

Emergent parameters and syntactic complexity: new perspectives

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1. *Background*

- Biberauer, Holmberg, Roberts & Sheehan (2014, BHRS) suggest a new way of assessing the formal complexity of grammatical systems viewed from the perspective of an emergentist approach to parametric theory, and its implications for language acquisition and change.
- **The central idea** (both in BHRS and here) is that, rather than postulating a richly specified parametric endowment as part of UG (Chomsky 1981), parameters are emergent properties falling out of the interaction of Chomsky (2005)'s three factors:

(1) The three factors:

F1: where UG doesn't mind (underspecification);

F2: trigger experience/what the child takes up (Biberauer 2011: departures from the simplest Saussurean form-meaning mapping);

F3: general strategies of L1 acquisition based on computational conservatism.

(2) Two third-factor principles:

(i) Feature Economy (FE) (see Roberts & Roussou (2003:201)):

Postulate as few formal features as possible.

(ii) Input Generalisation (IG) (see Roberts (2007:275)):

Maximise available features.

- Together these constitute a minimax search/optimization strategy:

(3) Maximise Minimal Means.

- **This presentation** takes up these ideas, focusing in particular on a subset of seemingly privileged formal features: *Pleiotropic Formal Features (PFFs)*.

2. *Parameter hierarchies*

(4) A learning path:

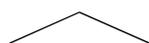
i) acquirers will always by default postulate that NO heads bear F; this maximally satisfies FE and IG.

ii) once F is detected in the PLD, IG requires that that feature is generalised to ALL relevant heads (on predicted overgeneralisation in acquisition, see Appendix A);

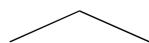
iii) if a head which does not bear F is detected, the learner retreats from the maximal generalisation and postulates that SOME heads bear F.

➔ In a nutshell: **NO > ALL > SOME**.

(5) Is F present?



NO Yes: Is F present on **ALL** heads?



Yes

No: F and not-F are present (**SOME**)

- ➔ The first step is a default: no feature is acquired unless observed in the PLD.
- ➔ The last step creates a distinction between domains where F is present and where it is absent, thereby effectively creating a new feature distinction (see also Drescher 2009 where essentially the same idea is applied in phonology, and Jaspers 2005, for a further application in the domain of concept formation).
- ➔ After the last step, the NO>ALL>SOME procedure is repeated for the restricted version of F, and for not-F (i.e. G). See Biberauer & Roberts (2014) for details.

What a hierarchy like (5) can potentially do:

- Express typological preferences/skewings (in this case the preference for harmonic word orders);
- Allow us to capture “mixed”/partial options (e.g. disharmonic word order) without proliferating parameters;
- gives us a very easy way to state markedness relations (the lower you are, the more marked you are);
- Simultaneously capture typological and acquisitional preferences;
- Connect to diachronic stability (higher/macro options are more stable; see Biberauer & Roberts 2012);
- Restrict the learning space by creating dependencies among parameters.

3. *Pleiotropic Formal Features (PFFs)*

- Parameter = unit of variation in language (i.e. heredity in the diachronic perspective)
- Gene = unit of heredity in biology

Pleiotropy

- In genetics, pleiotropy occurs when one gene influences multiple, seemingly unrelated phenotypic traits;
 - “Master genes”: are there “master parameters”? (NB not equivalent to macroparameters, which are epiphenomenal; see above).
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- ➔ Putative **pleiotropic parameters** would be “deep” parameters which profoundly influence the overall shape of a grammatical system.
 - ➔ Identifying parameters with (a subset of) formal features, we can try to identify a class of *pleiotropic formal features (PFFs)*

Here we propose to tentatively identify a small number of PFFs, drawing on earlier work, interpreting the central role played by certain formal features in this work as indicative of their status as PFFs.

(6) Four PFFs: Person, Tense, Case and Order.

3.1 *Person* (Longobardi 2008, Richards 2008)

(7) **DP-denotation hypothesis** (Longobardi 2008):

Individuals are denoted through the Person feature.

→ Person is necessary for reference to all types of individuals (including pluralities and kinds) and is therefore central to the functioning of the C-I interface.

- ❖ If it is so central, why do we see variation? This would be surprising if we had a predetermined set of UG-specified PFFs, but it is less surprising if these features emerge in the manner described above.
- ❖ But the nature of the variation is constrained:

(8) “Weak” vs “strong” person (Longobardi 2008, although here interpreted in a rather different way):

a. **Strong** Person implies the presence of a set of further parametric options concerning other formal features (including phi-features such as gender, number, etc.) and also plays a role in multiple domains (potentially, all phasal (sub)domains, across all categories, Ritter & Wiltschko 2009, Zubizarreta & Pancheva 2015);

b. **Weak** Person is simply instantiated with its standard values (1st, 2nd, possibly 3rd), without implying that other ϕ -features are grammaticalised (in the sense that they do not participate in Agree relations).

- It should be clear that the usage of the terms “strong” and “weak” here is quite distinct from that in Chomsky (1993); this is an unfortunate case of diachronic homophony.

(9) Strong Person:

a. in the nominal domain, determines aspects of the behaviour of proper names, kind names, genitives, definite and indefinite descriptions (at least in part by determining N-to-D movement, Longobardi 2008);

b. also in the nominal domain, it has implications for the semantics of bare nouns, the syntax of definiteness inheritance (construct state, Saxon genitive) and the syntax of definite enclitics;

c. is necessary, but not sufficient, for “unagreement” (Höhn forthcoming);

d. at the clausal level, determines consistent null subjects;

e. at the clausal level, may determine anchoring to the speech situation (Ritter & Wiltschko 2009, Zubizarreta & Pancheva 2015);

f. frequently associated with “rich” inflection morphology (a direct PF trigger for this feature).

- (10) Weak Person:
- a. at the clausal level, is associated with either partial or non-null-subject systems;
 - b. at the nominal level, does not determine N-movement;
 - c. may imply lack of other phi-features, e.g. grammatical gender (Longobardi 2008);
 - d. typically associated with impoverished inflectional morphology.

3.2 *Tense*

(11) **The TP-Denotation hypothesis:**

Events are denoted through the Tense feature.

(see Higginbotham 1985, Pollock 1989, Hinzen & Sheehan 2013 for similar ideas)

(12) Strong Tense:

- a. implies V-movement into the “inflectional field” (i.e. the area between C and v);
- b. implies restricted VP-ellipsis;
- c. implies few or no auxiliaries/TAM-markers;
- d. determines parameters relating to the instantiation of further FFs (e.g. future, modal and aspectual features: see Schifano 2015);
- e. functions in domains beyond the core clause (cf. i.a. Ritter & Wiltschko 2014 on CP-Tense, Pearson 2001 on vP-Tense, and Nordlinger & Sadler 2004 on nominal Tense);
- f. frequently associated with synthetic verbal TMA inflection.

- (13)
- a. no verb movement to the inflectional field;
 - b. more liberal VP-ellipsis;
 - c. a relatively rich auxiliary system (i.e. with modal and aspectual features either not grammaticalised or functioning independently of Tense);
 - d. Tense will tend to simply have the values Past and Non-Past.

3.3 *Case*

(14) **The Case “Denotation” Hypothesis:**

Thematic roles are identified through Case features (cf. Chomsky 1981 on Visibility).

(15) Strong Case:

- a. is associated with the presence of lexical, inherent and/or quirky Case
- b. a rich inventory of Case features (e.g. ablative, partitive, adessive, etc.)
- c. typically inflectionally “rich” case-marking

- d. Case is active in a range of domains: CP, e.g. case-stacking, case-markers used for discourse function (cf. Japanese *wa* as well as focus markers in many languages), and vP (marking relative prominence of arguments, interaction with aspectual interpretation of predicates and quantificational interpretations of nominals: various kinds of partitive case, genitive of negation, specificity marking, etc.);
- e. arguments may appear in a wider range of positions (“free” word order);
- f. relatively little A-movement;
- g. a limited range of “functional” adpositions.

(16) Weak Case:

- a. “licenses” arguments in given positions (Vergnaud 1977/2008);
- b. gives rise either to an undifferentiated feature which merely functions to make arguments active for Agree (in the sense of Chomsky 2001), or to a minimally distinct Nominative-Accusative opposition in the clause (and possibly Genitive in DP);
- c. arguments licensed only in designated positions (“rigid” word order), hence the range of argument positions is likely to be relatively restricted in weak-Case systems (as observed by Vergnaud and enshrined in GB Case theory in Chomsky 1981);
- d. likely to have a richer array of adpositions, including semantically empty “linker” elements (such as English *of*);
- e. effects of A-movement tend to be highly salient (especially raising).

3.4 Order

(17) The C-I effect of Order:

Basic word order identifies unmarked interpretation, thereby serving as a reference point for non-neutral discourse.

(18) Weak order implies that constituents are linearised in the default fashion, i.e. we take to be directly determined by asymmetric c-command relations and, as such, head-initial (Kayne 1994).

(19) Strong Order

- a. pleiotropically determines the presence of features whose effect is to cause complements to move leftward, giving rise to varying degrees of derived head-finality including fully harmonic head-final order (subject, among other things, to the Final-over-Final Constraint).
- b. is associated with the availability of a wider range of “marked”, non-basic orders than weak Order, giving us an understanding of the connection between scrambling and head-finality, as well as the semantic effects of scrambling.

(NB how (b) implies that strong Order and strong Case will tend to pattern together).

4. A case study: English vs French Tense

(20) V-movement into the inflectional field (Emonds 1978, Pollock 1989):

- a. John **often kisses** Mary.
- b. Jean **embrasse souvent** Marie.

(21) VP-Ellipsis:

- a. Cedric could have finished in October, and Alain could have too.
- b. *Cédric aurait pu avoir fini en octobre, et Alain aurait pu aussi avoir [fini en octobre].
Cedric would have been able to have finished in October and Alain would have been able also to have. (Authier 2012: 1)

(22) French lacks an equivalent of auxiliary *do* and modals are main verbs (with highly restricted restructuring properties; Kayne 1989).

(23) French has synthetic futures (*je mangerai*, etc.), conditionals (*je mangerais*, etc.) and imperfects (*je mangeais*, etc.), which English of course lacks.

- Property (12e) is not clearly instantiated in French (aside “fake past” in conditionals); French may instantiate just one variant of strong Tense – directly affecting the extended projection of V in the ways just enumerated, but in other systems strong Tense across a wider range of domains (Wiltschko 2014 and *passim*):

(24) a. Ngamari-**ngu** ngunytyi ngali-**ku** mangarni-marru- nga- **ku**
mother- NOM.FUT give we.DU-ACC.FUT bone- having-GEN-ACC.FUT
kathi-**ku**.

meat-ACC.FUT

‘Mother will give us the doctor’s meat.’ (Pitta-Pitta (Australian); Blake

197:60, via Sadler & Nordlinger 2001:1) [nominal tense with clausal scope]

b. pi- ya- dapana-pena- **naka** / pi- ya- dapana-**miki**- i- naka
2SG-POSS-house- NOM.FUT-PRES.VIS 2SG-POSS-house- NOM.PAST-NF
PRES.VIS

‘This is your future house (I can see it)’/ ‘This is what used to be your house (I can see it)’ (Tariana (Maipurean), Sadler & Nordlinger 2001:4)

[nominal tense with nominal scope]

c. i= tawi buangan **i-** ti Manus.

3SG.NFUT= place yams NFUT-on Manus.

‘He put yams on the island of Manus.’

(Titan (Oceanic), Bowern & Aygen-Tosun 2000:5)[tense-marked prepositions]

d. Namaky ny boky t- any an- tokotany ny mpianatra
 PAST.AT.read DET book PAST-there OBL-garden DET student
 ‘The student is reading the book in the garden.’

(Malagasy; Pearson 2005:369-70) [tense-marked lower adverbs]

- Property (12f) reduces to (12d) in the Romance context.

(25) Microvariation within strong-Tense systems, Italian:

a. Antoine confond **probablement** (*confond) le poème (Fr)
 “A. is probably confusing the poem”

b. Antonio (*confonde) **probabilmente** confonde la poesia (It)
 “A. is probably confusing the poem”

-- Italian has V-movement into the inflectional field, but to a lower position (Schifano 2015), but is substantially the same as regards ellipsis (cf Dagnac 2008).

(26) German:

a. lacks V-movement to the inflectional field (Vikner 2005), i.e. V2-independent movement (Holmberg & Platzack 1995, Zwart 1997, Biberauer 2003, Roberts 2010).

b. VP-ellipsis: German only has modal ellipsis of the kind found in Italian and French.

c. More auxiliaries than Romance (two types of *werden*); aspectual features are realised in the prefixing system and the adpositional system.

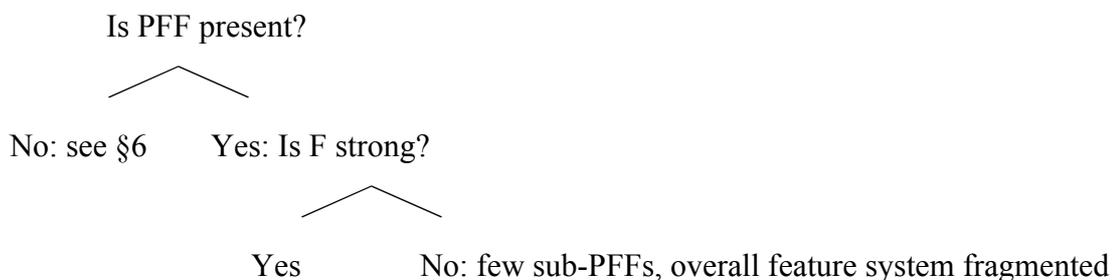
d. Tense has the values Past and Non-Past.

- The strong vs weak distinction is modulated by microparametric variation (see Baker 2008).

5. Evaluating complexity

5.1 Preliminary remarks

(27) A PFF hierarchy:



- ❖ The strong-weak option determines the nature of the microparametric variation epistatic to the PFF: if strong, the PFF determines a range of micro-features of the same general type (Tense, Person/φ, argument-marking, basic-order-disturbing

features), so this (in a different way from (5)) reflects the ALL option; if weak, microvariation is more scattered and fragmented; this is the true SOME option.

- ❖ Hence weak PFFs reflect greater complexity than strong ones in that strong PFFs entail the presence of a set of intrinsically linked subfeatures, causing the features to fall into classes in ways that they do not in the presence of weak PFFs.
- ❖ A higher degree of complexity is associated with the SOME options associated with weak PFFs, but SOME options can be associated with strong PFFs in the sense that not every strong PFF controls the maximum possible set of epistatic features.
- ❖ This can give us a basis for thinking about complexity in this connection.

BHRS propose ways to measure complexity of grammatical systems using parameter hierarchies of the kind introduced in Section 2. They say:

[W]e can equate complexity with probability. We reason as follows: all else being equal, there should be a roughly 50/50 chance of a given choice at each independent choice point, making lower positions in the hierarchy cumulatively less probable. ..We can quantify the probability associated with a given output of the hierarchy as 0.5^n , where n is the level of embedding in that hierarchy. (BHRS, p.120)

- ❖ Given our 4 features, we can aggregate the various probabilities and thereby define which systems are more or less complex.
- ❖ This leads to the prediction that “harmony” in PFF values, especially strength, is the least complex option.

(28) The characteristics of relatively simple systems:

- a. early first-language acquisition;
- b. diachronic stability;
- c. typological spread (including borrowing across macro-areas).

5.2 *Examples of shared PFF settings*

Table One gives approximations to PFF setting for relatively familiar languages across the 16 logical possibilities (NB only the SWWW and the SWSW combinations are not readily attested; unclear whether these are accidental gaps in the data or out for principled reasons – on SWSW see 4.5 below).

	Person	Tense	Case	Order
Latin, other conservative IE	S	S	S	S
Romance (not French)	S	S	S	W
Celtic/NW Semitic	S	S	W	W
??	S	W	W	W
English/MSc	W	W	W	W
Cantonese	W	W	W	S
Japanese/Korean	W	W	S	S
Russian?	W	S	S	S
*?	S	S	W	S
*?	S	W	W	S
Icelandic	W	S	S	W
French	W	S	W	W
Innovative Faroese	W	W	S	W
*?	W	S	W	S
??	S	W	S	W
Turkish/ic	S	W	S	S

TABLE ONE: suggested possibilities of variation in the four PFFs.

Given the above considerations, the “SSSS” type is predicted to be the least complex since it represents across-the-board ALL-options. Although this type allows for more features than WWWW since it is “maximally pleiotropic”, the features are all intrinsically linked.

5.3 The “Indo-European” type (SSSS)

- i. non-rigid head-final order (strong Order),
 - ii. second-position effects,
 - iii. a very active left periphery,
 - iv. sub-extraction from DP,
 - v. null subjects and objects, (strong Tense)
 - vi. synthetic verbal morphology and case inflections (strong Case)
- (on Latin, see Ledgeway 2012; on Greek Taylor 1990; on Sanskrit Hale 1995, Kiparsky 1995; on Old Church Slavonic Pancheva 2008; on Celtic Watkins 1963, 1964, Russell 1995:300-304, Newton 2006, Eska, to appear; on Germanic Walkden 2014:106-112, Ringe 2006:295; on Old Iranian Skjærvø 2009:94f. and on Anatolian Garrett 1990).

- ➔ If these are inherited features (which seems likely as they are found across all the observable old branches), they were diachronically stable for millenia – from the time of the parent language 6kyBP to roughly 2kyBP, since when there has been instability to varying degrees in different branches.
- ➔ NB properties (ii-iv) above suggest a further PFF relating to the degree of activity in the left periphery (second-position attractors and varieties of overt A'-movement).
- ➔ Many of these properties have been lost in the more recent history of the respective branches:

- (29) a. **Romance**: Order S > W, clearly entailing OV > VO, and possibly interacting with the loss of case on non-pronouns, the development of articles and the loss of scrambling (NB we treat Romance S-Case owing to the presence of case morphology in the clitic system, and cf Romanian). **French** has more recently lost S-Person, with the loss of null subjects, etc.
- b. **Greek**: same as Romance, but the S-Case is more evident (as it is in Romanian).
- c. **West Germanic**: has moved to disharmonic order, head-final in TP but head-initial elsewhere (aside from the recent history of English, which has become harmonically weak)
- d. **Celtic** has innovated VS order but is otherwise somewhat similar to Romance (we treat it as having W Case as there is no case morphology at all and word order is rigid).
- e. **Indic**, presumably as a consequence of its being in the Indosphere (Matisoff 1990), has developed rigid OV order.

(The Iranian languages are more complicated, see Harris & Campbell 1995:139-141; Slavic is unclear but appears to have also at least lost strong Order; we leave aside Albanian, Tocharian and Armenian owing to lack of data).

Generally, head-final systems showing full-blown OV syndrome are highly stable, as the historical evidence from Japanese (Yanagida 2005, Yanagida & Whitman 2009), Korean (Lee & Ramsey 2011:55), Turkic (Kornfilt 2009) and Old Tamil (Lehmann 1998:87) shows.

So what happened in Indo-European? Two phenomena:

- Grammaticalisation of clause-initial complementisers;
- (possibly related, see Kiparsky 1995): development of second-position phenomena;
- The rigidly head-final systems just mentioned don't show either of these.

Lexical-item- and feature-based complexity: in parametric terms, a system with lexical exceptions is as simple as one that lacks this complication and simpler than one which requires a featurally specific rule. Introduction of initial Cs initially just an exception, but a tipping point (Yang 2013) must have occurred (again at different times in different branches), causing a retreat from strong Order – move from ALL to SOME in the above terms, and the concomitant introduction of disharmonic word order. Ledgeway (2012) documents this happening in Classical Latin.

On typological spread:

- the “rigid OV” type is widespread across Asia (“Macro-Altaic”), while the IE type is not;
- There is no “rigid SVO” type (this was actually implicit in Greenberg 1963);
- Is there a VSO type? (See below and Longobardi & Roberts 2011)

5.4 *WWW: the English/North Germanic “type”*

- Also many creoles, probably basolectal Brazilian Portuguese, Austronesian (?), head-initial Chinese varieties (e.g. Southern Min, etc.).
- But NB these are different kinds of SOME system, hence not as favoured as the SSSS type.

- It is clear that, as we move downwards along the hierarchically defined routes, parameters become more “micro”, behaving in a non-uniform, differentiated fashion which is inherently more complex and governed by more features than the systems defined higher in the tree.
- Two things which unify all the WWW systems though: since strong PFFs must have robust morphosyntactic exponence in order to be acquired, we can understand the cross-linguistic tendency for morphologically rich (especially agglutinating) languages to be head-final, while analytic languages tend to be head-initial. This follows from “harmonic” setting of the four PFFs to strong and weak, respectively.

5.5 *The 50-50 types*

Of the possibilities with two Ss and two Ws in Table One, we find the Celtic/Semitic one (SSWW), the Japanese/Korean one (WWSS) but not the other two. SWWS may just be a gap.

On SWSW, it is possible that W Case and S Order can’t combine. S Case and S Order both facilitate “free” word order, while W Case implies “rigid” word order. NB S Case and W Order can combine: we observe case morphology, quirky/lexical/inherent case and rather limited word-order options (but freer than in the W Case, W Order languages), as in Icelandic. W Case + S Order is difficult/impossible to acquire from reasonable PLD, but S Case + W Order isn’t, given the inflectional trigger for S Case (although we expect it to be rarer than either S Case + S Order or W Case + W Order, which is certainly true).

By the same token, WWSS may be relatively easy to acquire and therefore common, as Case and Order have a relatively clear preference to be “harmonic”.

Person and Tense are both highly sensitive to inflection: “rich inflection” systems strongly tend to manifest both. Hence attestation of SSWW. But WWSS may be preferred owing to the “cost” of inflection. The Japanese/Korean type is certainly more widespread than the Celtic/Semitic type, and so here we may be seeing the cross-cutting effect of morphological complexity.

6. *Further options?*

Alongside Strong-PFF and Weak-PFF, do we have No-PFF?

In some cases this might be a “no-choice” option (in the sense of Biberauer, Roberts & Sheehan 2014), e.g. No Order (structure must be linearised). But NoPerson and NoTense are possibilities for East Asian systems. In such systems, individuals and times must be denoted in a radically different (and/or the utterance must be anchored in a radically different way; see Wiltschko 2014). Obviously bringing this option in significantly changes aspects of Table One. Saito (2007) could be interpreted as saying Japanese has No Case.

7. **Conclusion**

The PFF concept complements the emergent-parameter view and clarifies (simplifies?) our understanding of “deep” parameters in at least the following connections:

- Typological distributions
- Diachronic (in)stability
- Acquisition
- Areal spread

- Complexity

Most importantly, all of the above are related, on this view.

Moreover, the parallel with genetics is further developed.

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