Language Universals, Symmetry Breaking and Third Factor Principles*

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Workshop on Variation and Universals in Language
Crecchio, June 9-11, 2017

1. Position

Linguistic typology provides a wider domain to test the predictions of the hypotheses advanced in formal grammar. We focus on language universals and variation in the linearization and the pronunciation/silence of functional heads. We provide evidence from different Indo-European languages that Merge and third factor principles (Chomsky 2005) can be seen as language universals, as they cut across language typological classification. We also provide evidence from different Indo-European languages that further supports a theory of variation as minimal changes in feature valuation.

2. Approaches to language universals

2.1 Empiricist approach,

Greenberg's absolute and implicational universals, e.g. for P:

Languages with dominant VSO order are always prepositional. (e.g. Celtic, Semitic, Afroasiatic)
With overwhelmingly greater than chance frequency, languages with normal SOV order are postpositional. (e.g. Latin and Japanese)

2.2 Generative grammar approach and discoveries in biology

Principles and Parameter Model

Universal Principles (UG) + Hierarchy of parameters (Rizzi 1981; Baker 2001)
Discoveries in genetics: Organizing principles, deep homologies, hox genes (parameters predicting the variety of mammalian eyes (Darwin; Gehring and Ikeo 1990); discoveries in Evo-Devo: slight changes in regulatory mechanisms can yield great superficial differences (Jacob)

The Minimalist Program

Merge + experience +third factor principles, akin to natural laws
Parameters derived from language independent properties (Kayne 2011, Biberauer, Holmberg & Roberts 2014)
Discoveries in cellular and molecular biology: asymmetry and symmetry breaking is essential for cell movement, polarity, and developmental patterning. Amplification of initial asymmetry is key to the conserved mechanisms involved. (Montell 2008; Li and Bowerman 2017); discoveries in Evo-Devo: symmetry-breaking in the development of biological organisms (Palmer 2004, 2009)

3. Focus

There is micro-variation in the position of a functional Head with respect to its complement in earlier stages of language development. This variation tends to be eliminated in latter stages, for example (1)-(2). This variation cuts across typological classification, e.g, for the linearization of P structures:

- Latin - Old Italian – Modern Italian
  (1) cum me, me cum, co me, co me co, con esso me co, con me
  The variation is not longer observed in Modern Italian
- Old Germanic - Old English - Modern English
  (2) to him, him to, to him
  The variation is no longer productive in Modern English. However, some traces remain in complex functional elements, such as *herewith, hereby, hereafter, therewith, thereafter.*

Free Merge alone does not account for the fact that alternative derivations/linearizations possible at an earlier stage of language development are no longer attested at a latter stage.

How can these facts be explained?

4. Hypothesis: symmetry breaking as third factor principle

Third factor principles are architectural and developmental constraints that enter into all facets of growth and evolution of language (Chomsky 2008)

-No Tampering condition: If X is merged to Y, maximally efficient computation will leave X and Y unchanged. (Chomsky 1955)

-Derivation by phase: If [Edge [H Compl]] is a phase, only the Edge and the Head of the phase will be accessible from outside. (Chomsky 2001, 2008)

*This work was supported in part by funding from the Social Sciences and Humanities Research Council of Canada to the Major Collaborative Research on Interface Asymmetries, grant number 214-2003-1003, and by funding from the FQRSC on Dynamic Interfaces, grant number 137253. www.interfaceasymmetry.uqam.ca; www.biolinguistics.uqam.ca

- Spell-out condition:
  a. Edge(X) must be phonetically overt.
  b. The condition in (a) applies in a minimal way so that either the head or the specifier, but not both, are spelled-out overtly. (Collins 2007)
- Minimal search: The domain of Merge defaults to the smallest search domain possible and only when that domain is exhausted or otherwise inapplicable is Merge across a wider domain allowed. (Epstein 2014)

Third factor principles are i) architectural and ii) developmental:

i) Elimination of choice points in the derivations (Moro 2000; Kayne 1994; Di Sciullo 2005)
ii) Elimination of choice points in language development
Directional Asymmetry Principle (DAP) (Di Sciullo 2011)
Language development is symmetry breaking.
fluctuating asymmetry > directional asymmetry

We assume that feature valuation is part of the computational procedure of the language faculty and can be done via External or internal Merge. There can be a choice point in feature valuation in language development and symmetry breaking tends to reduce choice points by gradually eliminating one of the other option.

At the feature structure level, the choice one of the two values of functional feature will be erased. We hypothesize that this is an instance of the Universal symmetry-breaking principle of efficient computation.

(3)
[F]
/ \
[uF] [F]

In the derivations, the choice of one or the other value of functional feature will yield different derivations.

(4) a. [DP P[~~uD~~] [~~DP~~ [<F[~~uD~~]> [~~DP~~]]]] postpositional
b. [P[D] [DP [<F[~~uD~~]> [~~DP~~]]]] prepositional

At the sensorimotor interface the choice of one or option will give rise to different linearizations, as in (1)-(2) above.

4. Predictions of the DAP

A: Stable state / Directional asymmetry should be synchronically widespread.
B: Oscillation / Fluctuating asymmetry should characterize older diachronic stages.

4. 1 Linearization

The predictions A and B for our hypothesis for the development of micro prepositional structures are validated on a number of Indo-European languages, as documented on the basis of data reported in Hewson & Bubenik (2006).

The diachronic development of typologically different languages displays a phase of fluctuation where a complement may precede or follow its P head; this is true even for languages that display a clear preponderance of prepositions or postpositions. There is a clear diachronic tendency towards the gradual elimination of a fluctuating state and the development of a stable state, (Di Sciullo and Nicolis 2012).

Old Hittite > Middle Hittite > Late Hittite
Old Armenian > Late Armenian
Homeric Greek > Classical Greek > Modern Greek
Latin > Umbrian > Old Italian > Modern Italian
Old English > Early Modern English > Modern English

Prediction A:

Study	*# lgs*	*Pr*	*Po*	*Pr / Po*
Greenberg (1963)	30	16	14	0
Greenberg (1963) appendix II	142	63	79	0
Hawkins (1983)	336	148	188	0
WALS (queried 2011)	1185	512	577	58
SSWL (queried 2011)[4]	97	70	31	13

Order of Adposition and Noun Phrase (WALS)	
Postpositions	577 languages
Prepositions	512 languages
Inpositions[5]	8 languages
No dominant order	58 languages
No adpositions	30 languages
	1185 languages

Prediction B:

Language/time	Dominant	Fluctuat. asym.	Direct. asym. in later stages/derived lgs
Old Hittite 17th-16th c. BC	Po	**Yes** (12), (13)	**Yes**: New Hittite (14th-13th c. BC): *andan* (4) PostP only
Tocharian A (3.2) Tocharian B (3.2) 5th-8th c. AD	Po	**Yes**	**?**: No languages derived from Tocharian
Old Armenian (3.3) 5th – 9th -c. AD	Po	**Yes** (ex.5)	**Yes**: Modern. Armenian (Po, few relics of prepositions)
Homeric Greek 1000-800 BC	Pr	**Yes**	**Yes**: Modern Greek (fully Pr);
Albanian	Pr	**No** (Pr only)	**Yes:** Modern Albanian (Pr)
Old Persian from 2nd millen. BC	Po: Cuneiform Persian Pr: Gathic Pr: Younger Avestan	**Yes** **Yes** **Yes**	**Yes**: Persian (PreP); **No** : Pashto (still mixed, both PreP and PostP attested)
Indo-Aryan Vedic Sanskrit 1200BC	Po	**Yes**	**Yes**: Hindi (fully PostP)
Old Slavic	Pr	**Yes**	**Yes:** Czech, Serbian, Bulgarian **No:** Russian
Old Germanic	Pr	**Yes?**	**Yes:** Germanic (Pr only)
Latin	Pr(very strongly)	**Yes?**	**Yes**: Romance (Pr only)
Celtic	Pr	**No**	**Yes**

-Most languages go through a stage of fluctuation.
-Most predominantly prepositional languages remained prepositional after the fluctuation (Greek, Latin).
-Some language, predominantly postpositional, became prepositional after fluctuation (Persian)
The following questions arise:

A) Why is it the case that the fluctuation is still ongoing in some languages (Russian, Chinese, Pashto)?
Fluctuating asymmetry is not banned from the grammar. All things being equal, a switch from fluctuating to directional asymmetry is complexity reducing and thus likely to happen.

B) Why are there languages with postpositions at all?
Some predominantly postpositional languages remained postpositional after fluctuation (Hittite, Hindi). Why is this the case?
Greenberg's Universal no 4: languages with normal SOV order are postpositional. (e.g. Hindi, Turkish, Finnish, Estonian, Korean, Hungarian), and VSO languages are always prepositional (Welsh, Classical Arabic, Tagalog).

C) What counts as complexity in language development?
In SOV languages, Object Shift in PP (Scandinavian) is required independently.

D) What other principles than symmetry breaking fall into language universals?
Laws of preservation and harmony are also likely to be part of language universals.

E) Symmetry breaking and laws of asymmetry preservation may lead to a further understanding of language universals and language variation.

Developmental Universals, such as the DAP, are structure dependent, not category dependent. Their effect cut across typological classifications of languages in the subdomains of functional projections including:

[DET [DEM [NUM [ADJ [N (adapted from Cinque 2005)
Definite Determiner from Latin to Modern Romanian (Di Sciullo and Somesfalean 2013)
Demonstratives in Old Greek to Modern Greek and Grico (Di Sciullo 2011)

Typological evidence has implications for formal grammar as it brings support to Merge and third factor principles as language Universals and language variation as a minimal difference in feature valuing.

4.2 Pronunciation/silence of a functional head

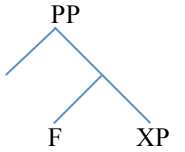
Additional evidence for the DAP comes from the pronunciation/silence of functional heads in micro-structures. Here again, linguistic typology brings support to (developmental) universals such as symmetry breaking.

4.2.1 There is variation in the pronunciation/silence of P in certain micro-structures in earlier stages of language development. This variation tends to be eliminated in latter stages. (Di Sciullo 2017a).

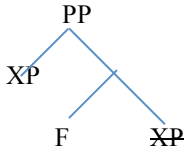
Pronunciation/silence of AT/TO in locative determiners *here* and *there*.

- Latin –Old Italian –Modern Italian
  (5) ad locum > (a) lochhe > li ad illic
  (6) ad ille >(a)elle > li
  The variation is not longer observed in Modern Italian ; it is observed in Fallese for example, a dialect spoken in the Abruzzi.
- Germanic > Old English > Early Modern English > Modern English

(7) a.



b.



(8) a. [P [$AT_{[P],\ [\text{~~uD~~}],\ \{LOC\}}$ here $_{\{\{D\},\ [LOC]\}}$]

b. [P here $_{\{[D],\ [LOC]}$ [P <AT> $_{\{[P],\ [\text{~~uD~~}],\ [LOC]\}}$ ~~here~~ $_{\{[D],\ [LOC]\}}$]]

4.2.2 There is variation in the pronunciation/silence of the conjunction in additive complex numerals. This variation also tends to be eliminated in latter stages of the languages (Di Sciullo & Español-Echevarría, in press) 2017b)

- Latin –Old Italian –Modern Italian

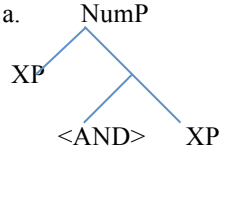
(7) viginti (et) unus,

(8) ventuno

The variation is not longer observed in Modern Italian

- Germanic > Old English > Early Modern English > Modern English

(9) a.



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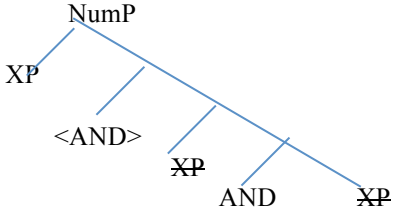

(10) a. [viginti$_{[NUM]}$ [<AND>$_{\{[\sout{uNUM}], [\sout{uNUM}], [ADD]\}}$ unus$_{[NUM]}$]]

b. [unus$_{[NUM]}$ <AND > [$\sout{unus}$ AND$_{\{[\sout{uNUM}], [\sout{uNUM}], [ADD]\}}$ viginti$_{[NUM]}$]]

-Linguistic typology brings cross-linguistic evidence in favour of a unified analysis of the apparent optionality of the linearization and the pronunciation/silence of the Functional Head in different micro-structures.
-A single operation derives the variation in the displacement as well as in the pronunciation/silence of constituents.
-Variation is a consequence of a choice point in feature valuation, given language universal third factor principles reducing complexity.

5. Summary

Linguistic typology provides broader evidence for the properties of Merge and third factor principles in language universals and variation, which is reduced to minimal choices in feature valuing. We distinguished architectural from developmental third factor principles. We proposed that symmetry breaking is a third factor language universal with biological correlates. We tested empirical predictions of our hypothesis on the basis of micro-variations observed in languages from typologically different families. As predicted, fluctuating asymmetry in linearization and pronunciation, available in earlier stages of language development, is gradually reduced. At the feature geometry level, symmetry breaking leads to reducing the choice between a valued and an unvalued variant of a functional feature associated with a functional head. At the SM interface level, the fluctuation in the position of a complement with respect to its head or in the pronunciation/silence of a head tends to be gradually eliminated. These results indicate that linguistic typology has implications for formal grammar, namely for the theory of language universals and variation.

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