

If the Clock Breaks

A Short Excursus from Machine-Grammars to Nondeterministic-Grammars

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Abstract: If we were to use a metaphor to summarise the long path that led us from the Stoics and Alexandrians to the various contemporary grammars, we could say that the grammar of a language has been conceived for a long time as a well-organised machine, built making use of more or less refined ways and formal apparatuses. Therefore, an obvious question arises: which was the grammar model that, despite some shallow differences, was successful? A question of this kind arrives in a systematic and coherent way with Maurice Gross in the mid-1970s, with the discovery of the salience of the Lexicon in defining the form of grammar. In fact, the lexicon of a language, which was originally used to check theoretical hypotheses, becomes the heart of the general model of grammar. This calls into question notions that had seemed completely certain in the tradition, precisely, those of “rule” and “exception”.

Keywords: Grammar; Lexicon-Grammar Theory; Taxonomies; Maurice Gross.

1. Introduction

It is difficult – if not impossible – to summarise solid traditions. There is a high risk of simplifying and in some cases even of making statements which are, in *vis polemica*, only partially true. Sometimes however, simplifying can be useful. If we were to illustrate with a metaphor the long path that led us from Stoics and Alexandrians to the various contemporary grammars, we could say that the grammar of a language has been viewed for a long time as an organised and well-oiled machine (Lo Piparo, 2003). An organisation made up of modules that are coherently integrated with each other and characterised by deep symmetries. Rules of different ranks and status levels, which can be judged on the basis of the coherence of the

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general model of grammar as well as on the basis of the relationship between the statements contained in every single grammar of every single language. There are of course exceptions to this, generally found in marginalised areas of research.

The notion of coherence appears curious – if not paradoxical – when considering that one of the main themes of grammar, or *thematata*, was – and is – the creativity of the use of language (Graffi, 2001). In fact, a model of grammar like the one described earlier seems related to the functioning of a deterministic machine – a (too) organised system – whose behaviour has been rigidly fixed in advance. A system which, by definition, is not creative.

2. *Grammar, Chaos and Order*

It is a common experience that, although a large part of Western culture has always emphasised the characteristics of order, cause-effect, and predictability, many systems do not comply at all or, at least, do not comply so simply to these criteria. From meteorology to the behaviour of financial markets, and to the modifications of viruses, for example, everyone agrees in affirming the not easily predictable nature of the underlying systems, which in themselves seem to recall a decisively more chaotic or certainly much more complex image than the one offered from strictly mechanical systems, which are on the other hand purely deterministic and predictable (Prigogine-Stengers, 1981).

It is always a fully deterministic system, but its description and the predictability of its evolution are directly linked to the possibility of knowing and describing its initial state in detail. In other words, what appears random or disordered or unpredictable seems to be linked to the cognitive limits of the observer rather than to characteristics specific to the system (Davies, 1992).

As in the case of Brownian motion, as well as in all cases in which a certain system follows a “path” apparently so complex as to appear random, the term “fractal” (or “Mandelbrot set”) is used¹.

In simple terms, a fractal is a structure which, while assuming an apparently totally disordered, chaotic, irregular, and complex ap-

¹ For the notion of “fractal object” see Mandelbrot (1975).

pearance, has an underlying geometric regularity, called “scale invariance” or “self-similarity”. In fact, “chaotic” events (for example atmospheric turbulence, or heartbeats) demonstrate similar trends on different time scales, just as objects characterised by self-similarity present similar structural shapes on different spatial scales. In some way, this seems to suggest that having exported the fundamental idea of the fractal from its original context, it could contribute to explaining the functioning of other systems which, if one pauses to observe them, appear at first to be chaotic or dominated by disorder.

What appears more and more is that the original opposition of Chaos against Order, with the dominance of one or the other according to the individual instances, myths or philosophies, should be replaced by a new principle. This principle should be somehow unifying on the level of scientific awareness and tendentially also on that of the individual dimension. It is the principle of complexity. As Morin states:

The simple idea of external order cannot be replaced by another simple idea, even that of disorder. The true message which disorder brought us, in its voyage from the thermodynamic to the micro-physical and from the micro-physical to the cosmos, is to enjoin us to set out on the search for complexity. Evolution can no longer be a simple idea: ascensional progress. It has to be simultaneously degradation and construction, dispersion and concentration. [...] Order, disorder, organizing potentiality must be thought of together, both in their well-known antagonistic character and in their unknown complementary character².

Entropy, understood in terms of organisation, can be applied to both closed and open systems as well as to men, as it underlines an irreversible tendency towards disorganisation. In the same way, the notion of complexity lends itself to its application to systems other than those for which it first had to be recorded (Witkowski, 2003).

Grammarians, philosophers of language and linguists – contrary to dialectologists, philologists and historians of language – have not always been aware that their object of study was not initially entirely comparable to those held by other sciences, for example, by those studied based on the Laws of Nature (Cardona, 1990).

² Cfr. Morin (1977: 41).

Grammar, in particular more formalised grammar, has had excised from it everything that could complicate the elaboration of a general model. Thus, its activity has been restricted to something that is too simple, too regular and orderly. This is the case despite the subsequent, increasingly refined efforts to formalise and mathematise the discipline.

It is not a question here of facing a real historical-epistemological debate in the strict sense – it would certainly be at least pretentious – on a set of disciplines which, “triumphant” and even sometimes taken as a model in the 1950s and 1960s, later seemed to slow down or “burst” in the last laps, in the same way as a marathon runner who has not been able to plan his race well. Bertinetto (1999) recognises, among other things, that the only attractive force of that period remains the notion of “value” of Saussurean origin.

3. Rules and Exceptions

If – knowing the current state of a deterministic system – it is possible to predict its future development, then it must also be possible to accurately reconstruct the previous phases (the “states”). Linguists – grammarians – never really pushed themselves to “predict” future developments, except for on absolutely marginal mechanisms or facts, and in non-academic or non-scientific settings. This is because they did not ignore the tradition of studies on time-bound modifications of languages, which have taught us that, given the inherent potentialities of a specific state, the system often evolves in an unpredictable way and in relation to the historical events in the community³.

However, when making choices on the “form of grammar” and

³ Languages change over time, and, in Saussurean terms, languages are “social institutions” (Elia, 2007). This does not mean, however, that all the modifications that a language undergoes are immediately and directly correlated to the modifications undergone by the community. The language-society correlation is stronger in the case of semantic and lexical modifications than it is in the case of morpho-syntactic changes. In fact, the modifications concerning grammatical tools used by the speakers in the communicative relationship with other speakers are more linked to historical-social events than they are to the broad relationship between language and society. Think, for example, of the changes recorded in Italian in the use of personal pronouns of courtesy. This does not alter the fact that, however, the Italian-language system today continues to maintain all the possibilities provided, even those that are more obsolete or less frequent in use.

on the elaborations of the individual grammars of the individual languages, linguistics generally remained faithful to the “grammar-machine” model (Lepschy, 1990).

Traditionally, two elements have disturbed the conception of grammar as a machine or – to use a metaphor underlining the relationship between this conception and the notion of order – as clockwork. These are “idiomatic forms”⁴ and “exceptions”. Exceptions, even more so than idioms, have been a thorn in the side of the history of grammar and grammarians (Auroux, 1996). Statements concerning the definition of any grammatical rule – such as the one below – can be found scattered everywhere:

the rule R1, which we have discussed, has a number of exceptions, for example in the case of the element Ln

The attitude towards exceptions, like that towards idiomatic forms, can probably be traced back to a sort of “aesthetic prejudice” analogous to that glimpsed by Erwin Panofsky in Galileo’s refusal to accept the ellipses of Kepler in relation to the motion of celestial bodies. That same attitude is found in language use: breaking one of the rules while speaking will not be welcomed by the fellow speakers of the same language, in the name of a notion of “rule” that is simply conventional. Every utterance is, in fact, the result of a grammar which is situated within the framework of variation anticipated by the language itself⁵. If errors are deviations from a norm, most of them actually fall within the range of possibilities provided by the linguistic system. Nevertheless, they are positioned at the margins of the system, because they are not tolerated – among others – by the majority of speakers (Grandi, 2015). The traditional

⁴ In this section, we will focus on the treatment of exceptions. On idiomatic constructions, see Vietri (2014, 2020).

⁵ According to Galli de’ Paratesi (1988), the notion of rule, whether implicit or explicit, is conceptualised as a norm that privileges one form over another. This definition underscores the prescriptive nature of rules within any system, highlighting their role in guiding behaviour or decisions. Specifically, a distinction is made between linguistic rules and sociolinguistic rules. Linguistic rules are those that describe language facts without considering social parameters, or the social characteristics of a linguistic interaction. Discussing the rules building the norm in Coseriu (1952), she describes how linguistic rules are designed to operate against possible variation and are different from the rules object of the norm, in that linguistic rules revolve around what is correct rather than what is normal (p. 5).

model of grammar has represented language as a set of *possible* and *impossible* structures – in other words, grammatical and ungrammatical structures – using the notion of rule as a boundary between the two (Lenci, 2015). As Edelman (2008) states:

For most of the 20th century, linguists assumed that grammars consist of algebraic rules, of which there were supposed to be fewer than the number of entries of the lexicon. On this view, the charge set upon the discipline of linguistics is to come up with a concise system of formal rules that jointly generate all the grammatical sentences in a given language, and none of the ungrammatical ones.

That said, in a “philosophy” of grammar and grammarians, it is the data that must bend to the theory, to the model, and not *vice versa*. With a clockwork-grammar, it is not surprising at all that exceptions and idiomatic forms have been identified as facts of secondary importance. However, a different view on exceptions may lead to the very revision of the notion of “rule”. If exceptions are no longer seen as an oddity, but as an alternative behaviour, the “rule” will simply be the statistically more widespread behaviour. That is, the notion of rule will be defined solely on a statistical basis.

Then, the central tenet will become the calculation of the various behaviours, to separate what is more widespread from what is less widespread. Of course, in the affirmation of a procedure in which the general and the singular are systematically integrated, the work to be done is more complex and lengthier.

It goes without saying that, in grammar, the reference to exceptions evokes the most mysterious – and annoying – object of grammar: the lexicon.

Therefore, for a long time the winning – or most widespread – model of linguist specialised in grammar has been that of a watchmaker who works in their artisan workshop with meticulousness and precision. In the 20th century linguistic studies increased exponentially, as well as the effort to define the object (Saussure) and the discussion on the methods and theory (Bloomfield, Harris and Chomsky). Nonetheless, there was still the impression that, however different and increasingly complex the explanatory apparatuses became, ultimately the most widespread model remained that of the watchmaker and the machine (Formigari, 2007)⁶.

⁶ Naturally, in this case, for obvious space limits, a simplification is being made,

4. *The Lexicon-Grammar*

A metaphor has been used, that of “calculation”. One wonders, in fact, what are the “calculations” in linguistics, in particular within grammar. One also wonders what are the “data” that are related to a certain theoretical elaboration. Contrary to the case of many other scientific domains, the data of a linguist are not, strictly speaking, extraneous to the same analyst. The latter is in a particular and original condition: they are “natural” data, but they are deposited in two different containers: the corpora of attestations on the one hand, and his personal competence as a speaker on the other⁷. In both cases, however, they are made up of “speeches”, of sentences⁸.

It means that, in most cases, the set of sentences on which the argument is built and the whole theoretical building are presented only in a minimal part, for that part that is used in the presentation of the formulated rules. This problem arose already in the structuralist manual of R.H. Robins (*General Linguistics: An Introductory Survey*, 1964). But, as we can say starting from the definition of a rule on a statistical basis, it would be interesting to be able to systematically evaluate the quantitative diffusion of regularities.

A question of this kind jumped onto the scene in a systematic and coherent way with Maurice Gross in the mid-1970s⁹. Specifically, with the research inaugurated by his study on French completives, and the research that gradually continued in that methodological direction that later took the name “Lexicon-Grammar”, the question of data processing and accumulation in linguistics finally became a crucial issue.

Gross’s analysis of the completives of French began as a “test” of the transformationalist hypotheses but was transformed into a powerful tool for reflection first and for change later. With it, notions

attributing the theoretical and methodological effort of this century exclusively to the authors cited. Geneva, Prague, Copenhagen, Pennsylvania, Cambridge, etc. these are names that all linguists know, and great bibliographic sources come to mind when one cites them.

⁷ On the differences between the two data accumulation methods, cf. D’Agostino (1992).

⁸ “Speech” in the Harrisian sense is a term that applies to any cohesive sequence, so it is also synonymous with “sentence”.

⁹ See Gross (1975).

that had seemed entirely certain in the tradition, namely those of “rule” and “exception”, are called into question:

The status of the notion of grammatical class raises a number of questions. In traditional grammar, as in transformational grammar, a class is defined on the basis of morphological, syntactic or semantic properties. In the case of the syntactic properties described here we can adopt the definition: a Boolean combination of properties P defines a class of lexical items. As a general rule, grammarians, having demonstrated the existence of properties P, simply give a few examples of the members of the corresponding class. An examination of the literature shows that syntactic classes are only ever defined *en intention*, and there are no examples of definition *en extension*, i.e. in the form: the elements of the class defined by the properties P are m1, m2, ..., mk (i.e. the list of elements) and there are no others. Our tables therefore provide an empirical result that was not obvious a priori. They show that it is possible to construct extensional syntactic classes. As we have mentioned, it is likely that linguists thought that complete enumeration of forms was not humanly feasible because of their extraordinarily high number; our tables provide a clear answer to this question¹⁰.

Taking into account the definition of “extensional” classes, rule and exception acquire an objective character from the quantitative point of view; secondly, their status is linked, as mentioned above, to a statistical consideration, for which “the rule” will be the “most widespread” mechanism; thirdly, the contrast between “rules” and “exceptions” can be reinterpreted as the contrast between what is most and less widespread. In both cases, as already mentioned, the “measure” is definable with precision, it is quantifiable.

There is a second fundamental aspect that is highlighted in Gross’s analysis. This is the salience of the Lexicon in defining the form of the grammar. In fact, the lexicon of a language, which was originally used to check theoretical hypotheses, becomes the core of the general model of grammar. The rules show their “lexicon-dependent” status, and they reveal that they can be “activated” in some lexical subsets and may not be in others.

Finally, there is the issue of attempting to discuss the accumulation, representation, updating, management and interrogation of data. To answer this, the lexicon-grammar response moves in the direction of taxonomic representations¹¹.

¹⁰ Cf. Gross (1975: 214) [my translation].

¹¹ The issue of the lexicon-grammar representation of data, like all purely binary

Z. Harris (1946) considers the constraints operating on the distributions of forms and states that they can be represented in lists, as they are in dictionaries, or in charts organised in rows and columns, which display the acceptability of certain characteristics in each instance. From this, the lexical-grammatical taxonomies are born. They represent the lexical-syntax interaction theorised as early as 1975 by Maurice Gross. This is how the “lexically exhaustive grammars” of the Grossian school developed. These project the elements of the lexicon of a language, indicated here with (L), onto a set of syntactic properties, indicated here with (P)¹², as in the following representation:

	P1	P2	P3	...	Pn
L1	+	-	+	-	-
L2	+	-	-	+	+
L3	-	-	+	+	+
...					
Ln	+	-	-	-	-

Thus, each lexical entry will be associated with the set of properties it accepts and, at the same time, with the set of properties it rejects, as it is shown in the following example¹³:

representations, poses some problems. As things stand, however, it is still the most appropriate solution (especially in terms of data management), provided, however, that it is integrated with records of phrases.

¹² The syntactic properties (P) of a lexical element to be used in the taxonomies are all the possible P observed in the language analysed.

¹³ For the annotation system, see D’Agostino (1992).

N0 = Num	N1 V W	N1 si V W	V	V-N	N0 Vsup V-n Prep N1	Vsup = Fare	Vsup = Dare	Vsup = Avere	N0 Essere in+a V-n di N1
+	-	-	abbandonare	+	-	-	-	-	-
+	-	-	abbattere	+	+	+	-	-	-
+	-	-	abbordare	+	+	+	-	-	-
+	-	-	accogliere	+	+	+	+	-	-
+	-	-	acchiappare	+	+	+	-	-	-
+	-	-	addestrare	+	+	+	+	-	-
+	-	-	adorare	+	-	-	-	-	+
+	-	-	adottare	+	+	-	-	+	-
+	-	-	affamare	+	-	-	-	-	-

At first glance, these taxonomies would appear to reinforce the “mistrust” and “indifference” towards the lexicon nurtured throughout the history of grammar, including in a good part of this century, particularly in American distributional linguistics and its generativist counterpart (Graffi, 2001).

On the contrary, lexical-grammatical taxonomies consistently and systematically bring to light the unpredictability and variability of the lexicon from a syntactic-semantic point of view. In other words, they reproduce the multiformity of the language which cannot be reflected in the form of the “clockwork grammar” mentioned above but, at the same time, they do not constitute the representation of chaos seen only in its most basic sense.

In fact, it is the very notion of taxonomy that integrates the two poles – order and disorder – with the stronger notion of complexity.

It is primarily the result of a first theoretical approximation, since on a set of parameters recognised in the analysis – consisting of possible sentence forms interpreted in a distributional-transformational way – it projects initial data which are themselves the result of the theoretical definition of the lexicon of a language and of

the identification of its minimal units. In this sense, a taxonomy has the characteristics of a theoretical object and is not just a snapshot or simple empirical evidence. Furthermore, a taxonomy testifies, in a formally reproducible and verifiable way, to the unpredictability or complexity of the syntactic-semantic functioning of a language (Lycan, 2000).

Unpredictability and complexity do not imply unknowability. The history of science is made of analyses of complex phenomena with unpredictable behaviour from the outset. The basic difficulty for those who study these phenomena lies in the need to operate with very high precision.

That nature is complex – and a language is, from a certain point of view, a natural system – is neither a merit nor a defect. In reality, observing the facts of language, one realises that complexity and unpredictability arise from the fact that – contrary to what linguists have thought for a very long period of time – they are forced to take into consideration an enormously large number of hidden variables.

As a matter of fact, two objections have always been advanced to the taxonomic treatment of the lexicon proposed by Gross and developed in lexicon-grammar research. The first: the vocabulary of a language is so large that it cannot be analysed. The second: it is, and it will be legitimate to add other words to the ancient ones, because languages change in relation to the words, and some of the words that are now “dead” will come back to life while others will perish, if the use so wishes – not the system – which, in the case of language, has the power to decide everything.

It is possible to answer the two objections, which in various ways have been periodically formulated, in the following way. As far as the first is concerned, the existence of descriptions of quantitatively significant lexical subsets for various languages is in itself already an answer. In this sense, the description of the lexical-grammatical interrelation of a language constitutes a venture which, like any other scientific venture, has aspects of design, planning, definition of employees, of time, etc. As for the second objection, which is undoubtedly more complex and which, in general, has been advanced by those who emphasise the creative use of language and its perennial variability, it is possible to suggest that linguists have at their disposal a powerful tool – shared with other disciplines that work on large amounts of data – and that is the so-called “idealisation

of data”. In fact, the structural movement of language cannot be a weakness: once again, the complexity of the object cannot turn into its unknowability.

Moro (2010) also mentions the geometry of fractals (in particular, he considers the “Koch snowflake”) but in an opposite sense to that used here. We assume here that a fractal object is to language nothing more than a metaphor – while for Moro the goal is always that of the various versions of Chomsky’s grammar, i.e., to rediscover a fundamental unit which is generated in different potentially recursive forms. In the case of lexical-grammatical taxonomies the object is primarily diversity and not unity.

Looking again at this chart:

	P1	P2	P3	...	Pn
L1	+	-	+	-	-
L2	+	-	-	+	+
L3	-	-	+	+	+
...					
Ln	+	-	-	-	-

It is clear how with an increase in the number of properties (P) for a constant number of lexical elements (L), the profile that emerges for each of them is, of not unique, at least almost unique:

	P1	P2	P3	P4	P5	P6	P7	...	Pn
L1	+	-	+	-	+	+	+	-	-
L2	+	-	-	+	-	-	+	-	+
L3	-	-	+	+	-	-	-	+	+
...									
Ln	+	-	-	-	+	+	+	+	-

If the profile of a lexical element is made up of both the accepted and rejected set of syntactic properties, then each profile will tend

to be original, as the number of classes multiplies very rapidly.

In this sense, a substantial diversity prevails over *a priori* unity. A diversity that has the merit of having been formally represented.

Albano Leoni (2009), finally, questions the “segmental paradigm”, discussing whether it is useful to abandon this notion in favour of a “physiognomics” of the word and its decoding on the basis of what is adjacent (the co-text, larger meaningful blocks) and what is overlying (prosody).

From Aristotle who, after the development of the theory of syllogism in the *Prior Analytics*, lays the foundations of physiognomics:

It is possible to infer character from features, if it is granted that the body and the soul are changed together by the natural affections. [...] If then this were granted and also that for each change there is a corresponding sign, and we could state the affection and sign proper to each kind of animal, we shall be able to infer character from features¹⁴.

to the more elaborate analyses of phonic production; all of it undermines segmental analysis:

The segmental, calculistic, discrete, deterministic paradigm [...] yielded exceptional results during the 19th and 20th centuries and changed the nature of linguistics, or rather, founded it and made it, to a certain extent and at certain times, a pilot discipline of the human sciences. For this it paid the price of detachment from more general reflections on the forms of human knowledge¹⁵.

“Calculistic” and “deterministic” are the same adjectives that were employed above for what was metaphorically referred to as the “watchmaker” model of grammar, referring in particular to the various forms of Chomskyan grammar. Towards the end of the syntax of the late 20th century, with the near-individuality of Gross’s lexical-grammatical taxonomies the notion of “individuality” is proposed, moving on from after centuries of “unity” founded on the principle of analogy (Carcattera, 2005).

¹⁴ Aristotele, *Prior Analytics* II.27.

¹⁵ Albano Leoni (2009) [my translation].

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