Interfaces in a biolinguistic perspective

Anna Maria Di Sciullo
UQAM

The purpose of this book is to contribute to the understanding of the points of contact between the Faculty of Language and the external systems, semantic and sensorimotor. The Chapters bring to the fore biolinguistic questions pertaining to the properties of the language design, in the sense of Chomsky (2005), namely the genetic endowment, experience, and factors reducing complexity.

The book is organized in five sections, covering syntax-semantic phenomena, the role of features for interface legibility, the properties of the phonological system, language development and experimental studies.

The Chapters in the first section discuss the properties of the units of computation at the syntax-semantic interface. The second section includes papers on the role of features in syntactic computation and the effect of feature-based derivations on interface legibility. In the third section, the chapters address basic questions on the elemental properties of the phonological system, and their incidence on the emergence of the Faculty of Language in the narrow sense (FLN) (Hauser, Chomsky & Fitch 2002). In the fourth section, two papers on language development and language variation discuss the role of external factors in language development. Results from brain imaging and parsing are reported in the chapters of the last section on experimental studies. These chapters also address questions related to the properties of the interfaces, as well as they discuss the role of the principles reducing complexity.

The theoretical proposals and the discussion of results from experimental studies present genuine contributions to the Biolinguistic program. They contribute to our understanding of the properties of the interfaces derived by the computations of FLN, viewed as an organ of human biology. The chapters add to the usual notion of interfaces, which is generally understood as the connection between the semantic system on the one hand and the sensorimotor system on the other. They raise novel interface questions on how these connections are possible at all. They anchor the formal properties of grammar at the interfaces between language and biology, language and experience, as well as factors reducing complexity.
The following paragraphs present each chapter, point out how they are related to one another, and how taken as a whole they contribute to our understanding of FLN and its interfaces with the external systems.

1. Syntax, semantics

The first section includes contributions from Howard Lasnik, Tim Hunter and Paul Pietroski. The three chapters address issues related to principles regulating the derivations of FLN, as well as more general issues pertaining to the mapping of syntactic expressions onto logical forms. By doing so they raise fundamental questions on the nature of FLN and its interfaces with the semantic system, addressing the central biolinguistic questions on the properties of the genetic endowment of human language. The discussions on the properties of the form of the operations and the derivations on FLN contribute to theoretical biolinguistics. They are briefly presented below.

In 'A surprising consequence of single cycle syntax', Howard Lasnik discusses phenomena that have been dealt with in terms of quantifier lowering, which falls into the class of improper movements. While different accounts are available for the phenomena, Lasnik argues that the single syntax of Lasnik (1972), a precursor of the multiple spell-out syntax (Uraigereka 1999), prevents quantifier lowering rather than allows it. Under this view, quantifier scope is determined cyclically, but as part of the syntactic cycle, not as part of a later LF cycle. The apparent lowered readings of indefinites are argued to follow from the fact that indefinites can be assigned their scopes without QR, via existential closure, as in Reinhart (1997).

In 'Syntactic effects of conjunctivists interpretation' Tim Hunter discusses a possible Universal Grammar constraint on remnant movement: the Just Outside Constraint (JOC). This constraint is a consequence of previous work (Hunter 2010) aiming at the unification of adjunct island effects and freezing effects, as well as the ruling out of all extraction from adjuncts and from moved constituents. The proposal is based on the hypothesis that the language design provides the simplest syntactic structures that can be interpreted in a restrictive theory of semantic composition by the mapping of syntactic structures into neo-Davidsonian logical forms.

In 'Language and conceptual reanalysis', Paul Pietroski argues that natural languages are also used to introduce formally new concepts, and that this is where the real cognitive utility of the human faculty of language (HFL) lies. While Frege introduced logically interesting concepts, such as saturation (functional composition) that let him explore the foundations of arithmetic, and many current theories assume that natural languages are similar in this respect, Pietroski posits
that HFL introduces logically boring but psychologically useful concepts that can be combined by means of simple (neo-Davidsonian) operations: restricted forms of conjunction, existential closure, and appeals to a few thematic concepts. The author discusses a range of facts suggesting that lexicalization is a formally creative process in which available concepts of various sorts are used to introduce concepts that are monadic and number-neutral.

The notion of simplicity of syntactic derivations in their mapping onto semantic representations ensures the connection between these papers. This notion plays a central notion in the Minimalist Program as well as in Biolinguistics. While the reduction of the technical apparatus of the grammar is a means of achieving greater explanatory adequacy in Minimalism, the reduction of the formal apparatus defining the operations and the derivation of the FLN may lead to a better understanding of the emergence and the development of language. Interestingly, the papers in this section also lead to posit the question on the properties of the mapping of the syntactic units of the derivation onto their semantic interpretation. Viewed in a biolinguistic perspective, it might be the case that simple mapping could be preferred for reasons of efficiency.

2. Features and interfaces

The second section includes three papers on the role of functional features at the syntax-semantic interface. The first chapter, by Dana Isac, derives Force from the interaction of independently needed functional features. The second chapter, by Christina Christodoulou and Marina Wiltschko, offers an account of the semantics of the subjective marker na in Greek by allowing flexible feature valuation. The third chapter, by Atsushi Fujimori, exploits the featural representation of lexical aspect in the analysis of vowel alternations in Japanese verbs.

In 'An exercise in syntactic (de)composition', Dana Isac proposes that Imperative Force is not encoded in the syntax as an atomic syntactic feature, but is instead a derivative notion which results from the semantic composition of more primitive components, which are in turn in a one-to-one correspondence with syntactic features. This leads to the unification of apparently disparate phenomena, such as Clause typing, Focalization and Topicalization, by potentially revealing primitive features that various clauses share with Topic and Focus, that have been shown to be 'composite' in a similar way. This kind of analysis has consequences for the theoretical choice between the assumption that each morpho-syntactic feature corresponds to an independent syntactic head, and the assumption that multiple syntactic features synchronically coexist on one syntactic node.
In ‘Function without content. Evidence from Greek subjunctive na’ Christina Christodoulou and Martina Wilschko observe that the subjunctive marker na in Greek is used in a variety of seemingly distinct environments, including clauses embedded under future oriented predicates, realis and counterfactual conditionals, as well as in main clauses which are used as requests, orders, wishes or desires. The authors aim to develop a unified analysis of na. They assume that INFL is intrinsically associated with an unvalued coincidence feature, which must be valued in the course of the derivation. In the absence of substantive morpho-syntactic feature valuation, INFL may be valued by the embedding predicate. It is proposed that na spells out an unvalued coincidence feature in INFL in the absence of morphosyntactic valuation from below. The dependent character of subjunctive na derives from INFL’s requirement to be valued. Since the unvalued coincidence feature must be valued, it requires external valuation. But there is neither restriction on the category or content of the embedding predicate nor on the positive or negative value of the coincidence feature. This flexibility is claimed to be responsible for the seemingly distinct interpretations associated with na.

In ‘The patterns of associating sounds with meanings: the case of telicity’ Atsushi Fujimori relies on a feature based approach to lexical aspect, in which telicity takes the form of binary features, as discussed in Di Sciullo (2005), and related works. The author addresses the relation between vowel quality and telicity features in Japanese monosyllabic verbs. A verb containing the vowel /e/ or /u/ denotes a telic event while a verb containing the vowel /i/ or /o/ denotes an atelic event. The relation holds between existing verbs and nonce verbs, as shown in two experiments with native speakers. The author establishes some relations with causatives and telicity alternations in other languages (Arabic, Malagasy and Russian) to sketch the beginnings of a typology.

These chapters are related to one another as they assume a feature based derivation and interpretation. They also aim to define grammatical systems where feature economy prevails. Independently needed features combine to check imperative Force according to Isaac’s proposal. INFL consistently functions as an anchoring category via its intrinsic coincidence feature, while its substantive content varies across constructions. However, while there is a one-to-one mapping between syntactic and semantic features in Isaac’s account of the featural analysis of Force, there is no one-to-one correspondence between the syntactic contexts and the semantic interpretation in Christodoulou and Wilschko’s analysis of the subjunctive marker na in Greek. These papers, while developing a feature checking approach to syntactic derivations provide different view points on the properties of the syntax-semantic interface. Further work is needed to understand these properties and how language variation follows from a featural
approach. The last chapter of this section links the feature analysis of lexical aspect to vowel alternations in Japanese as well as in other languages.

The chapters of the second section of this book address the question of the elements of the computational procedure enabling interpretable features to be legible by the interfaces. Feature checking/valuation as a formal property of the computational procedure of FLN opens new biolinguistic questions. One of these questions concerns the role of features versus the role of categories in derivations, and what would their biological correlate be. A biolinguistic approach to the issues related to features and labels may illuminate the debate on either category-free syntax or feature-free derivations.

3. Phonology, syntax

The nature of the relations between phonology and syntax is also a topic of interest in current Biolinguistic research. The chapters in this section take different views. The first chapter, by Charles Reiss, considers phonology on a par with syntax and argues for a theory of phonological typology that relies on feature underspecification. The arguments are based on simplicity and coverage. The second paper, by Bridget B. Samuels, takes the view that syntax emerged when the building blocks of the phonological system were already in place.

In 'Towards a bottom up approach to phonological typology', Charles Reiss presents two arguments that bear on the typological adequacy of current phonological theory. Reiss argues that a model with underspecification could be thought of as simpler than a model without. Underspecification may allow phonological theory to include fewer features than a phonological theory where all the features have to be specified. Furthermore, the author argues that a phonological theory including underspecification should be preferred over a theory that dispenses with this device on the grounds of simplicity. These arguments in favor of underspecification in phonology comply with Chomsky's (2007) bottom-up approach of Minimalism, where a simple theory of UG provides for a greater richness of descriptive power than previously suspected. Furthermore, they are compatible with the biolinguistic program, according to which the reduction of the role of the genetic endowment in the development of an organism, here UG, can ease the study of its development.

The purpose of 'Phonological forms: from ferrets to fingers', is to situate phonology within this emerging picture of the language faculty, the emergence of syntax, and specifically to investigate how much of phonological operations/representations can be explained by properties of general cognition and the
sensorimotor system. The author endorses the conception of phonology as a highly abstract, modality independent computational system consisting of a few primitive operations, namely searching, copying, and concatenation, which are shared with narrow syntax and other cognitive domains. Samuels' approach comes from two different angles: from behavioral and physiological studies on animal cognition, and from sign language phonology. The author provides evidence from sign language and from animal cognition that the perception of a discrete phonological signal relies heavily on abilities humans share with other mammals. These arguments would support the view that the building blocks of the phonological system, features and categories, were present prior to the emergence of syntax.

The chapters of the third section of this book address the question of the simplicity of the phonological system from a biolinguistic perspective. They contribute to the understanding of the nature of human language phonological system, and what elements of the phonological signal would have preceded syntax.

4. Language development

The two chapters of this section aim to contribute to the understanding of language development and variation from a biolinguistic perspective.

In 'Non-native acquisition from a biolinguistic perspective', Calixto Aguero addresses the question of whether the Critical Period Hypothesis (CPH) (Penfield & Roberts 1959; Lenneberg 1967) is or not undermined by the fact that humans may acquire a second language later on in life. The CPH has been questioned in the field of non-native acquisition. In some cases the L2 speakers' knowledge of the L2 cannot be attributed to their knowledge of the L1, and in the case of typologically very different languages, neither can this knowledge be attributed to the nature of the input of the L2. The implication of these studies is that non-native acquisition must be constrained by UG without the mediation of the L1, contra the CPH. Aguero argues that the effect of the Overt Pronoun Constraint (OPC) in an L2 by speakers whose L1 lacks overt pronouns, that has been claimed to be a central argument against the CPH, actually falls into the set of third-factor principles, which are language independent (Chomsky 2005). He argues that in an architecture of the language faculty in which parametric variation is restricted to certain aspects of the lexicon, it is quite possible to defend the Lenneberg's version of the CPH, once we factor out the effect of language independent principles in constraining knowledge of an L2.

In 'Interface ingredients of dialect design: Bi-x, socio-Syntax of development, and the grammar of Cypriot Greek' Kleanthes Grohman and Evelina Leivada
focus on the syntax of first language development targeting the child’s acquisition of the morpho-syntactic properties of the mother-tongue, here the Cypriot variety of Modern Greek (Cypriot Greek). Assuming, as it is the case in Generative Grammar, that dialects are languages, i.e. a system of abstract rules that govern a speaker’s I(nternalized)-language, Greek Cypriot children typically grow up acquiring their native variety, and it is only at the onset of formal schooling, around the ages 5 to 6, that the ‘proper’ language is being used, largely through instruction. The developmental part of this talk presents some systematic research carried out with a special emphasis on the socio-syntax of development hypothesis applied to the acquisition of clitic placement, drawing from experimental data with typically developing children aged 2 to 7 and children with (specific) language impairment.

Notwithstanding the fact that they address issues related to first language acquisition on the one hand and second language acquisition on the other, these chapters are related in that they both focus on the role of external factors reducing complexity in language development. Aguero’s chapter addresses the question whether second language acquisition presents a challenge to the Critical Period Hypothesis. The author argues that this is not the case, showing that revisiting the nature of a grammatical constraint on the second language acquisition of pronouns as being language independent, and thus falling into the set of third-factor principles in the sense of Chomsky (2005), not only allows for a better understanding of the facts, but also maintains the Critical Period Hypothesis. Grohman and Leivada’s paper considers the continuum that informs the process of first language acquisition in a dialectal context. The acquisition of clitic placement in Cypriot Greek is approached from the point where language-external factors affect the way language is put to use through choosing one out of a range of gradient syntactic variants that belong to different varieties existing in a continuum.

5. Experimental studies

Brain imaging studies and computer-based experiments on language processing and parsing provide measurable brain and computer-based data bearing on the computational procedure of FLN as well as on the properties of the interfaces with the external systems. Experimental studies provide valuable results for the biolinguistic understanding of the Faculty of Language and its interfaces.

In 'Experimental evidence from sign languages for a phonology-syntactic-semantics interface': Evie Malaia and Ronnie B. Wilbur report results from motion
capture experiments and fMRI indicating that sign language provides insights into neurobiology of language. The experiments show that sign languages utilize physical properties of movement to represent event structure at the syntax-semantics-phonology interface, as evident from verb sign production and neural activity during comprehension. Grammaticalization of distinctions in physical/action characteristics for lexical purposes enables learners to use existing visual system capabilities and fine-tune them through experience with signed input, thus permitting rapid and early neural, cognitive, and linguistic development to proceed on schedule, despite the use of the visual modality.

In 'Indeterminacy and coercion effects: minimal representations with pragmatic enrichment' Roberto De Almeida and Levi Riven discuss sentences such as 'John began the book,' often said to license an interpretation that includes a predicate such as 'reading,' which is 'interpolated' in semantic representation, thus yielding 'John began reading the book.' Several psycholinguistic and neurolinguistic experiments have shown that sentences with aspectual verbs such as 'begin' engender longer reading times. De Almeida and Riven discuss fMRI data suggesting that coercion effects are the products of pragmatic inferences. The authors defend a view of semantic interpretation guided by structural properties of token sentences, with structural markers operating as pragmatic triggers for inferences that occur largely outside the linguistic domain.

In 'Computation with doubling constituents: Pronouns and antecedents in Phase Theory,' Sandiway Fong and Jason Ginsburg develop a computational implementation of Binding theory compatible with basic assumptions of the Minimalist/Biolinguistic Program. One of these assumptions is that the operations of the Faculty of Language are reduced to the minimum. Another assumption is that the computational procedure is efficient. Inspired by Chomsky's probe-goal system (2000, 2001) and Kayne's (2002) doubling constituent proposal for pronoun-antecedent coreference relations, Fong and Ginsburg develop a computational implementation for pronoun-antecedent coreference relations and show how the computational implementation can derive the classic asymmetry in distribution between pronouns and anaphors for mono- and bi-clausal sentences, ECM, picture NPs and other constructions.

In 'Concealed reference-set computation: how syntax escapes the parser's clutches' Thomas Graf raises the question whether trans-derivational constraints add to the computational load of syntactic derivations. According to Graf, syntax does not necessarily have to obey interface requirements yet must not violate them, either. He demonstrates that Fewest Steps, which is a transderivational constraint introduced in Chomsky (1995), can be modeled by rational relations. The author argues that some reference-set constraints do not increase the power of the syntactic machinery, which entails that they can be replaced by local constraints. This
kind of concealed reference-set computation is allowed to persist in syntax despite opposing interface requirements.

The experimental results assembled in this last section are telling with respect to the properties of the interfaces, and they address the biolinguistic question on the properties of the principles reducing derivational complexity. Motion capture experiments and fMRI data indicate that naturally-evolved sign languages are shown to be perfectly adapted to the human visual system. Psycholinguistic and neuroimaging (fMRI) data support the view that the sentence enrichment occurs beyond linguistic computations per se, at the interface between syntax and pragmatics. Computer-based parsing experiments show that the Last Resort variant of Merge maintains the computational efficiency of the probe-goal system in that it operates precisely at the limit of probe-goal search domains and it does not introduce any additional choice points into the instruction stream. Moreover, it might be the case that certain kinds of concealed reference-set computation, such as Fewest Steps, does increase computational complexity as well as they do not violate interface locality requirements.

Taken as a whole the chapters of this book constitute a unified set. They address interface issues related to the formal properties of the computational procedure, as well as they discuss the role of external factors reducing complexity in language development and parsing. They contribute to our understanding of the notion of interfaces from a biolinguistic perspective.

Acknowledgements

We would like to mention that the issues related to a biolinguistic understanding of interfaces in Language design are central to the research project funded by the Social Sciences and Humanities Research Council of Canada, whose aid to research we gratefully acknowledge: a Major Collaborative Research Initiative on Les asymétries d'interfaces et le traitement cognitif (SSHRC#412-2003-1003); as well as to the research project funded by the Fonds de recherche du Québec on Interfaces dynamiques (FQRSC#103690), both directed by Anna Maria Di Sciullo.

We would like to thank the University of Quebec in Montreal for hosting the 4th International conference organized by the Biolinguistic Network on the theme of the Language Design, as well as Calin Batorii, Stanca Somesfaelean, Gustavo Beritognolo, Catherine Provencher and Marco Nicolis for their help in the organization of the conference.

Finally, we would like to thank the contributors, the external reviewers, namely Roberta d'Alessandro, Margaret Speas, Elisabeth Ritter, Manuela Ambar, Thomas Leeu, Gregory Kobele, John Heinz, Michael Kenstowicz, Harry van der Hulst, Henriette De Swart, Tom Bever, Jaklin KomfiI', Angela Ralli, Michael Friesner, Jon Brennan, Henk Harkema, Collin Philips, Robert Freidin, Fritz Newmeyer, the series editors Elly van Gelderen and Werner Abraham, as well as Kees Vaes and Susan Hendriks.
References


