [$\pm\alpha, \pm\beta, \pm\gamma$]

(6) *Weak T in Danish*

a. at Anna $T^{[0.4]}_{\textit{-er}}$ ofte [$_{vP}$ [$_{\text{V-V}}$ spis] [$_{VP}$ *t* tomater]]

b. /-er/ $\leftrightarrow$ [$\pm\alpha$]

Movement is feature-triggered and causes a violation if features are not discharged. In contrast, an economy constraint blocks movement which favours the competing *in situ* structure. Due to the nature of Gradient Harmonic Grammar, a movement operation can be more costly or less costly depending on the strength of the head responsible for the movement. In (5a), but not in (6a), T is strong enough to perform better than the competing structure that leaves the verb *in situ*. In the same vein, a realizational constraint can favor one output over another depending on the number of features, and thus strength, an exponent realizes. The fewer features are encoded by an exponent, the more likely syncretisms arise, which derives the poor morphology in Danish (6b) compared to Icelandic (5b). One advantage of such an approach is that it potentially captures other interactions between morphology and syntax beyond the structures discussed under the Rich Agreement Hypothesis, as we will show in the next section.

1.2. Complementizer trace effects

Another classic interaction between overt exponence and syntactic movement concerns extraction out of a finite clauses. As is shown in (7), *wh*-phrases (in subject position) can in principle be extracted out of finite clauses, but only if the complementizer is not spelled out (Perlmutter 1968).

(7) a. Who$_1$ do you think [$_{CP}$ t_1 [$_C$ $\varnothing$] t_1 saw Emma] ?

b. *Who$_1$ do you think [$_{CP}$ t_1 [$_C$ that] t_1 saw Emma] ?

Müller (2022) follows up on a suggestion by Chomsky (2013) and argues that the extraction asymmetry in (7) can be explained by the strength of the C head

across which the *wh*-subject has to move in order to escape the CP due to the PIC (Chomsky 2001). As in the previous case study, movement is feature triggered, in this case by [•WH•] on C,[1] but since constraints are violable, features need not be discharged necessarily. An economy constraint is also in place, which is violated if movement takes place. The crucial assumption is that C heads in English can be distinguished by strength, where a weak C head is not strong enough to be spelled out morphologically and does not give rise to a strong violation if a phrase moves across it, as is sketched in (8). In contrast, a strong C head causes strong violations for extraction and is ultimately also spelled out in post-syntax, see (9).

(8) *Weak C in English*

a. Who$_1$ do you think [$_{CP}$ t_1 [$_{C'}$ $C_{\varnothing}^{[0.5]}$ [$_{TP}$ t_1 saw Emma]]] ?
b. /∅/ ↔ [ ]

(9) *Strong C in English*

a. Who$_1$ do you think [$_{CP}$ t_1 [$_{C'}$ $C_{that}^{[1]}$ [$_{TP}$ t_1 saw Emma]]] ?
b. /that/ ↔ [C]

Note that strength on the morphological side has a different impact in this case. Whereas in the previous section the strength of the T head determined the richness of an entire morphological paradigm, the strength of the C head in (7) is related to *iconicity*. Thus, the notion of strength can lead to a direct mapping between function and form, in the sense that if the C head is assigned little weight, chances are that the head will not be morphologically realized at all.

There is another difference worth pointing out between the two phenomena. Although not explicitely discussed by Müller (2022), I believe that the model makes different predictions regarding head movement vs. phrasal movement. In the case of head movement, the presence of the syntactic operation correlates with rich morphology. In contrast, for phrasal movement to take place it matters that the head which needs to be crossed receives comparatively poor morphology, if not zero spell-out. In the next section, we will investigate this prediction regarding noun phrase internal movement.

[1] More concretely, matrix C comes with [•WH•] and intermediate movement steps are caused by duplicates of criterial features on phase heads (Abels 2012). Müller (2022) adopts a more restrictive version of the PIC according to which all phrases constitute phases, see Müller (2011) for discussion.

2. Extensions to the nominal domain

In this section, I present two small case studies exploring the status of noun phrase internal movement in Italian and Bangla.

2.1. Italian

One of the most prominently discussed arguments for head movement in the nominal domain is the word order alternation observed with modified proper names in Italian. Data and analysis are shown in (10). Italian displays an overt definite determiner with modified proper names (10a). The determiner, however, can also remain unpronounced but only if the proper name precedes the possessive adjective, see (10b) and (10c).

(10) *N-to-D movement in Italian* (cf. Longobardi 1994)

a. $[_{DP}\ [_{D}$ la $]\ [_{NP}\ [_{AP}$ mia $]\ [_{N}$ Maria $]]]$
DEF my Maria

b. *$[_{DP}\ [_{D}\ \varnothing\ ]\ [_{NP}\ [_{AP}$ mia $]\ [_{N}$ Maria $]]]$
DEF my Maria

c. $[_{DP}\ [_{\text{N-D}}$ Maria $]_1\ [_{NP}\ [_{AP}$ mia $]\ t_1\ ]]$
Maria my
'my Maria'

Longobardi (1994) argues that the D position has to be occupied overtly, either by merging *la* as in (10a) or by N-to-D movement as in (10c). The fact that N and D are in complementary distribution in pre-adjectival position is explained by head movement as an instance of *substitution*; see also Rizzi & Roberts (1989) and Riemsdijk (1998) for the same argument in the verbal domain. Given that the status of substitution is not uncontroversial (Salzmann 2020) and has mostly been abandoned in more recent work (Harley 2013), let us then attempt to explain the Italian pattern under the strength-based approach.

Following the intuitions in section 1.1, a head movement account would make the wrong prediction for the Italian data. In analogy to V-to-T movement, we would predict that raising N to D requires strength on behalf of D, yet in such a case the determiner is not spelled out (10c). The determiner is only overtly realized if there is no N-to-D movement (10a), which is also unexpected. Instead, what the interaction of morphology and syntax seems to

suggest is that the Italian data can be derived via phrasal movement, similarly to the complementizer trace effect in section 1.2. The strength-based rationale is illustrated in (11) and (12). First, we have to reanalize the adjectival modifier as an adjunct, attaching to the NP *Maria*. Second, D attracts NP into its specifier via some feature. This movement step incurs a weaker violation, if it takes place across a weak D head (11a) compared to a structure where NP stays *in situ*. If the D head is strong, the movement step will be fatal compared to the *in situ* structure (12a).[2] Finally, morphology mirrors the strength of the D heads, see (11b) and (12b).

(11) *Weak D in Italian*

a. $[_{DP}\ [_{NP}\ \text{Maria}\ ]_1\ [_{D'}\ \text{D}^{[0.5]}_{\varnothing}\ [_{NP}\ [_{AP}\ \text{mia}\ ]\ t_1\ ]]]$

b. /∅/ ↔ [ ]

(12) *Strong D in Italian*

a. $[_{DP}\ \ [_{D'}\ \text{D}^{[1]}_{il}\ [_{NP}\ [_{AP}\ \text{mia}\ ]\ [_{NP}\ \text{Maria}\ ]]]]$

b. /il/ ↔ [D]

It is worth pointing out that the argument against head movement aligns with the view in Georgi & Müller (2010), who specifically argue against the N-to-D movement analysis shown in (10). Instead of the analysis sketched in this paper, however, they pursue a reprojection approach, shown in (13). They propose that the possessor and the determiner enter the derivation via Merge features [•A•] and [•D•] on N creating a multiple specifier structure. The derivation results in an NP-over-DP structure since the determiner is merged as a specifier of NP, see (13a). In the case where the proper name precedes the possessor, N comes with an additional probe feature [∗D∗] which can only be discharged if N raises to a position where it c-commands DP, thereby reprojecting its category label (13b).

[2]The movement step in (11a) does not obey *anti-locality* (Abels 2012). This is not harmful insofar as the movement constraint is always violated if any kind of movement takes place. What matters is the strength of the violation, which is in turn is determined by the strength of the heads that are being crossed.

(13) *Reprojection in Italian* (Georgi & Müller 2010)

a. [$_{NP}$ [$_{DP}$ la] [$_{N'}$ [$_{AP}$ mia] [$_{N}$ Maria$_{[\bullet A \bullet \prec \bullet D \bullet]}$]]]

b. [$_{NP}$ [$_{N}$ Maria$_{[\bullet A \bullet \prec \bullet D \bullet \prec * D *]}$]$_1$ [$_{NP}$ [$_{DP}$ ∅] [$_{N'}$ [$_{AP}$ mia] t_1]]

Besides a technical solution in footnote 24 (Georgi & Müller 2010: 19), no connection is made between the morphological realization of the D head and the presence of the probe feature on N. The problem seems to lie in the fact that D is not the head of the noun phrase, thus its strength is not decisive over whether it can act as a barrier or not. If there is a re-analysis in terms of strength, it is presumably not an obvious one. Possibly, one way to model the contrast is to assign more strength to N in (13b) given that it comes with an additional probe feature. Indeed, Müller (2022) relates subject-object asymmetries to different strengths of the moved items themselves elsewhere in the presentation, though the reasoning is not based on number of features.

2.2. Bangla

In Bangla, an Indo-Aryan language spoken in Bangladesh and India, word order changes within the nominal domain seem to always be accompanied by semantic effects, akin to object movement in the clausal domain. As is shown in (14), nouns following their classifiers constitute the unmarked order creating indefinite readings, while nouns preceding their classifiers receive a specific (Bhattacharya 1999) or definite interpretation (Chacón 2011, Dayal 2012, Syed & Simpson 2017).

(14) *Numeral phrases in Bangla* (Chacón 2011)

a. du=ʈo kham
two=CL envelope
'two envelopes'

b. kham du=ʈo
envelope two=CL
'the two envelopes'

Most accounts attribute N-Cl orders in Bangla to NP-movement checking a semantic feature that is introduced by a silent D head, rather than N-to-D movement. Support for this account comes from the observation that modified nouns undergo the same transformation which implies phrasal status of the moved noun, see (15).

(15) *Modified numeral phrases in Bangla* (Chacón 2011)

a. du=ʈo lɔmba kham
two=CL long envelope
'two long envelopes'

b. lɔmba kham du=ʈo
long envelope two=CL
'the two long envelopes'

The indefinite reading which arises with the base order in (14a) can be made to follow from the absence of a DP-projection. Such accounts are given e.g., by Dobrovie-Sorin (1997), van Geenhoven (1998), McNally (1998), who derive indefinite readings by property-denoting arguments and predicates with build-in existential quantifiers. Indeed, indefinites also come with the classifier structure and NP raising is prohibited (16b). The absence of NP raising can be accounted for by the structure in (16c), that is via the lack of a DP shell.[3]

(16) *Indefinites in Bangla* (Dayal 2012)

a. ek=ʈa boi
one=CL book
'a/one book'

b. *boi ek=ʈa
book one=CL

c. [$_{\#P}$ [$_{\#}$ ek] [$_{ClP}$ [$_{Cl}$ ʈa] [$_{NP}$ boi]]]

As for (14b), the structure in (17) suggests itself, in line with the analysis for Italian in (11). The D head introduces the definite reading, presumably a maximality operator (e.g., ι), but its strength level does not lead to morphological

[3] In (16c), the classifier first combines with the noun instead of the numeral. An alternative view which is often entertained, e.g., for Korean (Ko 2014, Kim & Melchin 2018) and Japanese (Saito et al. 2008), is that the classifier forms a constituent with the numeral first before it combines with the noun. Bangla, however, seems to pass several diagnostics for a classifier-for-noun language, i.e., a language where the classifier turns the noun into a set of atoms, see discussion in Little et al. (2022). For example, not every noun requires a classifier, which is expected since there could be a subset nouns which do not require atomization. Chacón (2011: section 2.3) discusses certain "measure words" like *tin mas* 'three months' or *car paʃ* 'four sides' which never appear with classifiers. Additionally, classifiers show up in environments without numerals, as they are compatible with quantifiers: *sɔb=ʈa doi* 'all curd'; *kichu=ʈa doi* 'some curd' (see Bhattacharya (1999: section 4)). Again, this is predicted since not only numerals may require atomized objects.

realization. Given its relative weak strength, however, NPs can cross the D head. In (17), NP moves successive-cyclically through the specifiers of ClP and #P, as a consequence of the strict version of the PIC, recall footnote 1.

(17) *Weak D in Bangla*

$[_{DP}\ [_{NP}\ \text{kham}\ ]_1\ [_{D'}\ D_{\varnothing}^{[0.5]}\ [_{\#P}\ t_1\ [_{\#'}\ [_{\#}\ \text{du}\ ]\ [_{ClP}\ t_1\ [_{Cl'}\ [_{Cl}\ \text{ʈo}\ ]\ t_1\ ]]]]]]$

Note that it is not the presence of the numeral which is responsible or in any way required for NP raising to take place. Simple definites also display the N-Cl word order.

(18) *Definites in Bangla* (Dayal 2012)

a. boi ʈa
book CL
'the book'

b. *ʈa boi
CL book

Is there a strong D head in Bangla? Since Bangla is a bare argument language, it is tempting to analyze the demonstrative determiner as the overt spell-out of the definite determiner, akin to what has recently been claimed for Korean (Ahn 2017) and Mandarin (Jenks 2018). Interestingly, structures including a demonstrative determiner block NP-raising, instead the NP occurs in between demonstrative and numeral classifier, shown in (19). The structure in (19c) illustrates how a strong D head prevents NP from raising across D, in analogy to Italian in (12). In contrast to Italian, however, the word order alternations in Bangla reveal that it seems to be only the criterial movement step which is blocked since the NP does move across the numeral classifier.

(19) *Strong D in Bangla?* (Bhattacharya 1999)

a. ei boi du=ʈo
DEM book two=CL
'these two books'

b. *boi ei du=ʈo
book DEM two=CL

c. $[_{DP}\ [_{D'}\ D^{[1]}_{ei}\ [_{\#P}\ [_{NP}$ boi $]_1\ [_{\#'}\ [_{\#}$ du $]\ [_{ClP}\ t_1\ [_{Cl'}\ [_{Cl}$ ʈo $]\ t_1\ ]]]]]]$

This is, however, not the complete picture. There is an alternative structure involving a demonstrative determiner which is also acceptable, see (20). With nothing else being said, it is unclear why this variant is not the optimal candidate.

(20) ei du=ʈo boi
DEM two=CL book
'these two books' (Bhattacharya 1999)

According to Dayal (2012), the alternation between (20) and (19a) correlates with a semantic difference, as is shown in (21). Whereas the Dem-N-Cl order involves maximality and pointing, the Dem-Cl-N order only involves pointing.

(21) *Context: There is a bunch of bananas on the table.* (Dayal 2012)

a. ei pãtʃ=ʈa kala
DEM five=CL banana
'these five bananas' (pointing at five of the bananas)

b. ei kala pãtʃ=ʈa
DEM banana five=CL
'these five bananas' (pointing at all five bananas)

Whatever is responsible for the lack of maximality in (21a)/(20) must be reflected in the underlying structure, thereby allowing the other word order in the presence of the demonstrative. Of course, an alternative theory could take demonstrative *ei* to be a separate head, possibly projected over DP, which introduces deixis in the semantics (Bhattacharya 1999, Syed & Simpson 2017). In this case, Bangla would simply not display a strong D head.

3. Conclusion

In this contribution, I investigated potential evidence for a strength-based analysis of syntactic objects in the nominal domain, following up on Müller's (2022) recently developed Gradient Harmonic Grammar approach which is mostly based on clausal phenomena. While there are some promising interactions between morphology and syntax found for the noun phrase, they

presuppose the DP-hypothesis (Abney 1987). This is in and of itself an interesting result, though it is incompatible with the view defended in Georgi & Müller (2010) who argue for an NP-over-DP view more generally.

One aspect, we have not touched upon are the possible repercussions syntactic strength could have for semantic interpretation. Ross (1973) originally observed that syntactic constituents with little semantic input like expletives and idiom chunks can undergo passivization but not left dislocation in English. Accordingly, Müller (2022) develops an account modeling the extraction possibilities out of VP idioms in German depending on the level of semantic opacity. In this regard, one might wonder if semantic strength also plays a role in the nominal domain. Indeed, Longobardi (1994: 650 ff.) argues that the silent D head in Italian receives an expletive interpretation. But since a proper name refers to an object which is intrinsically unique even in the presence of an overt D head in Italian, there does not seem to be an interaction between the spell-out of a head and its semantics. For Bangla, we note that the silent D head specifically introduces a maximality operator since its presence triggers definite interpretations. Hence, the opposite correlation is observed. Based on the two case studies, we can conclude that at least when it comes to the strength of movement-triggering heads, no interaction with their semantic interpretations can be found.

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