Grammar in 3D: on linguistic theory design
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1 3D GLASSES

1.1 INTRODUCTION


All models are analyzed according to 3 D-properties or architectural features that may be argued to define the architecture or design of any model of grammar: Distribution, Derivationality and Directionality (the 3Ds). These are the three features related to grammar design that give name to this thesis: Grammar in 3D: On Linguistic Theory Design. Distribution is understood as a model’s outsourcing of linguistic information into various representational strata. Derivationality is analyzed as the pre-determined, sequenced, step-wise mapping between various strata. Finally, Directionality is seen as the (non-) compulsory direction of derivations between the various strata where linguistic information is distributed, i.e. the direction determined by which are the source and target strata of linguistic input and output, and the consequences that this has upon the architecture of a grammatical formalism. Note that, as opposed to the dimensions of Euclidean space, the 3Ds are not independent from each other. Although they do not fully determine each other, there exists a relation of dependency among them.

These architectural features defining a model of grammar’s design are analyzed for TGG, PA and FDG in
relation to their syntax-semantics interface: do certain phenomena e.g. quantifier scope ambiguity belong within the syntactic or semantic domain? Is the model derivational, does it allow for mismatches, or is the syntactic level responsible for the semantic one? Is the interface transparent? Does the flux of information take place from syntax into semantics, from semantics into syntax, or both?

A main research question is whether there exists a domino effect between a model’s approach to these three dimensions, the three Ds, and whether there is a direct relation between a model’s approach to the three Ds and the use of abstract syntactic categories and redundant representations. The ultimate goal of this thesis is, therefore, to define the architecture of a theory of language (linguistic theory design) according to Distribution, Derivationality and Directionality (grammar in 3D) such that a relation can be found between a theory of language’s approach to the 3 Ds and its architectural adequacy.

1.2 THE ORGANIZATION

The organization of this work is as follows. Chapter 1 motivates the elaboration of this thesis and enunciates its main goals. It also offers an introduction of the three grammatical models at the core of this work: Traditional Generative Grammar, the Parallel Architecture and Functional Discourse Grammar. A summary of the three architectural features according to which all three theories of language are analyzed is offered: Distribution, Derivationality and Directionality. These 3 Ds are the three architectural features according to which TGG, PA and FDG are analyzed and give name to the thesis Grammar in 3 D: On Linguistic Theory Design. Finally, the expected results are discussed.

Chapter 2 discusses the first D, Distribution. Distribution is defined as the architectural feature that determines the way in
which linguistic information is distributed in a given theory of language. A series of features are analyzed in this chapter according to TGG, PA and FDG: formation rules; levels of representation; and inter-level mapping processes. Focus is paid upon the relation between the number and type of formation rules and the number and type of (in)dependent levels of formation, on the one hand, and between the number and type of (bi)directional interfaces and levels of representation, on the other. A further section discusses the composition of the grammatical component of a theory of language in a patchwork-like manner, i.e. as the addition of formation rules, levels of representation and inter-level mapping processes. TGG, PA and FDG are then compared in terms of the number and nature of their formation rules, levels of representation and interfaces. A summary rounds off the chapter.

Chapter 3 discusses the second D, Derivationality. Derivationality is defined as the architectural feature that determines whether the various levels of representation of a grammatical formalism are derived (translated) from one another or whether they are independent (see Sadock 2003). In this chapter, the way in which each of the main features from the first D considered above influence a model of grammar's approach to the second D is discussed. Thus, the relation between formation rules, levels of representation and interface processes (Distribution, the first D), on the one hand, and Derivationality (the second D), on the other, is analyzed. Special attention is paid upon the way in which interface processes are conceived from the point of view of the second D. The difference between a flexible and a transparent interface is illustrated in relation to representational mismatches and Derivation. Subsequently, a classification of the main types of mismatches is offered. The final section of this chapter analyzes an instance of scope ambiguity in TGG, PA and FDG and relates it to the approach that each theory of language shows regarding the notions of derivationality, flexible vs. transparent interface and representational mismatches.
Chapter 4 discusses the third D, Directionality. This chapter starts off with four possible interpretations of the term Directionality: parsing vs. generation as possible goals of a grammar; the direction of inter-level mapping processes or descriptive priority (see Zwicky 1972); the direction of intra-level mapping processes; the direction of real-time processes (and whether a grammatical formalism mirrors any of them). All four notions are examined for TGG, PA and FDG in the hand of the phrase “the example”. The relation between this third D and the second D is considered. The chapter is closed by a summary.

Chapter 5 examines a series of linguistic phenomena in TGG, PA and FDG and relates the way in which each theory of language represents the same linguistic phenomenon to their approach to the three Ds. The phenomena analyzed are: sluicing; small clauses; pseudo-coordination (see Culicover & Jackendoff 1997); pseudo-subordination (Yuasa & Sadock 2002); interjections; understood subjects in imperatives; raising; and control. Special attention is paid to the relation between TGG, PA and FDG’s approach to the three Ds and the impact that this has upon the way in which they represent the same linguistic phenomena.

Chapter 6 offers conclusions as to the domino effect existing between the 3 Ds i.e. whether a model’s approach to the first D restricts its possible approaches to the second D, and whether a model’s approach to the second D restricts its possible approach to the third D. It also discusses the degree of representational abstractness and redundancy of the three theories in relation to their approach to the 3 Ds. Abstractness is conceived as the distance between the actual utterance and its representation under a certain grammatical formalism. Abstractness is mainly quantifiable by the presence of empty categories or unpronounced syntactic elements (see Sadock 2012). Redundancy is conceived as the representation of one and the very same linguistic property under various components, levels or any other sub-division within the grammatical component. Both representational abstractness and redundancy
are viewed as a direct consequence of a model’s architecture and conception of the three Ds such that a direct relation between the three architectural dimensions discussed in chapters 2-4, on the one hand, and empty categories and redundancy, on the other, can be established.

1.3 MOTIVATION: ON METHODOLOGICAL ANARCHISM

This work analyzes competing linguistic theories according to the same architectural parameters and linguistic phenomena in an attempt to unify linguistic analysis. The theoretical comparison presented in this work focuses on the way in which contrasting tendencies may theoretically and spatially implement their own conception of what the formalization of language could look like in an attempt to have a look at the neighbor’s garden and realize that, indeed, the grass over there may be a bit greener.

A theory of language is a method and, as such, something created by a linguistic community in order to represent language. In order to advocate for a particular theory, a linguist needs to focus upon a series of well-defined criteria to evaluate the various options. This leads to a series of optional candidate theories - and these, of course, need to be as representative as possible. In this light, the architectural features that one may choose for a theoretical comparison of models need be holistic and show far-reaching scope as to their consequences in the respective model’s implementation. Once the set of architectural features has been chosen, the selection of models is straightforward, and it will at best take into account not only the poles of the linguistic spectrum dichotomy, but also those theories representing an architectural compromise between theoretical poles. In this respect, the linguistic spectrum is here seen as a continuum of linguistic theories whose approach to the language formalism varies from fully formal to fully functional,
from derivational to non-derivational, from directional to non-directional. In the course of this thesis, I will locate TGG, PA and FDG along an architectural spectrum and will show that they represent architectural poles and sometimes compromises of distributional, derivational and directional dichotomies.

The idea behind this study is therefore to regard theories of language as a method partly dependent on the linguist, thus an example of methodological anarchism. This is in keeping with Feyerabend’s urge for an epistemological anarchism and the scientific relativity that comes with it such that scientific rules cannot possibly operate universally but rather yield methodological pluralism (Feyerabend 1993). Thus, this work considers the formalization of language according to a particular grammatical school as the scientific methodology chosen by a certain theoretical community to represent its object of study: it is partly theory-driven rather than a truth value, and this in turn explains the pluralism existing in the formalization of grammars.

1.4 GOALS

The main goals of this study are to offer a metatheoretical methodology for the assessment of and comparison between models of grammar and to apply it to three different grammatical models. Three architectural features that define the design of any theory of language -Distribution, Derivationality and Directionality- are applied to three theories of language that represent opposing architectural tendencies. On the poles of the spectrum, the models taken into consideration are Traditional Generative Grammar, epitome of a derivational and directional model of grammar with a traditional design, and the Parallel Architecture, epitome of a non-derivational, directionally non-restrictive model. The third model of grammar considered is Functional Discourse Grammar, a theory of language that possesses a non-default, hybrid approach to derivationality and
directionality. Although the proposed metatheory is applied to these three models, its properties are independent to them and may in principle be used to analyze any model of grammar.

More specifically, this work aims at analyzing the following linguistic phenomena, which challenge the transparent nature of languages: sluicing; small clauses; pseudo-coordination; pseudo-subordination; interjections; understood subjects in imperatives; raising; control. These phenomena are analyzed in all three models and the proposed analysis is related to each model’s approach to each of the three Ds – Distribution, Derivationality and Directionality. Finally, this work attempts to establish a relation between a theory of language’s approach to the three Ds and the use of empty categories and other abstract syntactic features, of redundant representations at various levels of representation, and of mismatches between strata.

1.5 THE 3 DS

Three architectural features give name to this thesis Grammar in 3D: on Linguistic Theory Design. These are: Distribution, Derivationality, and Directionality. Distribution is considered as the map of a grammar. The features that make up this first D are: a) the number and nature of formation rules; b) the number and nature of grammatical levels; c) the number and nature of inter-level mapping processes. All above-mentioned features are the formalized reflection of which aspects of the language object are considered to be relevant enough as to deserve a sit within the linguistic methodology, as well as proof of where each type of linguistic information is thought to belong to.

Secondly, Derivationality refers to the property of a model whereby levels are derived or translated from one another (Sadock 2003) such that one can follow the sequential steps of the derivation (Hale 1999), which results in the dependence of grammatical levels of representation. The features that make up this second D are: d) the nature of formation rules -whether
these are dependent or independent; e) the nature of grammatical levels - whether these are dependent or independent; f) the presence, and if so, the number and nature, of a main source level for linguistic computation (here called “all-first” levels of representation). These features make up a derivational vs. a non-derivational model of grammar, i.e. a model in which there is a relation of dependency vs. one of autonomy between the various grammatical levels. In turn, the presence or lack of autonomy between the various grammatical levels is proof of the relevance given to each of the levels within a grammar. Furthermore, should the model be derivational, the source level of computation will of course be overt proof of the formal or methodological control assumed by the one grammatical level being formally responsible for all other representations. In non-derivational models, contrarily, all levels are simultaneous or parallel sources of linguistic computation, whereby the terms “simultaneous” and “parallel” make reference to the temporally simultaneous and the spatially parallel (translated into temporal simultaneity) computation of linguistic information at the various levels of representation. As Hale puts it (ibid: 16), “[p]erhaps, the status of derivationality in syntax is one of the ‘formal properties of traditional rules’ with which, as Luigi Burzio writes of phonology, a fundamentally parallel grammar is inconsistent (Burzio 1995)”.

A further architectural feature that derives in a straightforward manner from derivationality is the number and nature of mapping processes allowed by the grammar (also under (c)). Mapping processes are co-determined by the formalized source of linguistic computation (under (f)) and by the general design of the grammar, i.e. by the number of levels represented within the formalism (under (a)), which obviously restricts the number of levels that may play a role in the mapping process. By nature of mapping processes I refer to two further sub-features: the transparent or flexible character of interfaces (for an indepth discussion of structural and interface uniformity, see Culicover & Jackendoff 2005), and the related
toleration or avoidance of inter-level representational mismatches.

Thirdly, **Directionality** refers to g) the presence or absence of a hierarchical relation in the description of levels (Zwicky 1972). If there is a hierarchical relation of some kind among the levels, the model may be classified as either top-down or bottom-up depending on which levels determine the computation of which other levels, or whether computation has no pre-determined source or target points. Note that the second D, Directionality, and the third D, Derivationality, are closely related: if there is no hierarchy or primacy of one or more level(s) over the rest, i.e. if the model is non-derivational, then it should, in principle, not receive any kind of directionality. A further feature arising from a model’s directionality is the h) uni or bi-directional sense of inter-level mappings, which corresponds to the overall directionality of the model. Notice that the directionality of interfaces only applies if these are one-way. The presence of two-way interfaces should in principle go against the derivational, and therefore directional, nature of a particular grammatical model. A final feature related to directionality, but also to derivationality and to the general design and distribution of the model, is the set of i) grammaticality criteria, which depend upon the well-formedness of all levels of representation as well as upon the correct activation of interface processes.

### 1.6 3 THEORIES OF LANGUAGE

#### 1.6.1 INTRODUCTION

This section introduces the main architectural tenets of the three models under study: Traditional Generative Grammar, the Parallel Architecture and Functional Discourse Grammar. The most relevant design features are introduced. These will be later on analyzed in depth in relation to one or more of the 3
properties analyzed in chapters 2, 3 and 4 respectively: Distribution, Derivation and Direction. In an attempt to remain as objective as possible regarding the models’ approach to the 3Ds, the models are presented in an epistemological vacuum.

1.6.2 TRADITIONAL GENERATIVE GRAMMAR

Traditional Generative Grammar is considered here as it appears in Chomsky’s *Syntactic Structures* (1957), the Standard Theory (1965), the Extended Standard Theory (1972), the Revised Extended Standard Theory (1975, Radford 1981), Government & Binding (1981, Radford 1988, Haegeman 1994) and the Minimalist Program (1993, 1995, Hornstein, Nunes and Grohmann 2005, Radford 1997). It holds for all the versions of TGG that its basic architecture consists of three levels of representation with its respective primitives (syntactic, semantic, phonological), which are defined by means of attribute-value pairs and hold structural relations between them. Some versions of TGG possess levels that are polystratal (cf. González Escribano 1993) and have various sub-levels that represent various aspects of the same utterance (e.g. two sub-levels for syntax named Deep Structure and Surface Structure for the syntactic component in Chomsky 1965 and D-Structure and S-Structure in Chomsky 1981). From these three levels, only the generative syntactic one is independent, since both the semantic and the phonological levels are merely interpretive. This leads to a “syntactocentric” framework of grammar (see e.g. Culicover & Jackendoff 2005). This is related to the model’s approach to derivationality.

Derivationality is understood as “[t]he sequence of steps or of transformations that generate a surface structure” and it has

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1 Non traditional versions are not considered in this study (Head-Driven Phrase Structure Grammar in Pollard & Sag 1994, Lexical Functional Grammar in Bresnan 2001, and Optimality Theory in Prince & Smolensky 2004).
2 Note that the direction of arrows for formation rules is not relevant at all. X
been “ordained from the beginning as the engine driving generative grammar” such that the sequence of transformations filters those structures that have followed a correct series of transformations as correct derivations, thus as grammatical instances (Hale 1999: 1-2). Derivationality can also be applied to the relation between different levels—as the translation of one level into another level. TGG has one single set of independent formation rules of syntactic nature that gives birth to the independent level of syntax. Phonology and semantics are thus derived from syntax. Since syntax is the source of all linguistic computation, it has to representationally account for anything that happens in phonology and semantics. Inter-level interfaces from syntax into semantics and phonology are therefore transparent and avoid inter-level representational mismatches: if semantics is born from syntax, then syntax accounts for semantics and the interface created is of a one-to-one nature.

This approach to inter-level relations is in turn related to the overall orientation of the model such that TGG results in a strongly directional model with only two possible interfaces: syntax into semantics and syntax into phonology. As to intra-level relations, these operate in such a way that smaller units are built into bigger units and TGG results in a bottom-up model. All these features, which define the architecture of the traditional Generative Grammar framework, will be accommodated into the 3 Ds introduced above such that an in-depth study of the 3 D-properties applied to the generative model will result in an in-depth analysis of the generative grammar design. Although the features presented above apply to most versions of TGG, in what follows I offer a brief overview of the peculiarities of the main generative versions.

In Syntactic Structures (Chomsky 1957), a finite number of phrase structure rules (PSR) and of symbols generate underlying terminal strings that are derived by transformational rules and generate other strings with different structural relations among them. These strings are then passed on to morphophonemics for surface changes. In this model, the
syntactic component is the main component and semantics plays no relevant role. An overview of this version of TGG is given in Figure 1.

**Figure 1. The architecture of Syntactic Structures**

![Syntactic Structures Diagram](image)

In *Aspects of the Theory of Syntax* (Chomsky 1965), the syntactic level is also the main computational machinery. In the base component, phrase-structure rules stating possible combinations of syntactic categories and the lexicon (from which words belonging to the appropriate syntactic category are inserted) generate a deep structure. This deep structure undergoes transformations and generates a surface structure. The deep structure thus underlies well-formed structure (Chomsky 1965: 138). The deep structure is related to the semantic interpretation (predicate-argument relations) and maps into the semantic component while the surface structure is related to the perceivable, well-formed structure of an utterance (where it undergoes morphosyntactic changes) and maps into the phonological component. The syntactic component (generative) thus maps into semantic and phonological components (interpretive). The architecture of this model is shown in Figure 2 below.
In *Government and Binding* (Chomsky 1981), the syntactic component is still the main computational component. Phrase structure rules and lexical insertion are the input for the D-structure or DS (before, Deep Structure) where predicate-argument relations are established. Theta-theory determines that all and only thematic positions be filled and X’-theory ensures that all constituents share the same structure (see Figure 4 below). DS undergoes transformations via the operation Move $\alpha$ (before, transformations). Moved elements leave traces that are co-indexed with the target position. DS maps into the S-structure or SS (before, Surface Structure). In SS, the derivation splits and maps, on the one hand, into the phonetic form of PF (related to phonetics) and, on the other hand, into the Logical Form or LF (related to semantics). Both PF and LF are interface levels. The architecture of this model is shown in Figure 3.
In The Minimalist Program (Chomsky 1995), the syntactic component remains the main component of the generative framework. In this component, the computational system of the human language ($C_{HL}$), lexical items are selected and merged (put together in pairs to constitute phrase structures) via the operations Select and Merge. A third operation Move applies at this stage such that an item $\alpha$ can be moved, leaving a trace behind. These movements are overt and result in Spell Out (formerly SS). From Spell Out, the derivation leaves $C_{HL}$ and
splits into two interpretation systems: Logical Form (LF) and Phonetic Form (PF) (ibid.: 169, 229). At LF, further movement operations can take place via covert Move. Move here is called covert because it does not have an impact upon the perceivable structure (Spell Out) but rather it is related to the semantic interpretation. Move is thus a structure building operation that can apply before and after Spell Out (overt and covert syntax, ibid.: 222). This architecture is illustrated in Figure 5 below (see also Dürscheid 2003: 157). LF and PF interact in turn with C-I (conceptual-intentional system) and A-P (articulatory-perceptual system).

Figure 5. The architecture of *The Minimalist Program*

Note that the main goal of this newer development of the generative framework is to minimize the efforts of the system by imposing economy conditions: the best movement is always the shortest, local relations are best, there should be “no superfluous steps in derivations and no superfluous symbols in representations” (Chomsky 1995: 161), Move is more costly than Merge (ibid.: 346), etc. Note that this version of GG is also

### 1.6.3 THE PARALLEL ARCHITECTURE

The Parallel Architecture is considered here as it appears in Jackendoff (1997, 2002) and in Culicover & Jackendoff (2005). It is a holistic theory of language that possesses three sets of units and principles of combination, thus three independent linguistic levels of representation – syntactic, semantic and phonological. These three levels are autonomous generative and hierarchical components that are processed parallelly and are linked by interfaces that stipulate how the different types of structures may correlate (Jackendoff 2007: 5, 7). Units of phonological and semantic structure cannot be derived directly from syntactic structures. Syntactic, semantic and phonological principles are specific to the syntactic, semantic and phonological levels respectively. Thus, correspondences between the syntactic, semantic and phonological levels are not necessarily one-to-one. An architectural overview for PA is offered in Figure 6.

Syntax, semantics and phonology are born from their own formation rules2 - all levels are sources of grammatical organization with their respective combinatorial power (coherent with the way in which nonlinguistic parts of the brain are organized (Jackendoff fc.: 9)).

The phonological structure (PS) can include the sequence of phonemes and syllables, the stress of a phrase and the morphophonology of sequences (whether it is a phonological word, phrase, affix, an utterance, etc).3 The input to PS is the

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2 Note that the direction of arrows for formation rules is not relevant at all. X formation rules give birth to X component. The direction of arrows is relevant for inter-level mapping processes.

3 Note that, for explanatory purposes, representations in PA (and in TGG, and FDG) may not be fully exhaustive – include all aspects in the representations.
auditory system and its output maps into the motor output. The conceptual structure (CS, Jackendoff 1983, 1990, 2002) interacts with other systems such as the visual system. The syntactic structure SS is built in trees that look like the traditional ones but that are not binary-branching and have no words at the bottom (in an attempt to keep all non strictly syntactic information out of SS). The constraint on the SS is such that all parts of the final tree have to conform to one of the treelets (pieces of stored structure that only consists of syntactic variables). Treelets are then clipped together at shared nodes (“unification” in Shieber 1986, Jackendoff fc.: 8). There is no specific order to build syntactic trees such that syntactic tree building is compatible with serial, parallel, top-down and bottom-up computation (Jackendoff 2007: 8-9, fc.: 11).

**Figure 6. The architecture of The Parallel Architecture**

Since phonology and semantics have their own generative and combinatorial capacity (in keeping with the fact that our ancestors could structure thought but had no syntax, see *ibid*: 17), syntax is simpler – the minimum syntax required to mediate between phonology and semantics (Culicover & Jackendoff 2005). The interface syntax-semantics can thus be mismatching (it does not have to be maximally simple and uniform) such that phenomena that present meaning in the lack of form do not need to resort to empty syntactic material in
order to provide all semantic material with syntactic counterparts and observe full isomorphism syntax-semantics. Also, since phonology and semantics are not derived from syntax, grammaticality is not determined by the well-formedness of derivations but by constraints: “ordered derivations are replaced by parallel constraint checking” (Jackendoff fc.: 11). The direction of interfaces is therefore not pre-determined (it is inherently nondirectional, Jackendoff 2007: 5) such that no specific level needs to be the main computational source. Interfaces start from, and target, all levels of representation. This is why arrows between levels are bi-directional (to express possible correlations between levels rather than derivation among them). This means that syntax is not only the input but also the output from phonology and semantics and that the interface phonology-semantics is also implemented (interface proved by the fact that the meaning of an utterance can be interpreted by its mere linear order, see ibid: 20). This configuration of interfaces is compatible with the feedback that takes place between and from phonology, syntax and semantics in real time language processing (ibid: 15).

An important component in the PA is the lexicon (see Jackendoff 2010a), which includes words and rules likewise in a continuum of generality (Jackendoff 1997, fc.: 5) and which are stored in long-term memory (ibid: 14). The lexicon plays an active role in the composition of structures in that lexical items behave like constraints or lexical rules, as pieces of phonological, syntactic and semantic structure that “check” the well-formedness of the three structures (Jackendoff 2007: 9-11, fc.: 9). Thus, words are built into phrases in the three levels in parallel with subscripts to join the phonological syntactic and semantic information of the same word.
1.6.4 FUNCTIONAL DISCOURSE GRAMMAR

Functional Discourse Grammar (FDG) is considered here as it appears in Hengeveld (2004), Mackenzie & Gómez-González (2005) and Hengeveld & Mackenzie (2008, 2010). Functional Discourse Grammar is a development of Functional Grammar (Dik 1978, 1997a, 1997b). It is a functional grammar in that it believes in language as a functional tool, thus functional relations play an important role at different levels of representation, and the use and usage of language are central to the theory. It is a discourse grammar not in that it analyzes the discourse, but rather in that it is discourse acts, and not sentences, that are the main unit of analysis.

FDG is a structural-functional theory of language (Butler 2003), i.e. a model of language that positions itself between strictly formal and strictly functional theories. It is a functional theory of language that adopts a “form-oriented function-to-form approach” (Hengeveld & Mackenzie 2008: 39). It is a function-to-form approach in that linguistic phenomena are represented in a top-down fashion (Hengeveld 2004: 3), from the pragmatic and semantic levels of representation (function levels or “formulation”) down to the morphosyntactic and phonological levels of representation (form levels or “encoding”). Such a top-down approach allows the model to gain psychological adequacy. It is a form-oriented approach, in that only those phenomena that have a systematic impact upon the form of a linguistic expression are formalized within the function-to-form formalism. The main architecture of Functional Discourse Grammar is presented in Figure 7. It is composed of four hierarchically-organized grammatical levels: the pragmatic or interpersonal level (IL), the semantic or representational level (RL), the morphosyntactic level (ML) and the phonological level (PL). The interpersonal and representational levels are coded by the operation of Formulation while the morphological and phonological levels are coded by the operation of Encoding. All these levels interact in a top-down fashion (see continuous,
top-down arrows in Figure 7), although bottom-up feedback is also allowed between continuous levels (Hengeveld & Smit 2009) (see discontinuous, bottom-up arrows in Figure 7 for non-hierarchical relations).⁴

**Figure 7. The architecture of FDG**

<table>
<thead>
<tr>
<th>Pragmatic rules</th>
<th>Interpersonal structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic rules</td>
<td>Representational structures</td>
</tr>
<tr>
<td>Morphosyntactic rules</td>
<td>Morphosyntactic structures</td>
</tr>
<tr>
<td>Phonological rules</td>
<td>Phonological structures</td>
</tr>
</tbody>
</table>

Regarding primitives, each level possesses its distinctive units of representation, non-derivable from units from other levels (see Hengeveld 2004: 5-8). Primitives at the interpersonal and representational levels are classified into three groups: frames (possible combinations of interpersonal or representational elements - rules⁵); lexemes (interpersonal or

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⁴ In a dynamic implementation of the model, bottom-up, inter-level feedback can take place in that one level of representation calls for a lower level before being implemented. A non-hierarchical relation is e.g. that established between the order of a predicate’s arguments and their morphosyntactic expression. Bottom-up processes are however not the default case-scenario, and they possibly do not belong to mainstream FDG.

⁵ Possibly with a more restricted function than rules in the traditional sense.
representational, inserted into frames); primary (interpersonal and representational) operators (non-lexical units of interpersonal or representational meaning). Primitives at the morphosyntactic level are likewise divided into three groups: templates (possible combinations of morphosyntactic elements - rules); auxiliaries (free grammatical morphemes - morphosyntactic “lexemes”); morphosyntactic secondary operators (non-lexical units of morphosyntactic content). Primitives at the phonological level are divided into: prosodic patterns; bound grammatical morphemes; phonological secondary operators (which anticipate acoustic or signed means of expression that are not a direct consequence of primary operators).

FDG is part of a wider theory of verbal interaction composed of a total of four components: the grammatical component (FDG) and three non-grammatical components: the Conceptual, the Output and the Contextual Component. The Conceptual Component is responsible for “the development of both a communicative intention relevant for the current speech event and the associated conceptualizations with respect to relevant extra-linguistic events”. The Output Component generates “acoustic, signed, or orthographic expressions on the basis of information provided by the Grammatical Component”. Finally, the Contextual Component consists of “a description of the content and form of preceding discourse and of the actual perceivable setting in which the speech event takes place and of the social relationships between Participants” (Hengeveld & Mackenzie 2008: 6). The architecture of FDG as the grammatical component of a wider theory of verbal interaction is represented in Figure 8.

Finally, the architecture of Functional Discourse Grammar possesses a hybrid approach to derivationality. On the one hand, each level of representation contains information that is specific to that one level: pragmatic information is located at the interpersonal level, semantic information at the representational level, morphosyntactic information at the
morphosyntactic level and phonological information at the phonological level. Also, rules and units are specific to each of the levels of representation. Specifications at the various levels do not obligatorily need to show a one-to-one mapping. Inter-level mismatches are allowed for, and the model does indeed show these types of mismatches: the model’s approach to interfaces is flexible.

These characteristics are, default case-scenario, typical of a non-derivational model whose levels do not depend upon each other. Now, the model shows, however, a clear top-down directionality, since representations from higher function levels (formulation) are translated into representations at the lower formal levels of representation (encoding). This suggests that, although possessing independent rules and primitives, and information specific to each level of representation, certain representations in the model do depend upon others. The dependency relation is clear: encoding depends upon formulation, since no computation at the latter means no computation at the former.6

Therefore, all computation in the grammar starts off with pragmatics, and it is only in (restricted) bottom-up feedback processes that encoding actually interfaces with formulation and the mapping direction is reversed. Note however that lower levels may start computing as soon as enough information is fed by higher levels (incremental processing or “depth first principle”, Hengeveld & Mackenzie 2008: 23-25). This approach can be named “pragmato-semantocentric”7 and implies that the model accords priority, both conceptually and architecturally, to formulation levels of representation. These characteristics are, default case-scenario, typical of a derivational model whose levels depend upon each other. The

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6 This does not exclude purely idiosyncratic morphological, syntactic, or phonological features which the model may exhibit (expletives, syntactic agreement, allomorphy, linear order, etc.).

7 Note that the pragmatic and semantic levels of representation can be processed in tandem (Hengeveld & Smit 2009).
model seems therefore to exhibit a hybrid approach to derivationality. The top-down, function-to-form approach whereby function levels necessarily precede, motivate, and are translated into formal levels coexists with no fixed, pre-defined correspondences between units at unique levels of representation that may interface in a flexible manner and thus show mismatches. These features will be accommodated into the 3 Ds in the following chapters.

**Figure 8. FDG as the grammatical component of a wider theory of verbal interaction**

### 1.7 EXPECTED RESULTS: THE DOMINO EFFECT

This study offers a metatheoretical approach to three models of grammar that represent, in differing ways, the same object of study, language. A theory of language is thus seen as the
formalized methodology with which a linguist chooses to approach its object of study. In this light, the expected results are two-fold. Firstly, a clear co-relation is to be expected between the different grammatical formalizations according to the classifying parameters introduced in section 1.5 above, on the one hand, and the respective theory’s ability to avoid purely theory-internal devices yielding redundancy and abstractness, on the other. The non-derivational nature of models showing inter-level mismatches is expected to show a lesser degree of representational redundancy and abstractness, which is here considered, given the theory-internal nature of both features, as a main architectural advantage on the way toward architectural adequacy. This will in turn offer the possibility of suggesting potential implementations in order to reduce such theory-driven allowances. Since a close relation between all architectural parameters introduced in section 1.5 is also to be foreseen, architectural-driven theoretical devices are expected to have far-reaching design consequences.

Secondly, a domino effect is expected to arise between a model’s approach to the three dimensions of Distribution, Derivationality and Directionality such that, in the default case scenario, the distribution of linguistic information may limit the choice as to possible derivational processes at, say, the syntax-semantic interface and the choice of a derivational model will compulsorily lead to a pre-determined Directionality of interfaces. It is expected, however, that a non-default violation of the domino effect between the 3 Ds may arise in that a single formalism may show features of Distribution, Derivationality and Directionality traditionally identified with opposing architectural tendencies of the syntax-semantics interface. The compatibility between derivationality, or of the establishment of inter-level hierarchies, on the one hand, and mismatch toleration, on the other (a clash between traditional derivationality and directionality) is thus expected to show contradicting results as to the domino effect between architectural parameters taking place in most linguistic trends.