

Introduction*

Human languages are inextricably a part of our mind/brain. No other animal has a comparable ability with the same complexity and richness that humans do. An important research goal is to better understand this ability for language: What is it that enables human to acquire and use language the way we do? One way of answering this is to argue that there are aspects of our biology that enable us to acquire and use language. This has been the answer that in modern times has been advocated by generative grammar, in particular in approaches developed based on work by Noam Chomsky (1965, 1986, 2009), although its origins are much older. This approach holds that there are universal aspects of language that all humans share. However, it is at the same time evident that languages also differ: A child growing up in Japan will acquire Japanese whereas a child growing up in Norway will acquire Norwegian. An adequate theory of human language needs to be able to account for both possibly universals and language variation. However, a core question is what such an adequate theory may look like.

This volume consists of essays that adopt a formal approach to linguistic variation and applies it in different areas: syntactic variation in synchronic grammars, the interface between syntax and semantics, and aspects of the grammar of multilingual individuals. In this introduction, these general themes will be discussed, albeit briefly, before a summary of the individual chapters is provided.

A formal approach to grammar

Formal and generative linguists are concerned with developing formal descriptions of the structures of human language. In some of his earliest work, Chomsky (1955, 1957), drawing

* I am grateful to Artemis Alexiadou for helpful comments on this introduction.

on Harris (1951), developed phrase-structural analyses for a fragment of English. For example, the grammar in (2) can be utilized to generate the derivation in (3), yielding the sentence in (1).

(1) Linda sings.

(2) a. Designated initial symbol (Σ): S

b. Rewrite rules (F):

S \rightarrow NP VP

NP \rightarrow N

VP \rightarrow V

N \rightarrow Linda

V \rightarrow sings

(3) a. Line 1: S

b. Line 2: NP VP

c. Line 3: N VP

d. Line 4: N V

e. Line 5: N sings

f. Line 6: Linda sings

Importantly, Chomsky introduced a level of abstract structure that was not present in earlier work. We see that in rewrite rules that utilize structure independently of the words (e.g., NP \rightarrow N). In all modern work on formal grammars, an important research question has been the number of levels of representation and their nature. The formal details of this abstractness has changed as new approaches have emerged, but the existence of abstraction has always been a staple of formal approaches to grammar.

Questions soon emerged regarding what phrase-structural grammars are describing. Chomsky (1959, 1965) argues that formal should describe the competence of the native speaker, that is, it should characterize the mental grammars that each of us have internalized. In order to develop this line of reasoning, Chomsky (1965) distinguishes between descriptive and explanatory adequacy. A descriptively adequate grammar is a grammar that correctly describes the set of sentences that are grammatical, while also ruling out those sentences that are ungrammatical. Explanatory adequacy is characterized as follows:

To the extent that a linguistic theory succeeds in selecting a descriptively adequate grammar on the basis of primary linguistic data, we can say that it meets the condition of explanatory adequacy. That is, to this extent, it offers an explanation for the intuition of the native speaker on the basis of an empirical hypothesis concerning the innate predisposition of the child to develop a certain kind of theory to deal with the evidence presented to him (Chomsky 1965: 25-26).

This displays a clear mental perspective on language whereby language is an aspect of the mind/brain. Formal linguistics, then, need to develop models of grammars that both respond to the descriptive generalizations and how this grammar can be selected based on available data and prior structure in a human being.

A crucial concept in the present tradition is the notion of an I-language. The notion is due to Chomsky (1986), but also goes back to Church's (1941) formalization of the lambda calculus. Chomsky (1986) distinguishes I-language from E-language, whereby the latter describes language use and aspects of language that are external to the mind and to the speaker. Notions such as "English" and "Norwegian" are typical examples of E-language, and so are corpora and other data collections. E-language constitutes the data from which I-

language can be distilled. The “I” connotes “individual”, “internal” and “intensional”. The first two notions make it clear that language is a psychological or mental existence in each and one of us. The last notion, that it is intensional, is more complex. This is the notion that relates to Church (1941) and his formalizations of functions. Church distinguishes between a function in extension and a function in intension. Roughly put, these can be thought of as “output” and “input”, respectively. A simplified example may serve as an illustration.

Consider the following two functions in (4).

$$(4) \quad \begin{array}{ll} \text{a.} & f(x) = x + 2 \\ \text{b.} & f(y) = 10 - y \end{array}$$

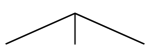
For a given value of x and y , say 4, both functions yield the same result:

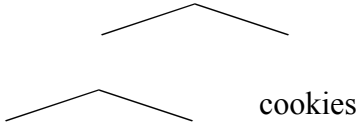
$$(5) \quad \begin{array}{ll} \text{a.} & f(4) = 4 + 2 = 6 \\ \text{b.} & f(4) = 10 - 4 = 6 \end{array}$$

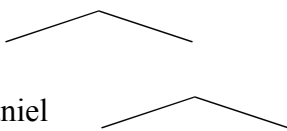
With Church, we can say that the extension of the functions is the same in (5). However, the intensions of the functions are *not* the same: In one case there is addition, in another case subtraction. The goal of an I-language approach to the study of language is to determine what the intensional function is, not just the extensional output. Consider the sentence in (6).

(6) Daniel likes cookies.

This particular sentence can be considered the extension of a function. There is a range of different analyses that could be given for this sentence. (7) provides three different analyses.

(7) a. 
Daniel likes cookies

b. 
Daniel likes cookies

c. 
Daniel likes cookies

Formal generative work has uncovered that among the alternatives in (6), the structural relations depicted in (6c) are the most accurate ones (though see Borer 2005 and Lohndal 2014, among many others, for yet another alternative). Determining what the intensional function is, that is, what the accurate formal structural analysis is for natural language, is a crucial part of the generative enterprise as developed by Chomsky and many others.

Language variation

In Chomsky & Lasnik (1977) and Chomsky (1981), a specific theory of I-language was developed which became known as the Principles and Parameters theory. On this view, there are universal principles that hold across all languages and limited variation that is encoded by way of parameters. In the words of Chomsky (1981: 6), “[i]deally we hope to find that complexes of properties [...] are reducible to a single parameter, fixed in one or another

way”. Such a model is substantially different from earlier approaches, where universal grammar was a specification of an infinite array of possible grammars. On that view, explanatory adequacy required a presumably unfeasible search procedure to find the highest-valued grammar based on the relevant input (primary linguistic data). The Principles and Parameters approach eliminated the necessity of such a search procedure.

Since then there has been a lot of discussion concerning the nature and structure of parameters (see, among many, Borer 1984, Chomsky 1995, Baker 1996, 2001, 2008, Kayne 2005, Newmeyer 2005, Fukui 2006, Biberauer 2008, Biberauer and Roberts 2012, 2016, Westergaard 2013, Alexiadou 2014 for expositions based on different empirical domains). Two main proposals have emerged: the macroparametric and the microparametric view.

The macroparametric view holds that there are major parameters that distinguish languages from each other and that parametric properties are linked by way of implications (see e.g., Baker 1996 on polysynthesis and Hale 1982 on the non-configurationality parameter). Consider e.g., the proposal in Rizzi (1982) for the null subject parameter. Rizzi argues that the following properties correlate: thematic null subjects, null expletives, free inversion, and *that*-trace effects. Since then it has become clear that clustering effects are not as strong as originally thought (see e.g., Newmeyer 2005 and Biberauer 2008). However, a different way of developing the intuitions behind a macroparametric approach is provided in Biberauer & Roberts (2012, 2016). They suggest parameters come in different sizes and that there is a cross-linguistic taxonomy for parameters. (8) shows this based on Biberauer & Roberts (2016: 260).

- (8) For a given value v_i of a parametrically variant feature F:
- a. **Macroparameters:** all functional heads of the relevant type share v_i ;

- b. **Mesoparameters:** all functional heads of a given naturally definable class, e.g. [+V], share v_i ;
- c. **Microparameters:** a small subclass of functional heads (e.g. modal auxiliaries) shows v_i ;
- d. **Nanoparameters:** one or more individual lexical items is/are specified for v_i .

This view fits better with the cross-linguistic generalizations and it also makes more accurate predictions concerning the structure of linguistic variation.

A different take on linguistic variation is the Lexical Parametrization Hypothesis (Borer 1984, and since adopted and developed by many others), locating variation in the features of particular items. Since then, functional heads have become a very important locus for parametric variation (e.g., Kayne 2005). The major appeal of this view is that it puts the acquisition of variation on a similar footing as the acquisition of lexical items, and furthermore, that this view would be sensitive to fine-masked differences between languages.

Yet another view is the view of Westergaard (2013, 2014) where parameters are replaced by micro-cues (originally a development of the cue-based approach in Lightfoot 1999, see also Fodor 1998 and Dresher 1999). Micro-cues are small pieces of abstract structure that emerge from children parsing the input. Universal grammar is the ability to parse the input, whereas the specific micro-cues emerge through parsing and input together. The size of a micro-cue is a relevant question, but work done by Westergaard and others already suggests that these cues come in different sizes.

Despite the various approaches and proposals, there is a consensus that the basic idea still holds: Certain aspects of language are universal, and a range of other properties vary in limited ways. This idea is also what distinguishes chomskyan generative grammar from all

other approaches to language and grammar, as most other approaches hold that there is no universality related to language per se.

In order to further our understanding of the space of variation, it is necessary to both compare languages that are typologically very different, and languages that are not very different. The present volume draws together papers that primarily scrutinize differences between two closely related languages, namely English and Norwegian. By comparing languages that are closely related both structurally and in terms of heritage, it is possible to more easily isolate fine-grained properties that differ, and thereby also understand exactly where grammars vary and where they do not vary. Several chapters scrutinize various empirical puzzles and demonstrate how these illuminate theory and model construction.

The syntax-semantics interface

Ever since the first work within generative grammar, a major concern has been the relationship between syntactic representations and the meaning of these representations.

Chomsky outlines the importance already in *Syntactic Structures*:

In proposing that syntactic structure can provide a certain insight into problems of meaning and understanding we have entered onto dangerous ground. There is no aspect of linguistic study more subject to confusion and more in need of clear and careful formulation than that which deals with the points of connection between syntax and semantics (Chomsky 1957: 93).

A leading intuition in much work has been that the semantic component “reads off” the syntactic representations. Put differently, semantic interpretation takes the syntactic structure as its input and respects its relations. This view is often called “interpretive semantics” as

opposed to a semantics with its own principles and rules, often called “generative semantics” (see e.g., Chomsky 1965 vs. Lakoff 1971).

The details of how the semantic interpretation takes place have been the subject of much debate. A major view is the approach that first was implemented by Montague (1974) for fragments of English (see also Partee 1975). This was a model-theoretic approach to semantics building on the foundational work by Frege and Tarski. The main textbook version of this approach is the one outlined in Heim & Kratzer (1998), where syntactic structures are interpreted by way of a formal semantics model with its own and independent principles. In modern developments of this approach, the syntax-semantics interface is not entirely transparent, as both the syntax and the semantics allow you to adjust the relevant representations.

An alternative approach is the one outlined in Davidson (1967), which is motivated based on sentences such as (9), based on Davidson (1967: 82).

(9) Jones buttered the toast slowly in the bathroom with a knife at midnight.

Davidson argues that all the adverbial modifiers have an event variable, which derives the entailment that (9) entails (10).

- (10)
- a. Jones buttered the toast slowly in the bathroom with a knife.
 - b. Jones buttered the toast slowly in the bathroom.
 - c. Jones buttered the toast slowly.
 - d. Jones buttered the toast.

Davidson argues that the logical form consists of conjuncts of event predicates. Later on, scholars have developed this further to be a general principle of semantic composition, by arguing that concatenation signifies conjunction (see Pietroski 2005 for much discussion). Most of this work has not addressed the question of what the syntax underlying conjunctive logical forms look like, although recent work has started to address this issue (see e.g., Borer 2005, Lohndal 2014).

In addition to much discussion of the correct characterization of meaning, there has also been a lot of work on argument structure which has argued that certain semantic relations are encoded in the syntax. Since Chomsky (1995), Harley (1995) and Kratzer (1996), researchers have argued that the Agent is introduced by a dedicated functional projection, VoiceP or *v*P (Alexiadou, Anagnostopoulou and Schäfer 2006, 2015, Folli & Harley 2007, Merchant 2013), distinguishing between the external and all the internal arguments (Williams 1981, Marantz 1984). Much work has since extended this to hold of all arguments, meaning that every argument is introduced by a dedicated projection (Borer 2005ab, 2013, Ramchand 2008, Bowers 2010, Lohndal 2012, 2014). Put differently, syntactic structure is essential for determining argument structure. Marantz (2013: 153) summarizes recent developments as follows:

[current developments in linguistic theory] have shifted discussion away from verb classes and verb-centered argument structure to the detailed analysis of the way that structure is used to convey meaning in language, with verbs being integrated into the structure/meaning relations by contributing semantic content, mainly associated with their roots, to subparts of a structured meaning representation.

On this view, the syntax transparently provides the correct relations for semantic interpretation to take place.

In the current volume, several chapters discuss issues relevant for modeling the syntax-semantics interface. They are especially concerned with negation, interrogatives, and argument structure.

Formal grammar and multilingualism

Chomsky (1965) makes a much-cited idealization concerning the object of study:

Linguistic theory is concerned primarily with an ideal speaker-listener, in a completely homogeneous speech-community, who knows its language perfectly and is unaffected by such grammatically irrelevant conditions as memory limitations, distractions, shifts of attention and interest, and errors (random or characteristic) in applying his knowledge of the language in actual performance (Chomsky 1965: 3).

This idealization has been very helpful for uncovering a range of important generalizations which in turn have contributed to a better theoretical understanding of human language in general. However, we know that probably the majority of speakers in the world are multilingual in some way or other. There has been a lot of generative work on second language acquisition (see e.g., Hawkins 2001, White 2003, Slabakova 2016), although less general work on the grammatical representations in multilingual individuals. Formal models and theories should also be able to account for multiple mental grammars within the same individual, as the way in which these emerge, are put to use, and possibly interact also constitute possible human grammatical patterns and rules. That is, multiple I-languages within the same individual are just as important as a single I-language within an individual is.

In addition to formal work on second language acquisition, there has also been continuous work on code switching or language mixing from a Chomskyan generative point of view (see e.g., Sankoff & Poplack 1981, Woolford 1983, Di Sciullo, Muysken & Singh 1986; Belazi, Rubin & Toribio 1994, MacSwan 1999, 2000, 2005, Muysken 2000, van Gelderen & MacSwan 2008, González-Vilbazo & López 2011, Alexiadou, Lohndal, Áfarli & Grimstad 2015). This work has proven very interesting because mixing data address the nature of interacting grammars and what their possible restrictions are.

However, one question which has so far not been scrutinized is the question of what the smallest units that can be mixed are. Data such as (11) show that mixing clearly goes beyond the word-level.

- (11) det andre crew-et (Haugen 1953: 571)
the.N other crew-DF.SG.N
'the other crew'

In (11), the noun *crew* has received the Norwegian inflection for neuter nouns, meaning that i) the noun has been assigned grammatical gender, and ii) there is language mixing within the word-level (pace MacSwan 1999, 2000, 2005). However, is it a category-less root that is mixed, or is it a stem that is already categorized as a noun? That is an important and yet unresolved question, though one chapter in the present volume addresses the question. See also Alexiadou, Lohndal, Áfarli & Grimstad (2015) for a different perspective.

Chapters in this book address three different issues: why multilingual data are important for formal models, what multilingual data can say about modeling that monolingual data do not address, how a formal model can account for various patterns of

word-internal language mixing, and how grammatical gender systems may change in heritage populations.

Three parts: Transformations, interface, and multilingualism

The present volume is organized in three different parts, which will now be reviewed and contextualized.

Part A: Transformational Constraints

Since Harris (1951) and Chomsky (1955, 1957), transformations have been a crucial part of formal grammar. Often scholars think of transformations as denoting syntactic movement processes, but the headline here has been chosen because originally transformations were richer and denoted what we today would label “syntactic operations”. This part of the volume is therefore concerned with constraints on syntactic operations, although the majority of the case studies are focusing on restrictions on what and when you can move a constituent in a syntactic structure.

The first chapter (co-authored with Howard Lasnik), despite its title, provides a rather lengthy and comprehensive discussion of the history of generative grammar, mainly in the tradition emerging from Chomsky’s work. It expands on the issues discussed all too briefly in this discussion and attempts to show the major lines of development from the 1950’s until today. The major topics are covered: How generative grammar emerged and developed in the beginning, how theories of phrase structure have developed, in addition to other core notions such as the syntax-semantics interface, filters, derivations vs. representations, and economy. An important point argued for in this chapter is that there is a lot of continuity within chomskyan generative grammar despite its changing formal apparatus. For that reason, the

chapter focuses on the general and overall theoretical ideas and principles rather than in depth discussion of specific empirical analyses.

There is no denying that Noam Chomsky (1928-) has been a pivotal figure in modern linguistics and arguably the most influential scholar within generative grammar. In part due to this, his ideas, position and influence are subject to often intense debate. Chapter 2 (again co-authored with Howard Lasnik) provides an annotated bibliography of Chomsky's work, both within linguistics and philosophy of language. It also includes work that is critical of Chomsky's ideas. Although by no means complete, the bibliography is hopefully a useful entry into the massive literature produce by and about Chomsky.

After these two more general chapters, a series of chapters follows which study restrictions on movement and syntactic dependencies more generally. A crucial question that is addressed is when movement is possible and when it is not possible, and in turn, why certain movements are not possible in certain languages. Chapter 3 considers the famous *that*-trace effect, which at least goes back to Perlmutter (1971). It begins by reviewing a specific proposal for how to analyze English and then extends this analysis to the Scandinavian languages. However, the chapter seeks to go beyond *that*-trace effects and deal with complementizer-trace effects more generally. This also includes an analysis of why relative clauses show a reversed *that*-trace effect. In chapter 4, aspects of the ideas developed in chapter 3 are developed much further and into a new empirical domain. The topic of chapter 4 is freezing effects as they relate to objects, both direct and indirect objects. A freezing effect is an instance where further movement is prohibited; the constituent is frozen in a specific position. Importantly, the analysis argued for crucially relies on a specific analysis on what we could call freezing effects for subjects, of which complementizer-trace effects would be one example.

In chapter 5, a very different set of phenomena are studied, namely instances where it seems like multiple members of a chain are pronounced. The focus of the chapter is instances of *wh*-movement where both various dialects/languages and developmental child language exhibits instances where the intermediate *wh*-constituent is pronounced. The paper looks at restrictions governing these data and provides an analysis which argues that the grammatical structures of developing children and adults should be analyzed differently.

Chapter 6 returns to the topic of subjects, although this time focuses exclusively on subjects that are sentential. The two main questions addressed are where sentential subjects are located in the sentential structure, and whether or not sentential subjects have the same structural position across languages. A detailed comparison of English and Norwegian illustrates that the answer to the latter question is negative: Sentential subjects occupy the canonical subject position in some languages whereas they occupy a special topic position in others.

The last chapter in part A, chapter 7 (co-authored with Liliane Haegeman), considers gapping in English and previously published analyses of this phenomenon. The chapter critically discusses the role of the left periphery of the clause in analyzing gapping, the main general concern being what restrictions there are on movement and how these should be formally implemented.

Part B: The syntax-semantics interface

Some of the chapters in this part are mostly concerned with the structures underlying semantic interpretation, whereas two of the chapters develop specific mapping hypotheses for the syntax-semantics interface.

The first two chapters in part B are concerned with negation and its structural representation. Chapter 8 (co-authored with Liliane Haegeman) scrutinizes what the correct

representation for negative concord in West Flemish is. West Flemish is important because it shows that there are restrictions on which negative words can go together, with implications for the general theoretical mechanism of Multiple Agree. The chapter argues against Multiple Agree on the grounds that it does not predict or derive the correct empirical generalizations.

Negation is also the topic of chapter 9 (co-authored with Karen De Clercq and Liliane Haegeman), this time based on corpus data from English. The paper demonstrates that medial non-negative adjunct PPs are attested in both American and British English, contrary to claims often made in the literature. Furthermore, the data show that medial negative adjunct PPs strongly outnumber postverbal negative adjunct PPs. In addition, the paper develops a syntactic analysis which relies on a polarity head in the left periphery.

Chapter 10 discusses the impact and development of Donald Davidson's original proposal that there is an event variable in the logical forms that encode meaning in natural languages (Davidson 1967). Originally, Davidson was concerned with adjuncts and their entailments, but this chapter demonstrates how these insights were extended to apply to thematic arguments. An important point is that there is a family of Neodavidsonian proposals that all have in common that they argue for logical forms that are Neodavidsonian in nature.

Aspects of the formal semantics used in Chapter 10 is also the topic of chapter 11. Chapter 11 (co-authored with Paul Pietroski) is a very long discussion of what an I-language semantics would look like for questions. The chapter relies on different semantic formalism than in the standard formal semantic literature (e.g., Heim & Kratzer 1998) and combines this with the syntax for questions provided in Cable (2010). In many ways, the paper can be conceived of as an initial case study of some phenomena and how these can be captured.

Part C: Multilingualism and formal grammar

This part of the book contains three chapters that all explore formal accounts of aspects of multilingualism. The chapters all focus on heritage languages, which can be defined as follows:

A language qualifies as a *heritage language* if it is a language spoken at home or otherwise readily available for young children, and crucially this language is not a dominant language of the larger (national) society. [...] From a purely linguistic point of view, we assume that an individual qualifies as a heritage speaker, if and only if he or she has some command of the heritage language acquired naturalistically (Rothman 2009: 156).

The heritage language in question is American Norwegian, which is a heritage variety of Norwegian spoken in the US since the 1850's.

Chapter 12 is an epistemological paper that seeks to justify why formal models should be able to account for individuals with multiple mental grammars. The chapter was originally a commentary on Benmamoun, Montrul & Polinsky (2013), and the goal was to show how multilingual data, notably data from heritage languages, can shed light on theoretical issues in syntax and morphology.

In chapter 13 (co-authored with Maren Berg Grimstad and Tor A. Åfarli), we argue that aspects of language mixing can be analyzed in a formal model that combines two different theories: An exoskeletal approach to grammar (e.g., Borer 2005ab, 2013, Lohndal 2014), and Distributed Morphology's notion of late insertion (Halle & Marantz 1993, Embick & Noyer 2007) can be straightforwardly extended to cover multilingual situations. The main empirical focus is on language mixing within verbs and nouns in the heritage language

American Norwegian, where we show how the model captures the main empirical mixing pattern: “Norwegian” functional morphology combined with “English” roots/stems.

The last chapter in the book, chapter 14 (co-authored with Marit Westergaard), investigates grammatical gender in the heritage language American Norwegian. Norwegian has the three genders masculine, feminine, and neuter, and this chapter shows that for many of the speakers of American Norwegian, this gender system has changed quite significantly: There is overgeneralization of masculine forms to both the feminine and the neuter. The chapter also proposes a way to distinguish between incomplete acquisition and attrition: The former should lead to systematic differences between the heritage variety and the non-heritage variety, whereas attrition will lead to general erosion and eventually complete loss.

In conclusion

Hopefully, this volume demonstrates the utility of comparative work on closely related varieties such as English and Norwegian. Taken together, it furthermore presents examples of the richness of formal approaches and what they cover empirically. The chapters illuminate both theoretical and formal models of grammar, how language variation speaks to such models, and lastly how these models have developed across time.

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