The Locus of Logodiversity
(based in part on joint work with Evelina Leivada)

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Overview

- Is language variation parametric?
  - If YES, what makes it so? (Parameters?)

- How can a model that seeks to characterize knowledge tell us anything about (tacit) history?
The Current State: Loci of Variation

- A central issue in current linguistic theory concerns the locus and the nature of language variation

- This variation has been often called ‘parametric’ and has been attributed to the different possible values of unfixed principles that Universal Grammar (UG) makes available (Chomsky 1981)
The Current State: Loci of Variation

- Three conjectures:
  (i) The Chomsky-Baker conjecture
  parameters that are syntactic in that they pertain to narrow syntax variation (NS parameters),
  (ii) The Chomsky-Borer conjecture
  parameters that are part of the mental lexicon by being localized on functional heads (lexical parameters),
  (iii) The Chomsky-Berwick conjecture
  parameters that are confined to externalization strategies
A Fourth Conjecture: No Semantic Parameter

- Ramchand & Svenonius (2006): semantic variation, but not semantic parameters

- Variation in the form of contextual variables: Not specified in the syntax, but provided with values at the syntax-semantics syntax-semantics mapping at the interface with the Conceptual-Intentional component

- Lexical semantics vary and form-sound associations differ across languages but such differences are arbitrary and not reducing to any obvious discrete parametric system
Parameters Today: Realizational Variants

- The observation that macroparameters ‘leak’ has lead to a number of proposals that question the feasibility of the classical notion of (macro)parameters in the GB sense, suggesting that this concept should be abandoned (e.g., Pica 2001, Baltin 2004, Newmeyer 2004, 2005, Evers & van Kampen 2008, Haspelmath 2008, Boeckx 2010, 2011, 2012)

- From the three possible answers to the question about the locus of variation, the one recurrently explored in the present state of development of the biolinguistic enterprise is the third one (PF ‘parameters’)

- A number of recent proposals are formulated along these lines also from an empirical point of view (e.g., Acedo 2010, Real 2011, Richards 2010, Jenks 2012, Safir 2013)

- These proposals converge in re-analyzing points of variation in morpho-phonological terms
Parameters Today: Realizational Variants [cont’d]

- Acedo (2010): differing morphological realization of Path in relation to the Talmyan distinction between satellite- and verb-framed languages
- Real (2011): a re-analysis of the satellite-/verb-framed pattern in terms of the morphological properties of the prepositional domain instead of assuming a syntactic parameter related to manner incorporation
- Richards (2010): “This is a book about conditions imposed on the narrow syntax by its interface with phonology. The idea that some of the properties of syntax follow from its interface with phonology is not a new one.”
- Safir (2012): “There is only one true anaphor in natural language which takes many shapes.”
- Jenks (2013): “By approaching analytic languages in terms of spanning, a complex web of realizational spanning rules might be found lurking beneath their spartan morphology.”
Parameters Today:
Realizational Variants [cont’d]

. The upshot of this work is that phonology has a much larger impact on the final form of a linguistic utterance that is generally thought
Conclusion so far

Strong Uniformity Thesis

Principles of narrow syntax are not subject to parametrization; nor are they affected by lexical variation (Boeckx 2011)

Principles are divorced from points of variation (i.e., we no longer have parameters in the traditional sense)
Towards a Theory of Language Acquisition

- The need of having a learning algorithm for acquisition in the absence of innately pre-wired parameters and parametric hierarchies
Language Acquisition in the GB Era

- The classical notion of parameter came alongside specific parametric paths; for instance, along the lines of the ones presented in Baker (2003).

- UG encapsulated an ordered representation of parameters, making available certain hierarchies that start off with a non-dependent parameter (e.g., the Polysynthesis Parameter; Baker 1996).

- Obviously, these top parameters have to be set first since their setting has an impact on the setability (i.e. whether the parameter is relevant/realizable or not) of the dependent parameters that follow.

- As Baker (2005) remarks, “an efficient learner should learn in a structured way in which some parameters are entertained first and others later” (p. 95, emphasis added).
Language Acquisition in the GB Era [cont’d]

• If one assumes that innateness exists in the form of a P&P-shaped UG, this assumption can be used in a way that reduces the acquisition cost by making certain parametric paths available.

• The child then has to make use of the primary linguistic data to navigate through a constrained domain of possible grammars and fix the relevant values.
Parametric Hierarchies

- What kind of hierarchies do interlocked parameters give rise to?

(8)

Figure 2: An example of parametric hierarchies (Baker 2003)
Parametric Hierarchies [cont’d]

Figure 3: Parametric hierarchies in the nominal domain (Longobardi 2012, from Rigon 2009)
Towards a Theory of Language Acquisition [cont’d]

A learning algorithm should in the absence of UG-provided acquisition cues:

a) account for the productivity of the hypothesized rules

b) integrate a parsing component that distinguishes between ambiguous data and unambiguous cues (Janet Fodor’s work)

c) tolerate exceptions also by taking into account computing time of rule-application vs. ‘exceptions list’-parsing (e.g., Legate & Yang 2011)

d) determine which biases aid the learning process in its initial stages without assuming that the learner is already able to understand heads from non-heads or other syntactic notions
Towards a Theory of Language Acquisition [cont’d]

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>(A) Reasoning under uncertainty (based on Bayesian models of learning; e.g. Gelman et al. 2003, Kemp et al. 2007)</td>
<td>Integrate conflicting tendencies in the process of learning through simultaneous entertaining of both overhypotheses as well as constraints on hypotheses.</td>
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<td>(B) Superset Bias (Boeckx 2011)</td>
<td>Strive for value consistency.</td>
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<td>(C) Variance (Bias/Variance Trade-off) (Briscoe &amp; Feldman 2011)</td>
<td>Keep the superset a bias, not a principle, in order to avoid backtracking.</td>
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<td>(D) Statistical Ability (e.g., Yang 2002, 2010)</td>
<td>Analyze datum s through a hypothesis G, with the probability p. Depending on being successful, punish or reward G, by decreasing and increasing pi.</td>
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<td>(E) Tolerance Principle (Yang 2005, Legate &amp; Yang 2011)</td>
<td>Based on (D), turn Gi into a rule. Assume a Rule R is productive if T(ime) (N,m) &lt; T(N,N).</td>
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<td>(F) Elsewhere Condition (Anderson 1969)</td>
<td>Following (E), once multiple candidates are available, apply the most specific rule.</td>
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<td>(G) PF-Cues Sensitivity (cf. Fasanella &amp; Fortuny’s 2011 Accessibility Condition)</td>
<td>Fix points of variation on the basis of explicit, saliently accessible morphophonological cues. Use of prosodic cues to define constituents.</td>
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<td>(H) Perception and Memory Constraints (Endress et al. 2009, Gervain &amp; Mehler 2010)</td>
<td>Keep track of sequence edges which are particularly salient positions in facilitating learning/giving rise to either word-initial or word-final processes much more often than otherwise.</td>
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Table 1: Components of a learning algorithm
A Learning Algorithm

**TASK**

Start

- (T1) Make use of prosodic cues to define constituents and identify positions of syntactic representation

- (T2) Fix points of variation on the basis of explicit, saliently accessible morphophonological cues

- (T3) Check the productivity of (T2) hypothesized rules by calculating computing time. Upon applying the Tolerance Principle, either make Rule R productive and list exceptions or list all relevant data as exceptions

- (T4) Decide between different productive rules

**CUE**

- (C1) Keep track of sequence edges

- (C2) Integrate conflicting tendencies (i.e., Superset/Subset Biases) in the process of learning through simultaneous entertaining of both overhypotheses as well as constraints on hypotheses

- (C3) Based on (C2), hypothesize rules. Analyze datum s through a hypothesis Gi with the probability pi. Depending on being successful, punish or reward Gi by decreasing and increasing pi (Yang 2002)

- (C4) Apply the Tolerance Principle (Yang 2005, Ledge & Yang 2011): Assume a Rule R is productive if T(time) (N,m) < T(N,N)

- (C5) Apply the Elsewhere Condition (Anderson 1969)
The Pool of Data (Longobardi & Guaridano 2009)

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Parametric Dependencies:

- L&G articulate in detail and across a variety of languages the status of all the input nodes as well as the parametric dependencies that define the neutralization/setability of their dependent parameters makes their pool of data a unique candidate for program analysis.

- However, any observations about the nature of parametric dependencies that are drawn from this pool of data should not be read only in relation to these specific parameters.

- These observations are highly likely to have parallels in data from other functional domains, because dependencies and states aside, the developed program does not see the parameters under examination; it simply traces issues related to their existence.
Parametric Dependencies: Program Input

- Program input: *States of input nodes* $\rightarrow$ all +/- values were assumed as presented in L&G

- Program input: *Dependencies* $\rightarrow$ were also received as presented, after being checked for consistency with the states on which they operate, which is what is led to the exclusion of what in L&G appears as parameter 62

- The overall number of the dependent and the independent parameters are 46 and 16 respectively

- Some of the dependent parameters involved optionality, that is, they could be set in multiple ways: these were converted into program input
Parametric Dependencies

- The program was developed in order to

(i) shed light on how deterministic models that assume such dependencies are and

(ii) see whether languages proceed in uniform ways in terms of the number and the complexity of the setability paths they involve

(iii) understand what kind of relations of setting and setability are obtained once all dependencies are analyzed until involving only independent parameters (overall setability vs. immediate setability)
Parametric Dependencies

The Program

- A tool implemented in Java

- It parses a file that contains the setability paths for each parameter/language pairing in a specific format

- It is a semi-automatic program because it takes as a prerequisite the construction of the paths by the user

- The output is produced as follows: Every path is converted to a logical expression which is formed by the conjunction of Boolean literals. Upon receiving the logical expressions, the program tests their realization in every parameter/language pairing, returning a True/False output for setability and non-setability respectively, coded in the tables that follow as 1 and 0 respectively
Parametric Dependencies
Setting Relations

- In (1) the differences are quite robust and the acquisition paths are dissimilar in terms of the nodes that await setting.

- The differences are rather robust: there is a 3:1 ratio — which turns into 5:1 if one focuses only on the dependent parameters of the schema — between the parameters that await setting in Spanish vs. Warlpiri.

(1)
Parametric Dependencies
Setting Relations [cont’d]

• But perhaps one could say here that this non-trivial difference is the result of (1) covering a quite large amount of parametric space while not being articulated enough

• So the relevant calculations were done for the parametric space identified by L&G, where a good amount of parameters is presented across a variety of languages
• Latin: 20 settable (dependent) nodes
• Grico: 42 settable (dependent) nodes
• Salentino vs. Finnish: A difference of 14 nodes; more than half of the settable space that Finnish realizes
Parametric Dependencies
Setting Relations [cont’d]

• Putting these differences in perspective, in models that introduce statistical notions into their approach to acquisition (e.g., Yang 2002, 2010), the value-fixing process involves a learning algorithm, according to which the child upon receiving datum s selects a $G_i$ with the probability $p_i$ and depending on being successful in analyzing $s$ with $G_i$, punishes or rewards $G_i$ by decreasing and increasing $p_i$ respectively (2002: 26–27, 2010: 1162)

• The algorithm kept constant, what can account for the fact that the acquisition task varies considerably from one language to another and yet children acquire their respective languages in around the same time?
Parametric Dependencies
Setability Relations and Implications for UG

(3)

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Setability paths for parameter 57 (± Feature Spread on Possessives)

- Alternative setability paths for a given parameter *within* languages
- Implications for UG (a cognitive map that organizes the variation space that the child has to navigate through in certain ways)
- 5 intertwined problems: setability, (species-)uniformity, fixity, overproduction, and optimality
Parametric Dependencies
Setability Relations and Implications for UG

- The ‘setability’ problem: Qualitative and quantitative crosslinguistic dissimilarity in terms of the setability paths that each language has available.

  - Qualitative dissimilarity $\rightarrow$ varying complexity: language A might achieve setability of a parameter on the basis of a path that consists of a single node, whereas language B might achieve setability of the exact same parameter on the basis of another path that has nine nodes (this is a scenario that actually occurs for parameter 49: Arabic sets it on a single node, whereas Salentino sets it on the basis of a path that involves nine nodes).

  - Quantitative dissimilarity $\rightarrow$ optionality: language A might be able to achieve setability of a parameter on the basis of one path, whereas language B might have four paths (again, this is a scenario that actually occurs for parameter 56: French has four ways to reach setability but Basque has one).
The ‘setability’ problem [cont’d]

- The problem of crosslinguistic dissimilarity also arose when discussing setting of parameters in (1) and (2)

- The crucial difference between these two cases is that in (2), the problem of dissimilarity in terms of the number of parameters await setting in each language could be remedied if one argues that the fact that the child acquiring Grico has to set more nodes than the child acquiring Finnish is the result of these two children entering different zones on the cognitive map

- The problem is not remedied in the case of setability because varying numbers of setability paths correspond to varying numbers of entrance points on the map
Parametric Dependencies
Setability Relations and Implications for UG

- The ‘uniformity’ problem: if the 1st factor is species-uniform, why do the cognitive maps of acquirers of different languages show up encoding varying numbers of setability paths in (3)?

- If UG is species-uniform (Chomsky 2005), the uniformity of a UG architecture that has interlocked parameters is retained in the case of parameters that await setting — because the cognitive map will make available the same amount of zones across speakers of different languages —, but it is lost in the case of alternative/multiple paths of setability, because a key component of the map is shown to vary quantitatively: the number of the entrances to each zone
Parametric Dependencies
Setability Relations and Implications for UG

❖ The ‘fixity’ problem

- An advocate of interlocked parameters may try to save uniformity at this point by suggesting that all children do underlyingly have the same number of setability ways and it is just that some of the ways are blocked at the beginning of the learning process, depending on the zone that each child selects

- This claim is ill-founded in an empirical sense because it fails to notice that the (un)availability of a setability path materializes not at the beginning but in the course of navigating the parametric space and after setting the input parameters to a target value

- In other words, in (3), the unavailability of the second setability path for reaching [57set] in Basque crystallizes not when [33set] is achieved but when 33 is not set to +
Parametric Dependencies
Setability Relations and Implications for UG

- The ‘fixity’ problem [cont’d]

- This empirical problem boils down to the very essence of UG as — what Chomsky calls — “an innate *fixed* nucleus”|| (Piattelli-Palmarini 1980, emphasis added)

- In their 1974 debate in Royaumont, Jean Piaget and Noam Chomsky argued over the specificity of this innate nucleus (i.e. UG), but both accepted its fixity

- If one endorses their view, one cannot argue that the existence of varying numbers of setability paths (across different languages) is due to the fact that certain entrances are rendered (un)available as the child navigates through the parametric space

- The *fixed* architecture of the system cannot be both fixed and moving at the same time, and yet it is moving if parts of it are continuously adjusted in the course of navigation
Parametric Dependencies
Setability Relations and Implications for UG

- The ‘overproduction’ problem: the tabularization of the program output showed an large number of unrealized/unrealizable setability paths

- Languages typically go for the simpler setability paths that a dependency predicts may be taken and the more complex paths remain unrealized

- Some paths are unrealizable due to conflicting requirements in the dependency
The ‘overproduction’ problem [cont’d]

Setability paths for parameter 61 (± Null N-licensing article)
Parametric Dependencies
Setability Relations and Implications for UG

👀 The ‘optimality’ problem

- Having observed
  
  (i) a significant portion of theoretically predicted but empirically not realized setability paths, and
  
  (ii) setability paths that are predicted as possible but are practically impossible to realize due to mutually exclusive requirements in the dependency,

from all the implications that interlocked parameters carry for UG, the implications that the ‘overproduction’ problem puts forth in relation to optimality are probably the most worrying ones
The ‘optimality’ problem [cont’d]

• One cannot reasonably suggest that the “innate fixed nucleus”\| of “an optimal solution to legibility conditions”\| (Chomsky 2000) Strong Minimalist Thesis makes available all these alternative setability paths

• If the setability paths multiply as new languages are taken into account and if there are 6.909 languages on the planet (Lewis 2009), UG would end up encoding an inordinate number of setability paths for a single parameter within a single language

• Observing that in a sample of 62 parameters and only 28 languages, a language can show up as having five different ways to reach setability of a parameter, one can imagine first, to what an extent this number can raise if the dependency incorporates correlations found in a larger variety of languages and second, the astronomical number of all the possibilities that UG has to encapsulate, if one allocates parametric variation to it
Conclusions

- Parametric dependencies run into empirical problems pertaining to intertwined considerations of setability, (species-)uniformity, fixity, overproduction, and optimality

- If the alternative solution of postulating non-interlocked, unrelated parameters is also giving rise to optimality-related concerns (i.e. exuberant nativism), the picture that emerges is that of a parameter-free version of UG