Language Quarks*

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This paper very briefly summarizes the results of recent research into the nature of grammatical features and relations (Sigurðsson 2004 *et seq*.). While morphology operates with discrete (albeit abstract) *features* and *feature values*, syntax builds and operates on *relations*. Many, perhaps all syntactic relations involve silent active heads, *language quarks*. Quarks cannot be materialized or absolutely located in linguistic 'space', and hence there can be no one-to-one correlations between them and 'concrete material', such as discrete morphological features. Minimalist syntax is a partly successful theory of I-language, but a plausible theory of language externalization remains to be developed.

Cinque (1999:127) suggested that "the entire array of functional projections [is] present in every sentence", an idea referred to as Cinque's Generalization by Sigurðsson & Maling (2009). It suggests that the negative evidence of grammatical silence (e.g. absent marking of tense or case) is weak, if any at all. Conversely, the positive evidence of the overt grammatical marking of some category in individual languages is only indirect. In particular, values like '1 person', 'accusative', 'past tense' or 'subjunctive' cannot be taken at face value as syntactic markings. What is required is a more atomic analysis that identifies properties of grammatical categories that are a *common* denominator of both semantic interpretation and PF expression (broad PF, including morphology). That is, the output of the syntactic computation has to be legible to and hence interpretable at *both* the interfaces, albeit in different (semantic vs. expressive) terms.

1. Person

For instance, person (Pn), tense, mood and case markings reflect syntactic matching *relations* that are distinct from the *features* expressing them. Feature values are not given in the lexical array (which contains only abstract roots and categories, cf. Sigurðsson 2006a), but are instead *computed in syntax*. Thus, Pn values like '1 person', etc., can be analyzed as the result of two matching relations, one structurally low, yielding +/–Pn (where non-humans are –Pn in unmarked cases), and another, structurally higher, yielding the values 1, 2 and 3 for +Pn arguments.[1] Crucially, these values do not simply reflect '1 person' etc., but different settings of two underlying binary features, +/–$\mathbf{\Lambda_A}$ (logophoric agent, 'speaker') and +/–$\mathbf{\Lambda_P}$ (logophoric

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[1] Sigurðsson 2004; cf. also e.g. Bianchi 2006, Baker 2008, Zanuttini 2008.

patient, 'hearer').[2] The combinatory effects of the lower Pn matching and the higher logophoric matching are illustrated in (1)-(3), where the arrow reads 'gets valued as':

(1) $NP_{\alpha Pn} \rightarrow NP_{+Pn}$ or NP_{-Pn}

(2) $-Pn \rightarrow$ 3P by default

(3) a. $+Pn \rightarrow -\Lambda_A, -\Lambda_P$ = 3P by computation[3]
b. $+Pn \rightarrow -\Lambda_A, +\Lambda_P$ = 2P by computation
c. $+Pn \rightarrow +\Lambda_A, -\Lambda_P$ = 1P by computation

This understanding can be implemented in a cartographic approach where Pn is a head in the TP domain, whereas Λ_A and Λ_P are heads in the CP domain (I use 'CP', 'TP' and 'vP' not in the X'-theoretic sense but merely as domain labels):[4]

(4) $[_{CP} \ldots \Lambda_A \ldots \Lambda_P \ldots [_{TP} \ldots Pn \ldots [_{vP} \ldots NP_{\alpha Pn} \ldots]]]$

Pn, thus, enters a matching (Agree) relation with $NP_{\alpha Pn}$,[5] valuing it as NP_{+Pn} or NP_{-Pn} and commonly attracting it into its vicinity (A-movement, cf. Sigurðsson & Holmberg 2008, Sigurðsson 2009c), NP_{+Pn} in turn matching Λ_A and Λ_P (resulting in 1, 2 or 3 person) usually under distant Agree, without concomitant movement into the CP domain.

The computed person values are obviously visible in the derivational outcome. In contrast, the computational elements themselves, Pn and Λ, are not materialized. Thus, syntax contains *active* silent elements or heads – *language quarks* – that do not have a fixed location and can only be located in syntactic 'space' in relation to other elements.[6]

[2] This approach is conceptually related to the performative hypothesis (Ross 1970), but it crucially differs form it in not postulating any performative null-predicate. Similar approaches have been developed in semantic terms in earlier works, including Sigurðsson 1990 and, in particular, the influential study of Schlenker 2003.

[3] That is, 3 person is either default ('minus person' or 'no person', Benveniste 1966 and many since) or a true, computed person ('a person that is neither the speaker nor the hearer').

[4] For early approaches to Pn as a clausal head, see Shlonsky 1989, Egerland 1996. Pn typically bundles up with other φ-heads and T in PF, an issue I will not address here.

[5] For an approach to the NP as Person Phrase, see Platzack 2004.

[6] Left edge quarks, including Λ and Top, are crucially active in licensing radically silent null-arguments, an issue I will not address here, though (but see Sigurðsson 2008b and the references cited there).

2. Tense

The basic semantic facts of tense have of course been widely discussed (Hornstein 1990, Giorgi & Pianese 1997, Cinque 1999, Schlenker 2003, among very many). In contrast to common assumptions, however, tense interpretation is *syntactically computed* (Sigurðsson 2004, 2008a, Sigurðsson & Maling 2009).

Like Λ, CP speech time or speech tense, $\mathbf{T_S}$ (partially corresponding to Fin(iteness) in Rizzi 1997 and related work) is a language quark, that is, it is an active silent head, matched by tense in the TP-domain, **T**, which in turn is matched by vP-internal event time/tense, $\mathbf{T_E}$.[7] In a cartographic approach, thus, clausal structure contains the following heads (among others, not indicated):

(5) $[_{CP}$ … Force ... Top ... Foc ... Λ_A ... Λ_P ... T_S ... $[_{TP}$ ... Pn ... T ... $[_{vP}$ ... T_E ...]]]

Much like Pn, T enters a double matching (Agree) relation (↔). First, $T_E \leftrightarrow T$ yields non-finite temporal relations, as illustrated for the common English-type system in (6):

(6)	a.	$T_E = T$	unshifted	as in (most) gerunds	*sleeping*
	b.	$T_E \geq T$	–FUTURE	as in past participles	*slept*
	c.	$T_E \leq T$	–PAST	as in infinitives	(*to*) *sleep*

Second, the so established $T_E \leftrightarrow T$ relations enter a second order matching relation with T_S, yielding the finite tense system. Thus, the simple tenses relate ($T_E = T$) with T_S, whereas relating ($T_E \geq T$) and ($T_E \leq T$) with T_S yields the perfect vs. the progressive tenses, respectively (Sigurðsson 2008a, Sigurðsson & Maling 2009). This is illustrated for the simple and the prefect tenses in (7) and (8):[8]

(7)	Non-finite	Finite	*Construction*	*Example*
a.	($T_E = T$)	$> T_S$	past	She slept
b.	($T_E = T$)	$= T_S$	present	She sleeps
c.	($T_E = T$)	$< T_S$	future	She will sleep

[7] Fin splits into T_S and speech location (S_L (or L_S) the basic speaker HERE and NOW, cf. Sigurðsson 2009c). T is referred to as T_R in Sigurðsson & Maling 2009 (it corresponds closely to reference time, R, in Reichenbachian approaches to tense).

[8] I abstract away from tense reading effects of aktionsart. For a similar presentation of the Icelandic progressive tenses (formed on the basis of infinitives), see Sigurðsson 2008a, Sigurðsson & Maling 2009. It is slightly more complicated to demonstrate this for the English 'progressive' (*be* V-*ing* forms), as it largely conflates simple tense and progressive tense readings.

(8)	Non–finite	Finite	*Construction*	*Example*
a.	($T_E \geq T$)	$> T_S$	**perfect**, past	She had **slept**
b.	($T_E \geq T$)	$= T_S$	**perfect**, present	She has **slept**
c.	($T_E \geq T$)	$< T_S$	**perfect**, future	She will have **slept**

Thus, finite tense relations canonically involve $(T_E \leftrightarrow T) \leftrightarrow T_S$, largely corresponding to the neo-Reichenbachian $(E \leftrightarrow R) \leftrightarrow S$ system (more complex and more peripheral tense relations exist – and can be accommodated, cf. Sigurðsson & Maling 2009).

In short, much like syntactic $(NP_{\alpha Pn} \leftrightarrow Pn) \leftrightarrow \Lambda_A/\Lambda_P$ yields person interpretation at the interfaces, $(T_E \leftrightarrow T) \leftrightarrow T_S$ yields tense interpretation, semantic at the conceptual interface and morphological at the expressive (externalization) interface.

3. Case

Case is a less transparent category than person and tense, and languages also vary greatly with respect to morphological case.[9] Commonly, however, argument case involves matching relations between θ-features (or 'roles') and Voice- and Aspect-features (T- and *v*-type heads in Chomsky 2000, 2001). Chomsky (2001) distinguishes between two types of *v*-heads, plain or 'defective' *v*, not assigning any case, and *v**, yielding ACC on the direct object of *v*-V. In the same vein, the *v*-type heads responsible for DAT assignment to direct objects (as opposed to indirect objects) in languages like German and Icelandic can be designated as *v*** (at least for expository purposes, cf. Sigurðsson 2009d, 2009e). The basics of the core argumental case system in nominative-accusative/dative languages can thus be simply described as in (9), where the arrow reads as 'assigns' (in PF morphology):

(9) a. v**-V → DAT
b. v*-V → ACC
c. v-V → Ø (interpreted as NOM in morphology)[10]

[9] However, the common general function of case is to simply distinguish between NPs that have different roles or functions within a predicate or a clause (Sigurðsson 2006b), case-marking thus being an externalization strategy (facilitating processing). As will be argued below, though, at least argument case is assigned in the externalization component on the basis of the syntactic computation, that is, despite not being part of syntax, case-marking reflects or interprets syntax in PF (cf. also e.g. Maling 2001, Landau 2006, and, *mutatis mutandis*, Yip et al. 1987).

[10] Syntactic elsewhere case-relations (or 'null-case reltions') are not necessarily interpreted or reflected by a null in morphology. Icelandic masculine 'strong' nouns, for instance, typically have the nominative singular ending -*ur*, while 'strong' neuter and feminine nouns in the language have no nominative singular ending.

The actual or the 'final' case of the underlying object of *v*-V is however adjusted by Voice. The well-know case or type is the Burzio's Generalization (or the Sibling Correlation) type, that is, the ACC-to-NOM conversion typical of active-passive pairs, as the Icelandic (and the corresponding English) one in (10):

(10) a. Þeir kusu **hana**.
they elected her.ACC
b. **Hún** var kosin.
she.NOM was elected.

The case assignment relation between the transitive and the passive verb can be analyzed such that the passive Voice, **Voice**$_{\textbf{PASS}}$, deletes the (ACC) case assignment property of the transitive *v*-V complex. Call this *case-star deletion* (following Sigurðsson 2009e).

As has been widely discussed in the literature (Zaenen & Maling 1984 and many since), 'case elimination' in the (eventive or dynamic) passive only applies to accusatives in languages like Icelandic and German. That is, datives 'survive' the (eventive) passive, as illustrated in (11):

(11) a. Þeir höfnuðu **henni**.
they rejected her.DAT
b. **Henni** var hafnað.
her.DAT was rejected
'She was rejected.'

In other words, (eventive) passive case-star deletion applies to *v**-V (or ACC-assigning) predicates, whereas it does not apply to *v***-V (or DAT-assigning) predicates. However, other Voice-type heads affect both predicate types, deleting not only accusatives but also (theme) datives. This is for instance true of *-st* anticausatives (traditionally referred to as 'middle'). That is, *-st* anticausatives do not only trigger ACC-to-NOM conversion (like the one illustrated for passives in (10)), but also DAT-to-NOM conversion, as illustrated in (12) for the DAT assigning predicate *breyta* 'change, alter' (compare the *-st* anticausative in (12c) with the passive in (12b)):

(12) a. Þeir breyttu **henni**. Active NOM-**DAT$_i$**
they changed her.DAT
b. **Henni** var breytt. Passive **DAT$_i$**
her.DAT was changed
'She was changed/altered (by someone).'
c. **Hún** breyttist. Anticausative-ST **NOM$_i$**
she.NOM changed.ST

Schäfer (2008) analyzes anticausative predicates as being embedded under expletive Voice, $\text{Voice}_{\text{EXPL}}$, but for our purposes the notations $\textbf{Voice}_{\textbf{PASS}}$ and $\textbf{Voice}_{\textbf{AC}}$ are sufficiently accurate for (eventive/dynamic) passive and anticausative Voice, respectively. What matters here is that different Voice-type heads affect the case assignment properties of different types of predicates in different ways. Thus, while $\text{Voice}_{\text{PASS}}$ alters only *v**-V (or ACC-assigning) predicates into plain *v*-V predicates (yielding NOM), Voice_{AC} alters both *v**-V (ACC-assigning) and *v***-V (DAT-assigning) predicates into plain *v*-V predicates (yielding NOM). This is simply sketched in (13)-(14), where the double edged arrows indicate matching (Agree) relations:

(13) a. $\text{Voice}_{\text{PASS}}$ … [… v* NP_{θ} …] > … v … NP_{NOM} … (* deletion)
↑_____↑↑__↑

b. $\text{Voice}_{\text{PASS}}$ … [… v** NP_{θ} …] > … v** … NP_{DAT} … (no ** deletion)
↑_____↑↑___↑

(14) Voice_{AC} … [… $\text{v}^{*(*)}$ NP_{θ} …] > … v … NP_{NOM} … (* & ** deletion)
↑_____↑↑____↑

Voice itself is a silent vP-external quark, which may however trigger or license some vP-internal marking, such as the anticausative *-st*-marking in Icelandic, under distant Agree (much as Λ and T_{S} license person and tense markings).

There are yet other Voice-type heads that have different case effects, for instance Icelandic $\text{Voice}_{\text{FATE}}$ selecting unaccusative predicates that 'preserve' ACC (type 'us.ACC drifted ashore', 'us.ACC (got-)carried off the road'), in contrast to regular unaccusatives (Sigurðsson 2006b, 2009d, 2009e):

(15) $\text{Voice}_{\text{FATE}}$ … [… v* NP_{θ} …] > ... v* … NP_{ACC} … (no * deletion)
↑_____↑↑__↑

The overt 'final' case of an argument NP is thus the result of a double matching relation, first between NP_{θ} and a v-type head ($\text{NP}_{\theta} \leftrightarrow v$, where *v* is e.g. *v** or *v***), and, second, a relation between *v* (or ($\text{NP}_{\theta} \leftrightarrow v$)) and Voice, sometimes triggering case-star deletion.[11] That is, like person and tense features, case features are 'indirectly' assigned on the basis of the computation of two distinct albeit interacting syntactic relations, where some of the elements involved are active silent heads or quarks.

[11] Voice is also involved in ergative case systems, as suggested by the fact that ergative case is canonically licensed by agentive Voice (however, more categories than just Voice can affect the case assignment properties of *v*-V, for instance Tense in some split ergative languages and negation in languages like Russian and Finnish).

4. Mood

Finite clauses in many languages may show up in different moods, depending on a number of factors (for a general discussion, see Palmer 2001:107ff). In Icelandic, for instance, a finite subordinate clause may either be in the indicative, in the regular subjunctive or in a periphrastic *skulu*- 'shall' subjunctive (see Thráinsson 2007:394ff, Sigurðsson 2008a and the references cited in these works). This is illustrated in (16):

(16) a. Hún veit að tunglið **brosir**/*brosi/*skuli brosa.
she knows that moon.the smiles.IND/smiles.SBJV/shall.SBJV smile
'She knows that the moon smiles.'

b. Hún vonar að tunglið **brosi**/*brosir/*skuli brosa.
she hopes that moon.the smiles.SBJV/smiles.IND/shall.SBJV smile
'She hopes the moon smiles.'

c. Hún harmar að tunglið **skuli brosa**/*brosi/?brosir.
she regrets that moon.the shall.SBJV smile/smiles.SBJV/smiles.IND
'She regrets/deplores that the moon smiles'

The *speaker* seems to always take *truthfulness responsibility* in Icelandic indicatives (Sigurðsson 1990, 2008a:17), whereas such responsibility is absent in both types of subjunctives. Hence, the subjunctive is typically found in complements of non-factive predicates (plain subjunctives, as in (16b)) or in complements of factive but non-asserted predicates (*skulu*-subjunctives, as in (16c)). However, a number of other factors may also affect mood selection, including matrix negation and the person of the matrix subject (+/–Λ_A or '+/–speaker').[12] The effect of NEG and person is illustrated (in part only) in (17):

(17) a. Hún sér ekki að þú **sért/ert** mikilvægur.
she sees not that you are.SBJV/IND important
SBJV: 'She cannot see that you should be important.'
IND: 'She does not see/realize (the fact) that you are important.'

b. Ég sé ekki að þú **sért**/*ert mikilvægur.
I see not that you are.SBJV/IND important
SBJV: 'I cannot see that you should be important.'

By using the indicative, the speaker is making a factive assertion about (what he or she considers to be) the real world: '(It is a fact in the real world that) You are important.' Hence

[12] Much as tense-agreement or 'sequence of tenses', these effects illustrate that finite CPs are not 'absolute barriers', suggesting that spell-out may sometimes be delayed beyond CP-boundaries.

the first person of the matrix subject (in combination with NEG) leads to a contradiction in the indicative version of (17b), whereas no such contradiction arises in (17a) or in the subjunctive version of (17b).

Predicates of expression and thinking, such as *say*, *maintain*, *write*, *think* usually require a subjunctive complement in Icelandic, as illustrated in (18):[13]

(18) Hún fullyrðir að tunglið **brosi**/*brosir á laugardögum.
she maintains that moon.the smiles.SBJV/IND on Saturdays

However, if the matrix subject refers to the speaker, the indicative is possible (in the complements of at least certain predicates of expression), as in (19):

(19) Ég fullyrði að tunglið **brosi**/**brosir** á laugardögum.
I maintain that moon.the smiles.SBJV/IND on Saturdays

By using the indicative the speaker asserts that the moon smiles on Saturdays ('I hereby maintain that it is a fact that the moon smiles on Saturdays'), whereas he or she only tells about his or her claim to this effect when using the subjunctive. – The difference between these readings becomes clearer when a temporal adverbial is added, in which case only the subjunctive is possible: *I sometimes maintain that the moon smiles.SBJV/*smiles.IND on Saturdays*. By adding *sometimes* the speaker makes it clear that she or he is not making a statement for which she or he takes truthfulness responsibility 'here and now'.

In addition, tense ($(T_E \leftrightarrow T) \leftrightarrow T_S$) affects mood assignment, as for instance seen by the fact that factives like *vita* 'know' usually take only indicative complements in the present tense, (20a), but may also take a subjunctive complement in the past tense (20b):

(20) a. Jón veit að María **fer**/*fari þangað.
John knows that Mary goes.IND/*SBJV to-there
IND: 'John knows that Mary goes/will go there.'

b. Jón vissi að María **fór/færi** þangað.
John knew that Mary went.IND/SBJV to-there
IND: 'John knew that Mary went there.'
(i.e., 'John knew about the fact that Mary went there')
SBJV: 'John knew that Mary would go there.'
(i.e., 'John was confident that Mary would go there')

[13] That is, the speaker makes the matrix subject responsible for the truthfulness of the complement clause. In this respect, Modern Icelandic differs from Romance languages, which commonly have indicative in *verba dicendi* complements (see, e.g., Giorgi & Pianesi 1997:215), and also from Old Norse (Nygaard 1906:284ff), which showed considerable mood optionality in complements of this sort.

In the indicative version of (20b), the speaker simply reports the past eventuality of John having known about Mary's going there. In the subjunctive version, on the other hand, the speaker reports on John´s *past state of mind*, that is, on his past confidence that Mary goes there (usually in the future, relative to John's moment of confidence), a phenomenon known as (subject's) *Point of View*, POV (see, e.g., Thráinsson 1976, 2007, Sigurðsson 1990).

The categories that enter into the syntactic computation that yields subjunctive mood marking in PF thus include at least the Λ quark or operator in the matrix CP domain, tense computation ($(T_E \leftrightarrow T) \leftrightarrow T_S$), NEG, the truthfulness operator and the closely related POV operator. That is, morphological subjunctive mood reflects a complex interaction of semantic/syntactic factors, in an even more intricate manner than person, tense and case markings do.

5. Conclusion

Syntax has no access to feature values like 'accusative', 'subjunctive', 'past tense' and '1 person'. Such values are assigned in morphology on the basis of the syntactic computation, and, being syntax-external, they are derivationally invisible to the semantic (conceptual-intentional) interface. In contrast, the underlying syntactic relations are legible to both the interfaces, yielding semantic interpretations like 'before the speech time' and 'identical with the speaker' as well as morphological interpretations like 'past' and '1 person'. – As they give rise to lexical/grammatical PF representations (as well as semantic interpretations), the underlying matching relations are evidently syntactic and not 'pragmatic' (contra many, e.g. Huang 2007).

Thus, while morphology operates with discrete person, tense, mood and case *feature values*, syntax does not, instead building and operating on *relations*. It follows that person, tense, mood and case values are *not* syntactic objects, hence not input to any syntactic operations (whereas they are commonly input to agreement processes, applying in post-syntactic PF morphology).

All this indicates that linguistic mapping processes are fundamentally *non-isomorphic*. That is, much as there are no direct mappings of morphological features onto phonological features or sound waves, there do not seem to be any one-to-one mappings from syntax onto morphology or onto PF in general. If that is true, as it seems to be, the challenge of explaining linguistic diversity and uniformity is even greater than suggested by mainstream minimalism (Chomsky 1995, 2001, 2002, etc.) – not to mention other approaches. One of the many challenging consequences is that syntactic economy does *not* extend to E(external) language(s) (PF, including morphology, which however has 'its own' economy strategies). It seems that the motoric externalization component of language does not directly project the I(nternal) language of syntax, instead 'cooperating' with it, on and in 'its own terms'.

Quarks cannot be absolutely located or materialized in space and hence they could not stand in any simple one-to-one correlations with 'concrete material', such as discrete morphological features. It follows that language externalization is a much more complex and sophisticated process than commonly assumed. While minimalist syntax seems to be at least a partly promising theory of I-language, a plausible theory of language externalization remains to be developed. E-language is *radically disentangled* from I-language, hence arbitrary in relation to it, as perhaps best evidenced by visible and tactile sign languages (cf. e.g. MacNeilage 2008) and writing systems, including successfully deciphered writing systems of extinct languages. It seems to be the case that humans can instinctively relate I-language to (and reinterpret it in terms of) *any* kind of minimally regular mind-external patterns.

Developing a coherent theory of language externalization is one of the most urgent and challenging goals of scientific inquiry.

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