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Systemic productivity must complement structural productivity

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Summary

Linguistic productivity is not just structural productivity (the making of assemblies), it also contains 'systemic productivity' (the productive placement within pluridimensional paradigms). An occurrential, dynamic model provides a cognitively founded explanation of systemic productivity.

Keywords

abduction; abductive movement; analogy; Analogical Speaker; grammar; isonomy; linguistic productivity; paronymy; plexus; transitivity; transposition; systemic productivity

Introduction

Systemic productivity is a dimension of linguistic productivity which has not been well identified. Current theories only grasp it as being in the margins of structural productivity – the latter very much apparent by contrast – and systemic productivity is touched only indirectly, either via morphology, or via syntactic features smuggled in to address some of its consequences: agreement or concord. Either way, systemic productivity is not studied for itself. From this unfortunate elision, there follows, in the first case, stopgap conceptions like improper derivation for example, in the second case, an inadequate treatment of systemic anomaly, and in both cases, an approach which is categorical, which is not desirable for many reasons.

¹ I am grateful to Editions Almedina for kindly authorising the placement of this paper on the HAL SHS server.

This article: i) defines systemic productivity, ii) approaches it with analogy, identifying for its treatment analogy transitivity, and analogy transposition, iii) discusses some cognitive issues and some plausibility issues of this proposition.

1. Background

In my doctoral thesis² I demonstrate the shortcomings of the grammatical approach to modeling or theorising linguistic facts: a stipulative, static³ set of propositions (a "grammar") will account for a synchronic and non-variant "language" always with residues. It will never account for variation among speakers, for language learning, and therefore, for language change. In short, the hypothesis "language", even if we understand it as an individual or internal language, is not the best approach to take because a speaker does not learn a language, he just learns how to speak. Therefore the model or theory of what is inside a speaker that enables him to go around with success in the linguistic milieu must, right from the start, incorporate a model of the dynamics along with a model of the static side of his linguistic knowledge. A static-only model or theory will not do. By 'dynamics' I understand the reception of linguistic material and its interpretation in a situation, its emission still in a situation, and, as a result of these, acquisition and learning, and later, language change. A 'language', as something describable on its own, can only be a historical or social object and does not reside in our heads, it is no object the understanding of which would be a prerequisite to understand our linguistic acts.

We need however some assumptions both about the permanent mental traces which support the dynamics in a speaker and about the dynamics themselves. Such assumptions cannot be falsified directly, they can only be indirectly, through their consequences observed in a precise model we can make of them.

The approach consists of three items: i) the static side of the linguistic knowledge which is called 'plexus' because it is meshed, ii) the assumption that the dynamics are abductive in nature and rest on four basic 'abductive movements' which conduct the static knowledge into the dynamics, and iii) a general model of the dynamics, inspired from work in AI (the part of it that stepped away from symbolism and cognitivism), and from results from psycholinguistics. A computer implementation supports the claims made, see Lavie 2003.

The plexus (the static side of the linguistic knowledge) is proper to a speaker. Two different speakers of the same 'language' have two different plexii, which can be extremely variant in their details. This is because the inscriptions in a plexus are a result of experience, including linguistic experience, and we all have different experiences and histories. Nevertheless, I show how 'about' the same utterances can be accepted with 'about' the same cognitive cost despite the fact that detail reasons for accepting them may vary. This reconciles speaker variation with the quasi-normativity of language. The critical step in reconciling both is not to postulate a language. A plexus consists of

² Lavie 2003, downloaded in French or in English from the CNRS server: HAL SHS .

³ With 'static' I include Generative Grammars as well. The derivation 'process' which they advocate is deployed in a space which is not that of the linguistic dynamics. Generativism has nothing much to say about linguistic dynamics. For a recent statement on this subject, see Jackendoff 2002.

exemplarist inscriptions, not of abstractions. Actually, it is deemed that neurons are perhaps capable of some amount of abstraction but we do not know which ones with precision, nor how to model them, and so, as a research posture, I try to make the best with a totally flat model: one with no abstractions at all. It turns out that interesting things are possible to be demonstrated within that radical hypothesis.

Other important themes in the conception of a plexus are i) that inscriptions are analogical, ii) that they bear on terms without properties, iii) that terms have no 'relations' but 'analogical copositionings', iv) that a principle of proximality applies among inscriptions (from one inscription, there is a limited set of other inscriptions which can be reached at low cost, and in further steps, more can be reached but it costs more), and v) that contextuality is obligatory by construction (this negates autonomous lexical entries, for example). A plexus on its own cannot be said to be the linguistic knowledge of a speaker because there is no test procedure to assess such a thing: the linguistic value or import of a plexus is unassessable without the dynamics that may apply to it.

The dynamics are built upon four 'abductive movements' which link the static side of the model (the plexus) to its dynamic side. These are: by transitivity, by transposition, by transfer of constructibility, and by expansive homology. Of these, only the first two are relevant in this paper. The abductive movements specify the elementary computation steps that can be taken in linguistic acts. They are cognitively founded (or foundable). Implementationally, they are more plausible than rules and categories.

In my doctoral dissertation (*ibid.*), I show in some detail in which manner many 'grammatical' properties can be reconstructed as results. The general argument is that grammatical stipulations are consequences of the dynamics, counter to, for example, the generativist claim that elucidating grammatical properties i) is doable, and ii) will help later in explaining the dynamics.

In this picture, linguistic productivity is revisited: there are two productivities actually, the structural one, well-identified, well described, and accounted for to some extent, and the systemic one, which, in my view, has so far been poorly approached, cognitively speaking.

After this brief overview of my thesis, I will now zoom in and expose in more detail the systemic productivity.

2. Systems as the locus of a specific productivity

The question of linguistic productivity being posed, it is envisioned spontaneously as the ability to utter (and receive) *novel assemblies*. This vision is necessary and is covered in chapter 4 of my dissertation, where I account for it mainly with structural analogy and the abductive movements by constructibility transfer and expansive homology.

But in considering linguistic productivity solely as a question of assemblies, one neglects to see that the placement of a form in a pluridimensional paradigm (that is, a system like the verbal paradigm of a Romance language), is a productive process in itself.

I understand 'placement', in reception, as the assignment of a place in a paradigmatic system to a given form, and in emission, as the attribution of the appropriate form to a given place. The notions 'paradigmatic system' and 'place in a paradigmatic system' are provisory, what follows being a critique of them; and the conclusion will be precisely that we must produce system *effects* (without reifying the frames that would define the systems), and consequently to produce the corresponding placement *effects*.

As a first approach, the question of the placement in a system roughly amounts to recuperating the 'semantism' that would be associated with a place in the system. We know what it turns out to be: the mapping between places in systems and their associated meaning (meanings) is contingent and complex. This is true for example, of the 'semantism' of verbal tense, as it is for definiteness, number, etc. Contingent and complex as this association may be, it nevertheless has an unescapable function in interpretation, because it helps locate terms that are similar in the sense that they are 'of the same place' and it is exactly via the similarity of their 'locality' or placement that interpretation may deploy its abductive paths.

The domain of systemic productivity encompasses all systems⁴, that is, all the tables which may be established in languages so that, for any pair of lines, for any pair of terms picked up from these lines in the same columns, the meaning ratio in this pair is the same as the meaning ratio in another pair picked up in the same lines and in another column. Likewise after premutation of 'line' and 'column'⁵.

To begin with, systems are verbal systems and declension systems which are usual. Systems also encompass a vast number of tables which receive less attention because they are less usual or concern fewer forms, like the following ones in French:

S1

la	le
une	un

S2

mieux	pire	plus grand
bien	mal	grand

S3

plus	autant	moins
plus grand	aussi grand	plus petit / moindre
majeur		mineur
supérieur	égal	inférieur

S5

après	suisvant
avant	précédent

⁴ The notion 'system' is a pretheoretical notion used provisorily. Below it will be abandoned for that of 'systemic productivity', which makes it possible to problematise the dynamics and the cognitive implications of system effects.

⁵ This last proposition : *Likewise after premutation of 'line' and 'column'* is important. We shall see below that it justifies calling on the abductive movement by transposition.

S5						
avant	ensuite	hier	plus tôt	tôt	plus près	recule
	lors, alors	aujourd'hui	en mm temps		à égale dist.	reste sur place
après	auparavant	demain	plus tard	tard	plus loin	avance
S6						
dans	dedans	intérieur		entrer		
hors (de)	dehors	extérieur		sortir		
à côté de	à côté	proximité		passer		
S7						
vite / rapidement		soigneusement / avec soin		bien		
rapide		soigneux		bon		

The dimensions of systems are grammatical categories like gender, number, grammatical tense, and person. They may also be a set of what a categorical description would call 'lexical class', like the rows of system S7 above which are Adv. and Adj.

3. Explaining systemic productivity

In a small system, systemic productivity may be considered a small problem: speakers learn it by rote and there is nothing more to it. The explanation of ensuing acts of emission and reception would be covered in this way. At the lower extreme, the smallest possible system is a two by two system, that is, a systemic analogy (e.g. *speed : fast :: abundance : much*). The speaker forms a systemic analogy and nothing more: once formed, he can use it.

However, this does not explain the possibility of extension of a system, be it a durable extension by conventionalisation of more forms that append to the system, or by an occurrential extension. One example would be the possibility of metaphors, which is always open.

Neither does this provide a base to the differential process of meaning recuperation.

In a large system, all these reasons still hold to disqualify a 'learning by rote' explanation, but moreover it is just no longer possible to learn by rote, because of the size of the system.

We know that morphology (occasionally syntax) takes over, in the very measure of the system's size, by installing in the overt form some marks (affixal marks for example) which guide the placement of forms in the system. This is an empirical fact. In what does it constitute an explanation that would nullify the need to envisage a properly systemic productivity ?

4. An explanation by structural productivity does not suffice

Then, for instance in a verbal system, the attention focuses on a morphological schema like:

verbal base + inflexion → inflected verbal form.

The question of a possible systemic productivity would then be moot because it would be replaced by structural productivity. A replacement as simple as this presents many obstacles.

This schema does not explain the alternation of bases because it does not do justice to a fact like, in Fr.:

irai is to *vais* as *mangerai* is to *mange* .

This schema also fails with classes (conjugation classes, declension classes, etc.). Neither does it apply to forms occupying more than one place in a system⁶: *fais*, in written Fr., is a first person or a second person.

This schema cannot apply to systems S1 to S7 above, which present little or no morphological regularity.

Systemic productivity takes place despite structural anomaly, therefore it cannot be explained by structural dynamics alone.

5. Explaining with a dimensional frame

Theories then usually postulate a dimensional frame which underlies the system: they reify the system's dimensions. For example, in the Fr. verb: a tense-mode dimension, a person dimension, and a number dimension are postulated. The frame is assumed to be given and it is spontaneously presented (this is not always made explicit) as explaining the system and its operation. This analysis is the classical one in pedagogical grammars, but these grammars are intended for speakers who already have a certain command of their language. It is also the analysis made by modern theories (generativism, HPSG, etc.) which renewed it with syntactic features. Forms are assumed to be determined by three features, one for each frame dimension, and the feature values assign a form a place in the system.

As a descriptive means, such a frame is comparatively efficient (with some defects), but is not explanatory.

6. Defects of the frame

The frame does not explain the anomaly of forms

Syncretism and the alternation of bases remain as formally anomalous residues.

Now, despite formal anomaly, the forms find their place in the frame, and this set operates smoothly: speakers perform placement even when the 'base + inflection' schema cannot support the placement process.

One may object that in French the obligatoriness of the personal pronoun partially compensates for anomaly and syncretism. However, in Spanish, pronouns are not used in current practice and this does not prevent anomaly:

⁶ Phenomenon which is sometimes called 'syncretism'.

infinitive	pres. ind. 1S	fut. ind. 1S	pret. ind. 1S
<i>ir</i> (go)	<i>voy</i> (I go)	<i>iré</i> (I shall go)	<i>fuí</i> (I went)
<i>ser</i> (be)	<i>soy</i> (I am)	<i>seré</i> (I shall be)	<i>fuí</i> (I was)
<i>hacer</i> (do, make)	<i>hago</i> (I do)	<i>haré</i> (I shall do)	<i>hice</i> (I did)
<i>andar</i> (walk)	<i>ando</i> (I walk)	<i>andaré</i> (I shall walk)	<i>anduve</i> (I walked)
<i>cantar</i> (sing)	<i>canto</i> (I sing)	<i>cantaré</i> (I shall sing)	<i>canté</i> (I sang)

Likewise in Russian, in Basque, and in many other languages with the category 'person', but eliding personal pronouns, formal anomaly is not an obstacle to systemic productivity.

The frame assumption does not explain the anomalies of the frame itself

Such anomalies are numerous.

In systems S1-S7 above, there are many unoccupied places.

Imperative in French does not have persons 1S, 3S, 3P.

In Fr., there is no compound past subjunctive, no anterior future conditional, etc. To account for the fact that not all pairs (tense, mode) are attested in French, Gross proposes⁷ to substitute tense and mode with a tense-mode category which would *de facto* sanction those of the pairs which are attested. This measure is prudent and wise but it fails to do justice to data like *j'aurais vu : je verrais :: j'ai vu : je vois*. That is to say: between tense and mode in French, there is a partial categorial orthogonality, certainly incomplete, but which is not nothing. Therefore, the theory underlying Gross's decision (and which he leaves non-explicit) misses a 'local generalisation', if one may say so.

The French definite plural article *les* is neither masculine nor feminine.

Etc., examples of anomalies of the frame are numerous.

We see that the system of the places itself (the frame) is more a matter of empirical observation than one of postulation⁸, and that the systematicities which it offers are partial only; this is the case well before the forms that it hosts are found morphologically regular or not.

The frame does not explain learning

Postulating a multidimensional frame does not explain how children gradually build up a pluridimensional ability either. The reason for this is that experience never shows up as a methodic teacher and one must always make with the availabilities, fragmentary as they may be. The subject must be efficient without a complete system, with at best some systematisations here and there, partial and contingent. So the learner must integrate sparse and heterogeneous data, and positing a frame is simply positing the contrary.

In a large paradigm, speakers never really acquire the same ease in all points of the domain. Even for an educated adult, at its margin (seldom used forms of seldom used

⁷ Gross 1986, p. 10.

⁸ That it has a 'contour dentelé' as Milner (1989) would say.

irregular verbs) there are hesitations and gaps. For a speaker of French, the tridimensional system of the verb is ideal and its margin never really gets comfortable; either it remains a zone of free variation or, to comply with a norm, the speaker uses a *Bescherelle*.

This is not compatible with an explanatory schema like innateness plus parameter setting. In the case in point: innateness of paradigm dimensionality plus setting the right dimensions all at once.

Postulating the frame does not explain language evolution

As in any categorical theory, having postulated a frame (the dimensions of which are categories) it is impossible to show how it may undergo progressive alterations and therefore evolve.

The frame is not appropriate because it is partonomic

Finally, postulating a frame requires the forms in it to be attributed properties which are coordinates in the frame (for example : tense-mode, person, number). Doing this would be accepting categories (which we do not want) and would be a handicap in building an isonomic⁹ dynamics (which we want). This reason is a general reason but it is an important one in the approach we are taking.

Finally, the frame is not explanatory, an antecedent explanatory mechanism is required

To sum up, if we stick to a pluridimensional frame¹⁰, there is a description problem since real systems often do not even observe it, and it is difficult to explain a verbal system, i) as the contingent product of a history, ii) as learnable, iii) as useable and serviceable for the speaker when the latter does not have an available theory of this verbal system.

As we have not taken advantage of systemic analogy, this particular productivity remains unexplained. There is therefore a productive mechanism which is antecedent to its partial sanctioning by morphology, and it is not suitable to postulate a preexisting frame which would explain how the learning speaker makes the right form-meaning associations.

⁹ After Koenig (1999a), I call 'partonomic' a theory which posits that its components have properties. For example : "all nominals bear case", "finite verbs have tense". Contrasting with partonomy, a theory is 'isonomic' if it does away with properties: it develops uniformly and univocally on a single level. I claim that 'analogical copositionings' of terms plus the four abductive movements mentioned above make such a thing possible. Isonomy is better than partonomy because the 'object-property' schema already contains in itself a defect: it resists accounting for linguistic flexibility and plasticity. Multiplying properties (as does HPSG) or building up an inheritance lattice of categories (as do Construction Grammars) helps to live with this shortage without actually facing its deep causes.

¹⁰ Which is what syntactic features do.

7. Systemic productivity as the dynamics of systemic analogy

The refusal of syntactic features leads us to seek an explanation by a genuine systemic dynamics, that is, a dynamics which should be exemplarist¹¹ and isonomic as is that which accounts for structural productivity in Chap. 4 of my doctoral thesis.

This new dynamics is conceptually distinct from structural productivity, but as both operate together, complementing one another, and taking over from one another, it is not always easy to perceive what belongs to each.

The systemic dynamics is based on systemic analogy: we make the assumption that, at some point in his learning history, the young speaker becomes capable of making some analogies like (in French):

va : vais	:: vient : viens
vient : viens	:: est : suis
sommes : suis	:: jouons : joue
sont allés : est allé	:: sont venus : est venu
sont : est	:: sommes : suis

These elements of linguistic knowledge are exemplarist systemic analogies. Their number is modest because each has a certain cognitive cost. The young speaker makes a certain number of them, but not a very great number. He does so without the availability of abstractions like 1P, 3P, indicative present, future, singular, plural, verb "aller", verb "venir".

We assume then that these elements can undergo the abductive movement by transposition¹². This assumption is not theoretically very costly: it is entailed by the definition of systems (cf. *supra*). These elements can also undergo the abductive movement by transitivity¹³. The two movements then permit the unitary analogies above to enter an integrative dynamics. Starting from the initial systemic analogies, this dynamics¹⁴ has the final effect of producing a large number of other analogies by abduction, under conditions which are cognitively more economical.

This progressively renders effects of pluridimensional systems.

Naturally, the pluridimensional system 'preexists' the learning speaker; it is obviously not he who establishes it. He is simultaneously the beneficiary of the mother tongue and dependent on it. Gradually, he must comply with it if he wants to understand, to be understood, and to be an esteemed member of his speaking community.

¹¹ That is: refrain from positing abstractions.

¹² Analogy *went : go :: thought : think* transposes into analogy *went : thought :: go : think*; the two inner terms are swapped. Seen as a formal operation, transposition does not hold for any analogy, that is, its result does not always make sense. Here it does. It does in most linguistic pluridimensional paradigms.

¹³ Roughly stated, the movement by transitivity means that the friends of friends are also my friends, (although perhaps a little less). A linguistic example is as follows: given the two analogies *went : go :: came : come* and *came : come :: arrived : arrive*, the following analogy can be abducted: *went : go :: arrived : arrive*.

¹⁴ Details stand beyond the format of this article.

But he does not get hold of a system with three coordinates all at once. It is not a 'take it or leave it' matter. If it were, French would have, as Latin, a perfect infinitive, a supine, an ablative, etc. It is necessary that the conditions of this appropriation allow it to be a progressive and incremental process. It is not the case that it has to be taken to any predefined term except, in constraining pedagogies, the learning of tables that are preestablished and presented as an ideal norm. In a more spontaneous exercise of language, something of the ancestral inheritance reconstitutes itself; the acquired knowledge complies with the inheritance in the much frequented parts of the paradigms and, in the less frequented parts, remains an occasion for hesitations that generate more adventurous abductions, and these in turn generate occasionally variant creations.

The perspective is reverted. A categorial theory would postulate a tridimensional analysis frame, of which it should then have to explain the gaps (defectivity, i.e. unoccupied places, syncretism, alterations, anomaly); it would have nothing to say about the evolution of this frame. Here on the contrary, we start from the acts and from operating mechanisms which are explanatory right from the beginning. Exemplars are primary, as is the abductive computation which uses them; and the possibility of describing the system which the young speaker constructs, and in which he becomes productive, is recuperated as an effect of the base dynamics.

Adopting a dynamic as an explanatory schema of this type has many advantages, as we can see:

- a plausible discourse about learning becomes possible.
- the progressive way a verbal system is built in its dimensions is better explained.
- room is made for allomorphy, syncretism and classes as a cognitively motivated residue of a regularisation process.
- inflexional morphology is better positioned: it can sanction a pluridimensional system without having to do so entirely and its role is second in time, and causally second, even if, once the language has been learnt, in the adult's knowledge, this role becomes very important.
- the 'failures' in the learning process, or its residues in the margins of the system, make room for its possible evolution.

Systemic productivity is thus based on transitivity and on transposition. It shares transitivity with structural productivity, but transposition is proper to it: structural productivity is not concerned with this movement.

Systemic productivity assumes some hypotheses concerning the inscriptions that support it but they are beyond scope of this paper.

8. Conclusions

Structural productivity does not exhaust linguistic productivity. Besides it, a systemic productivity is recognised as necessary. It has a proper dynamics, and, even if it conjoins very quickly with systemic productivity, it is antecedent to it.

The dynamics of systemic productivity can be constructed within an exemplarist, dynamic model by means of analogy transposition and analogy transitivity, set in the service of an abductive computational view of linguistic acts.

This allows us to eschew an explanation by syntactic features and the associated problems of plausibility, learnability, and language change. It provides for a cognitively founded and plausible model of how a speaker does with pluridimensional paradigms.

The recognition of systemic productivity adds system effects and syntactic feature effects to the list of grammar effects which may be rendered by dynamics that are antecedent to grammars.

This is one occasion¹⁵ to show how it is not an antecedent grammatical description that conditions the understanding of the dynamics. It is the previous elucidation of the dynamics that allows us to reconstruct, as effects, the stipulations of the grammars. The latter may, in a second tense, become the subject of grammatical discourse; but this is second in history and causally second. The grammatical approach to linguistic phenomenology is superseded by an exemplarist, dynamic approach, notably because the latter is cognitively better: it explains better speaker variation, learning, language change; it is more plausible and makes lesser demands on innateness.

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¹⁵ Among others; cf. Lavie 2003.