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WHAT ARE YOUR VALUES? DEFAULT AND ASYMMETRY IN PARAMETER STATES*

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Abstract We propose a minimalist approach to parameter theory that gives up the idea that parameters are a predefined list at the initial state of the mind; this leaves one with the hypothesis that parameters are structures progressively added to the mind, under restricted conditions (schemata), to accommodate the Primary Linguistic Data. As a consequence, an inherent asymmetry is predicted between the two values of a parameter: absence *vs* presence of an added structure. Using a realistic dataset of 94 parameters, we test this prediction: we demonstrate that virtually all parameters display such asymmetry, in two distinct formats. Then, we sketch a preliminary theory of parameter change, and show that the asymmetry between the two values is confirmed by evidence from parameter resetting in diachrony.

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This work is the result of collaboration among the four authors; for official purposes, Longobardi takes responsibility for sections 1 and 2, Guardiano for section 3, Fabbris for section 4 and Crisma for sections 5 and 6. The parameters in the Parameter List have been mostly assembled by Guardiano and Longobardi over the past fifteen years, and used in a number of publications. Crisma contributed to the reformulation of some of them, Fabbris investigated in particular the evidence for [−] for various parameters. The historic data presented in *Unabridged parameter values* and discussed in section 6 were collected and analyzed by Crisma for English, Fabbris for Nordic and Guardiano for Latin and Greek.

1 Grammatical diversity: the background

1.1 The original generative model

In early theories of generative grammars, the problem of language ontogeny was addressed as parallel to the linguist's procedures for extracting a grammar from a corpus of utterances; at the time, the initial linguistic state S_0 of the human mind was conceived as a Language Acquisition Device (LAD) consisting of:

(1) (a) a set of universal principles (Universal Grammar, UG)
(b) an Evaluation Metric for grammars (in the sense of Chomsky 1957: ch. 6)

In (1), the principles of UG should naturally restrict the number of hypothesizable grammars compatible with primary linguistic data (PLD) to a limited set, out of which every child chooses the highest-ranked grammar in terms of minimization of certain features.

Within such a model, it is possible to provide a natural answer to a fundamental evolutionary question:

(2) Why is there such wide grammatical variation?

The amount of variation allowed can be construed as complementary to the constraints made available by UG: the more numerous the restrictive principles, the smaller the amount of languages/grammars allowed. Therefore, the breadth of variation can be attributed to the fact that the amount of universal restrictions made available by human nature may be subject to a size constraint on inherited cognitive information; this is a conceivable economy condition on the architecture of the LAD, active through evolutionary history.

However, this model failed to prove explanatorily adequate mainly for two reasons: first, it was not possible to propose any serious and general evaluation measure, especially outside phonology. Second, it became clear that infinitely many grammars often remained compatible with a plausible set of primary data and the available principles of UG. All this contrasted with the finite, uniform and relatively short nature of the process of language acquisition, and made the model implausible.

1.2 The P&P model

The Principles-and-Parameters (P&P) research program (Chomsky 1981) arose as the alternative to models based on evaluation metrics.

In these models, the LAD consists of a UG made up of universal principles and of parameters:

(3) UG = Principles + Parameters. Open parameters at S_0, closed parameters at S_S

Here, grammatical variation is also innately given (exhaustively, at the appropriate level of idealization), under the form of a finite amount of discrete possibilities: all variability is present at the initial state of the mind S_0 in the form of open parameters, actual grammars are represented by closed parameters at the steady state S_S.

However this model proved increasingly problematic (see Karimi & Piattelli-Palmarini 2017 and the contributions in that collection). First, it is far from simple and economical: proposed or conceivable parameters seem to run in the hundreds, perhaps in the thousands, and in a P&P model all must be attributed to the initial state S_0 of every speaker's mind.

Second, any relatively large set of parameters (see e.g. Longobardi & Guardiano 2009 and following work) contains an extremely intricate system of implicational conditions holding among the parameters and among their surface manifestations; this leads to even more complex and specific hypotheses about the structure of the mind at S_0 (Boeckx & Leivadá 2014), which must include a high number of redundant parameters that will never be activated at successive states of maturation.[1]

Third, P&P theories have so far failed to answer the question in (2). In fact, with the development of parametric approaches this problem has become less tractable (Longobardi 2005): the existence of variation can no longer be explained in terms of economy of genetic endowment. For, limiting the size of the LAD should presumably decrease the number of parameters as well; therefore, it should reduce, rather than increase, the variability allowed by the language faculty.

Thus, the classical P&P model hardly solves the old tension between *descriptive* and *explanatory* adequacy, and raises a new one with the minimalist goal of *evolutionary* adequacy (Longobardi 2003).

1 Redundant or neutralized parameters amount to about 46% of the 94 x 61 states considered in section 6.5.

2 Parameters and Minimalism

2.1 *Intensionalist models*

Minimalist alternatives have been conceived. They can be collectively termed *intensionalist* theories of parameters, since they do not assume an extensional list of parameters given at S_0, but consider them as choices defined according to general formats and arising in the course of acquisition.

Intensionalist proposals in this sense, e.g. the "Principles-and-Schemata" framework in Longobardi (2005, 2017) and Biberauer's (2019) "neo-emergentist" model, as well as Lightfoot's (2017) and Crisma, Guardiano & Longobardi's (2020) approaches, are characterized by the following properties:

(4) (a) 'parameters' are not defined extensionally: they only arise in acquisition when they are needed for the grammar to make sense of the PLD;

(b) parameter setting is the addition of structure to the then current state of the mind, conventionally notated as [+parameter P];

(c) [−parameter P] is just a conventional notation for the absence (i.e. non-addition) of a given mental structure;

(d) restrictiveness of UG (limits on possible grammars) is obtained through intensional definitions of the class of possible parameters: e.g. in Principles-and-Schemata there is a small universal set of possible formats of variation (schemata).

Operationally, we define as a parameter "any point of minimal (binary) choice ultimately responsible for a set of observable syntactic differences between two languages." (Crisma et al. 2020: 105) These differences are its manifestations. In this model, the acquisition of syntax consists only of setting [+] values in response to positive evidence, i.e. salient manifestations in the PLD, while the presence of some other structures, manifestations of the 'redundant parameters' of fn. 1, may derive from the implications among parameters.[2]

Of course, in these frameworks which do not predefine an innate list of parameters, it is equally necessary to avoid stating cross-parametric implications parameter-by-parameter. In this spirit, Crisma, Guardiano & Longobardi (2024) show that a network of parameters governing Genitive Case is

2 We code redundant parameter states as [0].

regulated by implicational conditions reducible to general principles like the following:[3]

(5) (a) Anti-Synonymy (and possibly also Anti-Homonymy) (Keenan 2009)[4]

(b) Effability (Katz 1978)[5]

(c) Maximize Minimal Means (Biberauer 2019)[6]

Under what conditions exactly these principles apply to determine all parametric implications must be the object of an important research program.

Intensionalist theories try to combine the advantages of the two previous models of grammatical diversity. First, in this framework, the goal of a "Twenty question" model (Fodor 2001: 734) is not entirely off target: for the 94 nominal parameters used below as a datasource, the average of [+] values per language is between 20 and 25 (of course there may be more in clauses, see in particular Roberts 2019). Second, S_0 remains relatively simple, i.e. a radically underspecified UG is postulated, and variability need not appear hard-coded therein as an unexplained outcome of biolinguistic evolution. Such theories pursue a balance between fully selective and instructive "learning" models (Piattelli-Palmarini 1989).

2.2 *The new questions*

In this restyling of the P&P model, the notion of *default state* for each parameter becomes central. In the process of language acquisition, the acquirer adds some structure to his/her mental grammar upon encountering the relevant triggering experience (a *p-expression*, Clark & Roberts 1993); this added structure is conventionally indicated as [+parameter P]. Thus, at its steady state, an I-language is a string of [+parameter P]s added to S_0.

If the acquirer finds no p-expression in the PLD to set a parameter, no relevant structure is added to the grammar. For descriptive purposes, the absence of a given parameter in a grammar is conventionally indicated as [−parameter P], which is only a metaphor for the default state: in language acquisition,

3 These principles may fall within the category of Chomsky's (2005: 9) Third Factor: (5 a) and (5 c) might be data processing principles and/or architectural/computational-developmental constraints; (5 b) seems to naturally fall into the latter type.

4 This principle, proposed by Keenan (2009) in the study of anaphoric expressions and applied in Longobardi (2014) to negative operators, blocks the proliferation of synonymous functional morphemes in a language.

5 The effability constraint requires all languages to have at least one way of expressing a given meaning/grammatical function.

6 Biberauer (2019: 59–60) characterizes Maximize Minimal Means as a "general cognitive bias" which, in language acquisition, comprises strategies such as Feature Economy and Input Generalization.

[−parameter P] is a nonentity, which "literally requires the acquirer to do nothing" (Biberauer 2019: 60).

Thus, these approaches presuppose an intrinsic *lack-of-symmetry* between [+parameter P] and [−parameter P]: the former must always have visible manifestations in the PLD; the latter, i.e. the default state, need not.

However, the model does not *a priori* exclude that [−parameter P] may correspond to some structure in the PLD incompatible with [+parameter P].[7] Yet, we expect many salient cases of asymmetry between the two states of parameters. In this article we confirm this prediction, showing how the notion of default state is not simply a necessary device for the model to work: on the one hand, it receives empirical corroboration, on the other hand it adds to our understanding of the language faculty and of language diachrony.

2.3 Dataset

Much work on learnability has so far been based on very limited sets of parameters, often conceived abstractly rather than inferred from a robust sample of human languages (Gibson & Wexler 1994, Sakas, Yang & Berwick 2017). Our analysis, instead, stems from a collection of 94 parameters, originally assembled over two decades for comparative purposes, which describe the diversity of nominal structures in a large number of real languages from at least 13 families.[8]

These parameters, presented in the Parameter List[9] in the Support Material of this article, relate to different subdomains of the DP:

(6) (a) D-domain and classifiers (parameters 1–31)
(b) Genitives and linkers (parameters 32–53)
(c) Numerals, relative clauses and adjectival modifiers (parameters 54–80)
(d) Pronominal possessives (parameters 81–86)
(e) Demonstratives (parameters 87–94)

7 In our model, this potential evidence is supposedly disregarded by the language acquirer and should not be (mis)taken as a trigger for [−parameter P], see Sections 5 and 6.

8 See Ceolin, Guardiano, Longobardi, Irimia, Bortolussi & Sgarro (2021), which presents the value of each of the 94 parameters in 58 modern languages, and tests the plausibility of their phylogenetic signal.

9 In the present article, each parameter is referred to using its three-letter label, that can be clicked to open the relevant page in the Parameter List. The article and the Parameter List must be opened in the same directory/folder on your device. For readers who prefer printed versions, we provide a *Parameter Index* with page numbers in the Parameter List.

For the present work, some ancient and mediaeval languages (see (13)), necessary for testing the diachronic predictions in Section 6, have been added to those used to formulate the parameters referred to in (6).

3 Default state, positive evidence and absence thereof

We begin by drawing attention to parameters for which the PLD clearly displays positive evidence only for one state, call it [+parameter P]: for these parameters there is no conceivable structure compatible with [−parameter P] but not with [+parameter P]; in this case, [−parameter P] is unlearnable, unless negative evidence is taken to be usable by the acquirer. Intensionalist theories assume precisely that [−parameter P] is the default state and is not learned, therefore they are corroborated by the existence of parameters of this kind.

Such parameters correspond to the core type assumed in classical models of language acquisition based on the Subset Condition and the Subset Principle (Berwick 1982, Manzini & Wexler 1987). They combine the following two properties: first, there is no conceivable structure generated by [−parameter P] that is not also generated by [+parameter P]; second, there are structures generated by [+parameter P] incompatible with [−parameter P]; therefore, the language generated by [−parameter P] is a proper subset of the language generated by [+parameter P]. Thus, the approach to language acquisition that we adopt naturally accommodates the Subset Condition, while the Subset Principle is straightforwardly derived from the fact that, in parameters complying with the Subset Condition, the smallest grammar coincides with their default value. We therefore call these parameters *subsetting parameters*.

There are 39 subsetting parameters in our dataset, plus 2 others that may be subsetting or not in each particular language depending on the interaction with the effects of independent parameters on the PLD. As an example, take parameter [GUN]: in [+GUN] languages, Genitive Case is realized as an inflection and not through an adposition; still, in addidtion to occurring in the non-iterable positions to the left or the right of attributive adjectives,[10] such Genitives occur also with the typical distribution of the adpositional ones in languages that have them, namely as iterable arguments surfacing as the rightmost or the leftmost elements in the noun phrase. The simultaneous presence of two inflected Genitives in the same noun phrase is often, though not always, sufficient to determine that the language is [+GUN], as in the Finnish examples in (7).[11] The ungrammaticality of (7 c) shows that it

10 For an analysis of Genitive, see Crisma et al. (2024).

11 Thanks to Anders Holmberg for the discussion of these examples.

is not the case that "anything goes" in Finnish: the iteration of a Genitive in a position that does not admit it rules the construction out. On the other hand, the two examples (7 a) and (7 b), with more than one Genitive at the left periphery, are grammatical and constitute evidence that Finnish is [+GUN]:

(7) (a) *Leonardo-n* *Louvre-n* *Mona Lisa-n* *maailmankuuluisa*
Leonardo.GEN Louvre.GEN Mona Lisa.GEN world-famous
muotokuva
portrait
'Leonardo's famous portrait of Mona Lisa at the Louvre'

(b) *Leonardo-n Louvre-n maailmankuuluisa Mona Lisa-n muotokuva*

(c) * *Leonardo-n maailmankuuluisa Louvre-n Mona Lisa-n muotokuva*

Now, by definition, if a language has adpositional Genitives, it cannot be [+GUN], thus overt adpositional Genitives are overt evidence for [−GUN].[12] There are however languages in which Genitive is only marked through inflection, and inflected Genitives can only occur in the non-iterable positions to the immediate left or to the right of adjectives,[13] i.e. the language is [−GUN]. Thus, a *single* inflected Genitive surfacing as the leftmost or the rightmost element can be grammatical both in [+GUN] and in [−GUN] languages. Modern Greek is an example of a [−GUN] language with inflected Genitive, but the only evidence in this sense is the *un*grammaticality of constructions like (8 a), where inflected genitive arguments are iterated;[14] the relevant meaning can be conveyed using a by-phrase, as in (8 b). Therefore, in the PLD of modern Greek, positive evidence for [−GUN] cannot be encountered.

(8) (a) *Η περιγραφή του Γιάννη του κλέφτη
i perigrafí tu Iánni tu klépti
the description the.GEN Iannis.GEN the.GEN thief.GEN

(b) Η περιγραφή του κλέφτη από τον Γιάννη
i perigrafí tu klépti apó ton Iánni
the description the.GEN thief.GEN by the.ACC Iannis.ACC
'Ianni's description of the thief'

Conversely, classical Greek was [+GUN]; this is manifested for example by the presence of two phrase-final genitives in (9), a sort of mirror-image of the

12 Crisma et al. (2024) attribute this to Keenan's (2009) Anti-Synonymy (see (5 a) and Section 5.)

13 Whether or not they are crossed over by the raised N.

14 Together with the ungrammaticality of other constructions involving Genitives, see Crisma et al. (2024) for details.

Finnish examples in (7):

(9)

ἡ	δὲ	διαγνώμη	αὕτη	[τῆς	ἐκκλησίας]
hē	dè	diagnṓmē	haútē	tês	ekklēsías
the	PRT	decree	this	the.GEN.SG.F	assembly.GEN.SG.F
[τοῦ	τὰς	σπονδὰς	λελύσθαι]		
toû	tàs	spondàs	lelústhai		
the.GEN.SG.N	the	treaty	being-dissolved		

'this decree of the assembly about the peace treaty being broken'
(Thuc. 1.87.6, adapted from Guardiano 2011: 130)

We conclude that in languages without adpositional Genitives, only one state, which we call [+GUN], is associated with unambiguous positive evidence (Classical Greek), while the other state is the default (Modern Greek) and need not be set.

4 Default state and economy of derivation

The structure of the manifestations for [GUN] may be thought of as yet another example of a parameter satisfying the Subset Principle, therefore, in this particular case, intensionalist models may seem to add little to our understanding of the language faculty.

However, other subsetting parameters allow one to address more meaningful questions, in particular whether [−parameter P] is always derivationally more economical, in the sense of requiring fewer visible operations; intuitively, one may expect the default to be the most economical option, but our data suggest otherwise.

In various movement parameters, it turns out that there is unambiguous positive evidence only for the *absence* of overt movement. The conclusion is that in these cases the default value is the seemingly more complex derivation, the one involving displacement, while lack of movement requires positive evidence.

As an example, consider the distribution of adjectives in Latin and Romance. Though the exact nature of the phenomenon is still elusive, it is generally recognized that the distribution of adnominal adjectives in prenominal position is subject to various restrictions and seems to obey a relatively fixed hierarchy.[15]

15 It was first proposed by Sproat & Shih (1987) and subsequently taken up by almost all researchers working in the field of adjectival modification. An instantiation of such a hierarchy is the following one (adaped from Alexiadou, Haegeman & Stavrou 2007: 310: *Quantification/Numeral* > *Quality/Speaker-oriented* > *Size* > *Shape/Color* > *Provenance/Argument*. An En-

In particular, adjectives denoting provenance or nationality and adjectives denoting material are the lowest in the extended projection of N. In Italian they can never surface to the left of N as shown in (10); in the research line initiated by Bernstein (1991), Crisma (1991, 1996), Valois (1991) and pursued in much subsequent work, this has been used as evidence that, in Romance, N obligatorily raises to some intermediate functional projection.[16]

(10) (a) *un vaso dorato*
a pot golden
'a golden pot'

(b) *? *un dorato vaso*

(c) *un ragazzo romano*
a boy Roman
'a Roman boy'

(d) * *un romano ragazzo*

The picture, however, is complicated by the fact that many languages that have no N-raising can construe postnominal adjectival modification as a reduced relative,[17] as in (11), with variable cross-linguistic restrictions:

(11) Every person blessed was healed (Larson & Marušič 2004: 275)

As a result, a language with no N-raising like Latin, where nationality/material adjectives can surface prenominally, admits those same adjectives in post-N position if they are construed as reduced relatives:

(12) (a) *tres Parcae aurea pensa torquentes*
three Parcae golden allotments-of-wool spin.PART.PRES
'Three Parcae spinning their golden threads' (Petr., Sat XXIX)

(b) *pyxis aurea non pusilla*
box golden not insignificant
'a large golden box' (Petr., Sat., XXIX)

(c) *Aegyptius puer*
Egyptian boy
'The/An Egyptian boy' (Petr., Sat., XXXV)

glish structure like *the three beautiful big grey Persian cats* is an example. In this case, all adjectives are prenominal.

16 Parameters NM1, NM2, NUA.

17 Parameter ARR.

(d) *puer* *Alexandrinus*
boy Alexandrian
'The/An Alexandrian boy' (Petr., Sat., XXXV)

In sum: the pre-N position of nationality/material adjectives is overt evidence for the absence of N-raising, while there is no unambiguous overt evidence for the existence thereof, because the post-N position of nationality/material adjectives can be either the result of N-raising or a reduced relative. The same holds for the classes that are higher in the hierarchy (see fn. 15).

Since overt N-raising is not unambiguously p-expressed in the data, while its absence is, one must conclude that it is the default option. Thus, these subsetting parameters suggest that the default state of a parameter is not necessarily the one implying fewer visible movement operations. This may be taken as indirect evidence for a theory of Internal Merge, where the same number of copy-deletion operations takes place whether the pronounced copy is chain-initial or chain-final, as opposed to a classical approach in terms of presence vs. absence of overt movement.

5 Parameters with positive evidence for the default state

As mentioned in Section 3, not all parameters are subsetting: in many cases it is possible to imagine positive evidence for either state of a given parameter.

Returning to [GUN] as an example, we saw that for modern Greek it is impossible to construct positive evidence for [−GUN]; however, recall that [+GUN] is not compatible with the contemporary presence in the language of adpositional Genitive, as a potential consequence of Anti-Synonymy: if a language has Genitives marked via pre- or postpositions it is necessarily [−GUN]. Thus, under certain conditions, there is conceivable overt evidence for either state also for this parameter.

Such parameters pose a theoretical challenge: if both values for a given parameter are potentially associated with positive evidence in the PLD, how can one decide that one value requires triggering experience in order to be set by an acquirer, while the opposite is just the default state? In our dataset, parameters with positive evidence for both states come in two types, asymmetrical and symmetrical.

5.1 Asymmetrical parameters

We call some parameters 'asymmetrical' because, though positive evidence can be constructed for both values, only the evidence for one of them seems

plausibly utilizable in language acquisition. 49 parameters are asymmetrical in our dataset, and another 2 may be subsetting in certain languages and asymmetrical in others, depending on various interactions.

Of these 49 parameters, 43[18] govern the presence/absence of visible morphological alternations such as presence/absence of a grammaticalized interpretable feature, presence/absence of feature spread to other positions, presence/absence of overt morphology encoding syntactic information. Now, presence vs. absence is an asymmetrical concept by logical necessity. Thus, for these parameters, it is natural to decide which structure corresponds to [+] and which to [−]: making the assumption that for the acquirer it is necessary to be presented with alternations that manifest the relevant morpheme in order to incorporate it into his/her functional lexicon, its presence will correspond to [+], its absence to the default value.

An example of a parameter of this type is [FGN], which governs the grammaticalization of the feature Number. Visible plural morphology sets [FGN] to [+], but it is also possible to construct some overt evidence for [−FGN]: if nominal arguments are, as a rule,[19] formally neutral between singular and plural interpretation in a language, their systematic ambiguity is positive evidence that the language is [−FGN]. This kind of evidence enables the linguist to set the parameter to [−] for closed-corpora languages without the help of quantitative data.

Yet, this type of evidence is not available to the acquirer: recall that we assume that language acquirers never set parameters to [−]; thus, for example, the Mandarin language acquirer is not aware of the fact that in other languages there is a formal distinction between singular and plural nominals; rather, in the course of the acquisition of Mandarin, [FGN] simply never plays a role.

Another 6 parameters in our dataset appear to be asymmetrical because they are set to [+] upon encountering a salient deviation from a general pattern attested in the language. A clear example is parameter [GPC], which determines systematic gender counter-agreement (masculine with feminine and *viceversa*) between cardinal numerals and nouns, characteristic of Semitic, which elsewhere displays regular gender agreement. Here, again, it is natural to assume that the default state coincides with the absence of similar deviations, i.e. nothing for the acquirer to notice.

18 Plus the 2 that can also be subsetting, for a total of 45.

19 I.e. disregarding lexical and phonological exceptions.

5.2 *Symmetrical parameters*

The second type of parameter with positive evidence for both values is at first sight more problematic: in this type, the overt evidence for the two states is perfectly symmetrical, therefore there seems to be no principled way to determine which one should be interpreted as evidence for [+] and which one corresponds to the default.

For example, take parameter [PNP], distinguishing prepositional languages from postpositional ones. In this case, postulating that one order corresponds to [+] and the other one to [−] is an entirely arbitrary choice, dictated by the necessity of encoding grammatical variation in a uniform way. In this case [−parameter P] does not correspond to absence of p-expressions or to a default state: a scenario where the acquirer of English uses the pervasive presence of P-DP sequences to set the parameter to [+], while the acquirer of Basque simply ignores the equally pervasive presence of DP-P sequences because this is the default option, is counterintuitive. Thus, symmetrical parameters might seem to undermine the foundation of our parametric theory.

However, once symmetrical parameters are examined in full, they turn out to be less problematic than they appear at first.

First, note that out of 94 parameters, only 4 are presumably symmetrical: the already-mentioned parameter [PNP], governing the placement of adpositions relative to their complement; the parameter [NUP], governing the placement of non-genitive arguments relative to the head noun; the parameter [NUD], governing the placement of the determiner relative to its NP-complement; the parameter [NUC], governing the position of cardinal modifiers.

Then, most importantly, at least the first three seem to be theoretical developments of classical head-complement parameters. These are arguably a very special class, for it has been proposed that the basic head-complement order for each language is recognized by infants at a pre-lexical (and, consequently, pre-syntactic) stage, using intonational contour and rhythm as a cue (Langus, Mehler & Nespor 2017 and references cited). Thus, the very early sensitivity of acquirers to these prosodic features ensures that basic head-complement orders are set very early,[20] then acting as the 'stepping-stone' into grammar (Biberauer 2019: 53).

In many cases, the head-complement directionality extends to all categories, resulting in harmonic languages.[21] There are however disharmonic

20 Therefore our symmetrical parameters enlarge the subset of "basic parameters" that are set "very early" (Wexler 1998: 25, 29).

21 In our dataset, [PNP] and [NUP] are largely harmonic with each other, and it is natural to

languages, where, for certain categories, head-directionality deviates from the expectation generated by the prosodic patterns; this makes the introduction of specific parameters necessary, our 'symmetrical' parameters. If this line of reasoning is correct, the latter are not symmetrical at all, for they are instances of deviations from a pattern otherwise expected in the language, the last type discussed in 5.1: they do have a default value, which is variable and determined in each individual language by a non-syntactic *proto*-parameter,[22] the prosodic properties of the language.[23]

6 Default state and diachronic development

Once the default state for each parameter in our dataset is determined on principled grounds, it becomes possible to test the asymmetry of parameter values against some observable instances of parameter resetting in the history of languages. To this purpose, we constructed five idealized lines of descent within Germanic, Romance and Greek, without aiming at exhaustiveness. First, we determined the parameter states in the historic languages in (13):

(13) Historic Languages

(a) Germanic: *Beowulf*, Late West Saxon, Old Icelandic, Old Norwegian

(b) Latin: Classical Latin, *Satyricon*

(c) Greek: Homeric Greek, Classical Attic, Hellenistic Greek

We then singled out all the parameters which underwent change from [+] to [−] or from [−] to [+] at some point, setting aside parameters neutralized by implications.

Within Germanic, three separate lines are considered. For English, three stages are compared: Late West-Saxon (lWS) and Present-Day English (PDE), with the tentative addition of the language of *Beowulf* (Beow), which, notwithstanding the great uncertainty of its dating,[24] is taken as a witness

assume that this kind of harmony is at the root of many implicational universals, involving also clausal parameters, disregarded here (Greenberg 1963, Hawkins 1983). Safe conjectures with respect to [NUD] and [NUC] cannot be made because our language sample is skewed with respect to these properties.

22 This would be a parameter of the highest type (Macroparameter) in the hierarchy of Biberauer & Roberts (2012), Roberts (2019).

23 For comparative purposes, in Ceolin et al. (2021), Crisma et al. (2020) and subsequent work, it was necessary to arbitrarily assign a default value to these parameters, uniform for all languages and independent of the *proto*-parameter.

24 For a semi-serious account of the heated debate about this issue, see Frank (2007).

of some traits of the oldest stages. Two stages are analyzed for two Nordic languages: Old Icelandic (OIce) and contemporary Icelandic (Ice); Old Norwegian (ONorw) and contemporary Bokmål Norwegian (Norw). The findings are presented in Table 1, while the full list of 94 parameter values is available in the *Germanic lineage* section of *Unabridged parameter values* in the Support material.[25]

In Romance (Table 2, and *Romance lineage* in the Support material), Latin (Lat) is taken as the ancestor of the modern varieties: Italian (It) and two dialects of Italy (Ragusa, RG and Reggio Emilia, RE),[26] Spanish (Sp), Portuguese (Ptg), French (Fr) and Romanian (Rm); no intermediate stages were taken into consideration.

As for Greek (Table 3, and *Greek lineage* in the Support material), a single succession is taken to lead from the syntactic features of the Homeric language (HG) to Classical Attic (ClG, with an obvious strong idealization), then to the Hellenistic Koiné instantiated in the New Testament (NTG) and subsequently to all modern varieties considered: standard Greek (Grk), two Italiot varieties from Calabria (CGA and CGB) and one from Salento in Apulia (SaG).

Asymmetry is revealed also in diachrony, as a tendency for [−] to substitute for [+]. In particular, in the Germanic languages considered here, 7 of the parameters change their values from [+] to [−] and just 2 from [−] to [+]. The figures from Latin to Romance are identical (7 changes from [+] to [−], 2 from [−] to [+]). Finally, through the stages of development in Greek, we witness 10 parameters going from [+] to [−] and 2 from [−] to [+]. In all, there are 16 parameters that change their value from [+] to [−] and 4 from [−] to [+], marked in green and red respectively in Tables 1, 2 and 3. The two sets are disjoint, i.e. no back mutation is observed.

6.1 Asymmetry and directionality of change

The numbers alone already point to some asymmetry between the parameter values. However, it is not simply the quantity of these changes, but rather the relation between the directionality of change and the PLD that provides relevant evidence. Our hypothesis that only the value [+] for each parameter

25 Here and in the other tables, whenever the value of certain parameters could not be determined, [?] appears in the relevant cells. The use of [+/−] encodes the presence of conflicting evidence, a possible indication of grammars in competition; the symbol between parentheses is the minor variant. [0] encodes predictable values (see fn. 2). Changes from [0] to [+] or [−] have not been reported in these tables.

26 These two dialects are representative of the changes from [+] to [−] or [−] to [+] occurring between Latin and the 29 dialects in Guardiano, Cambria & Stalfieri (2022: 25).

	Beow	lWS	PDE	OIce	Ice	ONorw	Norw
±FGG	+	+	−	+	+	+	+
±DGR	−	+/(−)	+	+/−	+	+/−	+
±CGR	0	+	−	+	+	+	−
±DNN	0	+	−	0	0	0	0
±GUN	?	?	−	+	−	+	−
±GAD	−	−	+	0	+	0	+
±GFL	?	+	−	0	0	0	−
±DSN	0	0	0	+	−	+	+
±APO	−	?	−	+	−	−/?	−

Table 1 Parameters reset in Germanic

	Lat	It	RG	RE	Sp	Ptg	Fr	Rm
±FNN	+	+	+	−	+	+	−	+
±DGR	−	+	+	+	+	+	+	+
±GUN	+	−	−	−	−	−	−	−
±GIT	−	−	−	−	−	−	−	+
±NM1	+	+	−	−	+	+	+	+
±NM2	+	−	0	0	−	−	−	−
±APO	+	+	+	−	+	+	−	−
±TAR	+	−	−	0	+	−	−	−
±TNL	+	0	0	−	0	0	−	0

Table 2 Parameters reset from Latin to Romance

	HG	ClG	NTG	Grk	CGA	CGB	SaG
±DGR	−/(+)	+	+	+	+	+	+
±CGR	0	+	+	−	−	−	−
±FVP	0	+	?	+	+	+	−
±DNN	0	+	+	−	−	−	−
±GUN	+	+	−	−	−	−	−
±NM1	+	+	+	+	−	−	−
±NGL	+	+	−	−	0	0	0
±DSA	0	+	+	+	+	−	−
±APO	+	+	+	−	−	−	−
±OPK	0	+	?	−	−	−	−
±TDC	0	−	−	−	−	+	+
±TAR	+	+	+	+	−	−	−

Table 3 Parameters reset from Ancient to Modern Greek

is set by the acquirer, hence requires overt evidence, predicts that all changes from [−] to [+] are a consequence of the emergence of new p-expressions in the PLD, while disappearance of p-expressions typically leads to change from [+] to [−]. If this prediction is correct, this association must be found in the observed changes.

The initial theory of the sources of linguistic change that we adopt is the restrictive approach proposed by Edward Keenan:

(14) INERTIA: "Things continue as they are unless acted upon by an outside force or DECAY", where DECAY is understood either as phonological reduction or semantic bleaching (Keenan 2009: 17–18)

The 'outside force', i.e. contact, should not *a priori* favor the emergence or the loss of p-expressions, thus it should be neutral between the two directions of change.[27] In our dataset, there are three languages in a pronounced situation of unbalanced contact, the three Italiot Greek varieties; in all cases where they diverge from standard Greek, they converge toward the neighboring Romance dialects: [+NM1] to [−NM1] and [+TAR] to [−TAR] in all Italiot Greek; [−TDC] to [+TDC] and [+DSA] to [−DSA] in SaG and in CGB; [+FVP] to [−FVP] in SaG.[28] As extensively discussed in Guardiano & Stavrou (2014, 2019, 2020, 2021), the initiator of change in these cases may well be independent of contact, but contact effects cannot be disregarded. Therefore, it is preferable for a theory that explores the role of parameter asymmetry in the directionality of change to factor out such situations as potential noise, because parameter re-setting may be influenced by the asymmetry in the sociolinguistic situation, not in the parameters themselves.

On the other hand, DECAY is relevant and predictive in our analysis: it is natural to expect DECAY to more readily result in loss rather than emergence of p-expressions, hence in changes from [+] to [−] rather than the opposite. However, changes from [−] to [+] do exist, and, surprisingly, they are also a consequence of DECAY; we discuss them first.

6.2 *Parameters reset from* [−] *to* [+]

DECAY, often as the combination of phonological reduction and semantic bleaching, may result in grammaticalization (Roberts & Roussou 2003),

27 Which does not mean that parameter interference is unrestricted, see e.g. Guardiano, Longobardi, Stavrou & Crisma (2020).

28 For the latter in particular, note that the two Italiot Greek varieties from Calabria remain [+FVP] and their closest neighbors are [+FVP] Italian dialects, see also Höhn, Silvestri & Squillaci (2017).

and categorial reanalysis from lexical to functional; this, in turn, may lead to the emergence of grammaticalized features/morphemes, hence new p-expressions triggering the addition of the relevant parameters to the grammar.

There are three such instances in our dataset. One is the change from [−DGR] to [+DGR], affecting all three families. The most visible manifestation of [+DGR] is the obligatory definiteness marking on arguments, often realized through definite articles. Now, definite articles seem to arise through a classical grammaticalization path from deictic demonstrative to text-anaphoric demonstrative, then to free-standing article, and, often to clitic.

Similarly, the shift from [−] to [+] for parameter [GAD] represents the loss of more specific interpretable features like 'ablative' from prepositions like Latin *de* or English *of*: essentially, they change from meaning 'related to X by derivation/provenance' to just 'related to X', where X is the denotation of their complement.

The third change from [−] to [+] concerns parameter [GIT], and is another case of grammaticalization of a morpheme: in Romanian an adnominal genitive phrase is only licensed when adjacent to a [+N] head incorporating Person (as well as Gender and Number), features typically spelled on the suffixed definite article. Each noun phrase has one head noun, so when two genitive adnominal arguments need to be expressed or when the noun is indefinite, therefore unsuffixed, Romanian has developed a special functional morpheme (*al, a, ai, ale*) that appears to contain all the features needed to license an adjacent Genitive, though without necessarily interpreted features of definiteness or deixis.

6.3 Parameters reset from [+] *to* [−] *and* DECAY

Thus, somewhat counter-intuitively, DECAY, combining here phonological reduction and semantic bleaching, is at the root of all the three changes from [−] to [+] that cannot be imputed to contact. DECAY is the most likely explanation also for some changes from [+] to [−].

Three changes from [+] to [−] are clearly linked to DECAY as simple phonological reduction. One is the well-known loss of grammatical gender in English, with [FGG] going to [−]. Another is the loss of systematic exponence of number morphology on nouns, witnessed in French and in Reggio Emilia (Guardiano et al. 2022), which become [−FNN] with consequences on the syntax of bare nouns (Delfitto & Schroten 1991). Third, in the change to [−DSN] in Icelandic, the doubled definiteness marker is eroded, up to full elimination of redundancy. In all these cases, the morphemes triggering [+parameter P] are eroded and the evidence for [+] in the PLD is lost.

There seems to exist another type of nonphonological DECAY, the loss of certain features enabling a wider distribution, which produces the loss of p-expressions. It happens with [APO], that shows instances of changes to [−] in all the three branches considered: the loss of adjectival distribution of possessives may follow from dropping their lexical-categorial features [+N, +V]. Similarly, when English and Greek become [−DNN], the definite article is weakened to a morpheme that can only cliticize on overt [+N] categories.

A corollary of Keenan's theory in our model is that the change of some independent parameter may affect the p-expressions for another parameter. In principle, this could cause loss or emergence of p-expressions, hence change in either direction. We singled out three cases of parameter reset leading to further parameter change, resulting in change from [+] to [−] in all cases.

The first is the change to [−NGL] in Hellenistic Greek; we trace this back to the loss of [+GUN], because in [−GUN] languages, non-adpositional post-nominal Genitives are necessarily analyzed as outcomes of N-movement over a functional low Genitive position, triggering [−NGL] (Crisma & Gianollo 2006). The second case is [CGR] changing to [−] in Germanic and in Greek (at some point in the history of Romance as well): on the surface, this produced the emergence of an indefinite article (Crisma 2015). All over Europe, the [−] value of this parameter is observed in [+DGR] languages, which already have a definite article;[29] this suggests that definite articles bleed possible p-expressions for [+CGR], which is lost unless 'protected' by other manifestations. A further change from [+] to [−] that is connected to the resetting of other parameters is the change to [−TNL] in some Romance languages, a direct consequence of the emergence of [+TSP] in these same languages (Latin was [0TSP] owing to its being [−DGR]).

6.4 *Parameters reset from* [+] *to* [−] *and asymmetry*

A further class of changes from [+] to [−] can be traced more directly to the asymmetry of parameter states, which leads us to postulate another source of violation of INERTIA beyond DECAY and 'outside force', i.e. 'borderline occurrence'. For some parameters, p-expressions happen to be borderline in the so-called *Restricted List* of that parameter in the sense of Crisma et al. (2020: 113–115), i.e. the set of p-expressions of a parameter that belong to the core utterances of an E-language; by chance, those p-expressions may be absent from the PLD of quite a few acquirers, resulting in the default value. This development is exemplified by the loss of [+GUN]. From Latin to Romance,

29 The oldest attested stages of Germanic and Greek are [−DGR] and [0 CGR], the intermediate stages are [+DGR] and [+CGR] in both groups. It is reasonable to posit a similar intermediate stage for Romance, not represented in our sample.

this loss seems connected to the ultimate disappearance of Case inflection from categories other than pronouns, hence to phonological reduction. But in Greek and Icelandic [GUN] goes to [−] even if Genitive Case inflection has remained quite robust. The model of acquisition we adopt here, however, predicts the instability of [+GUN], for its triggers are rare in common and casual utterances in the PLD (e.g. three genitive arguments in the same noun phrase, or two in certain precise positions).[30] This type of explanation reasonably applies also to the resetting of [TAR] to [−] in most of Romance, and possibly to [OPK] going to [−] in Greek.

A similar, though not identical, mechanism may be at work in three changes from [+] to [−] where the original value [+] correlated with some synchronic variability in surface order of the relevant elements in the structure. For [GFL], which is [+] in lWS and [−] in PDE, there is ample evidence that one of the two orders, the one acting as trigger for [+], steadily declines over time,[31] maybe under the pressure of the general principle of Anti-Synonymy (5 a). It is therefore plausible that at some point in the history of English, not represented in our sample, the relevant evidence became borderline in the *Restricted List* and escaped the acquirers' awareness. The other two changes from [+] to [−] that reduce variability of surface order affect [NM1], reset in Romance (Latin is [+] and Ragusa and Reggio Emilia are [−]) and Greek (it goes to [−] in all Italiot Greek); and [NM2], that becomes [−] in all the other Romance languages in the study. Whether these changes were also preceded by a decrease in the frequency of the word-order linked to [+] is a possibility not yet investigated.

6.5 Asymmetry and drift

To sum up, in our revised theory of syntactic diachrony there are four plausible primitive sources of change in E-languages, with different consequences on p-expressions:

(15) (a) outside force ⇒ emergence or loss of p-expressions
(b) nonphonological DECAY ⇒ emergence or loss of p-expressions
(c) phonological DECAY only ⇒ loss of p-expressions
(d) borderline occurrence ⇒ loss of p-expressions

Under an asymmetrical theory of parameters, (15) predicts the observed numerical unbalance in the direction of change.

30 See Hicks (2023) for a study of the phenomenon in late Latin.
31 See Allen (2008) and references cited.

This unbalance might lead to the uniformitarianist conjecture that, over long timespans, languages should all drift toward the [−] value for every parameter. Conceptually, this is not a necessary outcome: to draw a parallel, in historical phonology changes from [p] to [f] (or to [h]) are common while the reverse is hardly possible, but, typologically, this does not make [p] disappear, since there are possible sources of new [p] (e.g. Proto-IE [b] in Germanic).

Similarly, no general diachronic tendency to reduce the overall number of [+] values in the 94 parameters can be observed in the lineages of Tables 1, 2 and 3, despite the fact that shifts from [+] to [−] are more frequent than from [−] to [+], see *Unabridged parameter values* in the Support material.[32] In English, one does witness a decrease of values [+], from 25 in lWS to 22 in PDE, but Icelandic has 28 at both stages and in Norwegian they increase (from 25 to 27). The 23 [+] values of Latin become 22 in RE, remain the same in Fr, increase in all the other Romance languages (25 in It and in RG, 26 in Ptg, 28 Sp and 30 in Rom). In Greek, HG has 23 parameters with value [+], ClG 33, NTG 30 and Grk 27; conversely, the Italiot dialects go down to 22, 21 and 20.

As it turns out, the source for new values [+] not considered in Tables 1, 2 and 3 is the reactivation of parameters once neutralized by implications and notated as [0].[33] This happens when some change affects the implicational rules neutralizing a given parameter: a possible consequence is that existing structures previously unable to function as p-expressions for this parameter become able to set it to [+] (see Longobardi 2012 for examples in Romance).

The reactivation of [0], apart from keeping the overall number of values [+] essentially stable, has interesting consequences for the shaping of a diachronic theory: we have seen that the same principles that lead to changes from [+] to [−] also account for those from [−] to [+], and that direct back mutation is not attested in our dataset. It is however plausible to conceive a scenario in which what looks like long-term back mutation may in fact happen through an intermediate [0] stage, resulting in a full rotation of the type sometimes observed in phonology and known in morphosyntax under the name of 'Jespersen's cycle', see van Gelderen (2011). We leave the elabora-

32 Synchronically, in a sample of 61 present-day Eurasian languages (the 58 languages of Ceolin et al. (2021), with the addition of RE, CGA and SaG, considered here but not there), out of the 5,734 parameter states (94 x 61), 1,844 are [−], 1,262 are [+] and 2,628 are neutralized by implications (i.e. they are [0]).

33 This process of reactivation of neutralized parameters produces new values [+] (19 cases, fully compensating for the losses), but also new values [−] (26 cases), see *Unabridged parameter values*. Whether this pattern is typical of most diachronic sequences and whether it can be related to the default status of [−] in our theory must be left to further investigation.

tion of this hypothesis for future resarch.

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