Universitetet i Tromsø
Fakultet for humaniora, samfunnsvitenskap og lærerutdanning
Institutt for språkvitenskap
Center for Advanced Study in Theoretical Linguistics (CASTL)

The No-Reference Hypothesis

A Modular Approach to the Syntax-Phonology Interface

—

Dragana Šurkalović

A dissertation for the degree of Philosophiae Doctor – June 2015

The No-Reference Hypothesis:

A Modular Approach to the Syntax-Phonology Interface

Dragana Šurkalović

A thesis submitted for the degree Philosophiae Doctor
University of Tromsø
Faculty of Humanities, Social Sciences and Education
Center for Advanced Study in Theoretical Linguistics (CASTL)
June, 2015

mami i tati s ljubavlju

Contents

Acknowledgements

The only reason these acknowledgements exist is the unending patience and understanding my supervisor, Martin Krämer, has granted me over the years. The journey here was a long one, the outcome was not certain, and sometimes I felt he had more faith in me than I had in myself. Thank you, Martin, for making me a better linguist and for all your support.

Just as it takes a village to raise a child, it takes a CASTL to raise a PhD student. It was an honor and a joy to be a part of such a creative, productive and supportive research community, as anyone who ever asked me "Why did you study linguistics in Tromsø, of all places?" can attest to. As someone interested in the interface between two modules of language, I benefited immensely from interacting with linguists working within different fields. Thank you, Peter Svenonius, Gillian Ramchand, Michal Starke, Marit Westergaard, Bruce Morén-Duolljá, Patrik Bye, Curt Rice, Ove Lorentz, Tarald Taraldsen, Øystein Vangsnes, Antonio Fábregas, Klaus Abels, Christian Uffman, Sylvia Blaho, Pavel Iosad, Peter Jurgec, Naoyuki Yamato, Violeta Martínez-Paricio, Islam Youssef, Monika Bader, Marleen van de Vate, Éva Dékány, Pavel Caha, Marina Pantcheva, Madeleine Halmøy, Björn Lundquist, Sandhya Sundaresan, Thomas McFadden, Kristine Bentzen, Helene Andreassen, Minjeong Son, Yulia Rodina, Inna Tolskaya, Rosmin Mathew, Kaori Takamine, Andrea Márkus, Patrycja Strycharczuk, Peter Muriungi and Anna Wolleb.

These acknowledgements would not be complete without thanking my professional families that came before and after CASTL. I would never have ended up in Tromsø without the support of Tanja Milićev and Nataša Milićević while I was a BA student in Novi Sad. My linguistic journey started with them suggesting I go to my first EGG School in Niš. So, thank you, Tobias Scheer and Michal Starke, for organizing the EGG, Boban Arsenijević for organizing the one in Niš, Peter Svenonius for promoting the CASTL MA program at the EGG, and most of all to Tanja and Nataša for treating me more like their colleague than their student and for giving me my linguistic wings. After CASTL came HIOA, another wonderful environment I have had the pleasure of being a part of. Thank you, Mona Flognfeldt, Lynell Chvala, Colin Haines, Hilde Tørnby, Ingrid Rodrick Beiler, Cecilie Dalland, Louise Mifsud, Vibeke Bjarnø, Hilde Harnæs and Ellen Watkinson, for all your support in the last stages of writing this thesis.

Finally, my love goes to all my friends and family, whose lack of linguistic background did not make them any less instrumental in my completion of this journey.

PS: Martin, if you ever need a kidney, give me a call.

Abstract

This dissertation investigates the interface of syntax and phonology in a fully modular view of language, deriving the effects of syntactic structure on prosodification without referring to that structure in the phonological computation. It explores the effects of the Multiple Spell-Out Hypothesis and 'syntax-all-the-way-down approaches', specifically Nanosyntax, on the phonological computation. The dissertation addresses three issues for modularity: (i) phonology can see edges of syntactic constituents, (ii) phonology distinguishes between lexical and functional elements in syntax, and (iii) phonology recognizes Information Structure marking features. The No-Reference Hypothesis is presented as the solution. It states that phonological computation needs to proceed in phases in order to achieve domain mapping while maintaining an input to phonology consisting of purely phonological information. The dissertation provides an explicit account of how the outputs of different phases get linearized wrt each other, providing arguments that spell-out does not proceed in chunks but produces cumulative cyclic input to phonology. An analysis is provided, using data from English, Kayardild and Ojibwa, showing how prosodic domains can be derived from phases by phonological computation being faithful to the prosodification output of the previous phase. The analysis is formalized by introducing Phase-Phase Faithfulness constraints to Optimality Theory.

Keywords: syntax-phonology interface, prosody, Optimality Theory, phases, modularity, linearization, spell-out, Nanosyntax, English, Kayardild, Ojibwa

List of the papers

Paper 1

Šurkalović, D. (2011a). Lexical and Functional Decomposition in Syntax: A view from Phonology. *Poznan Studies in Contemporary Linguistics (PSiCL)* 47(2). pp. 399–425.

Paper 2

Šurkalović, D. (2011b). Modularity, Linearization and Phase-Phase Faithfulness in Kayardild. *Iberia: An International Journal of Theoretical Linguistics* 3(1). pp. 81-118

Paper 3

Šurkalović, D. (2013). Modularity, Phase-Phase Faithfulness and Prosodification of Function Words in English. *Nordlyd* 40(1). pp. 301-322

Please note that Šurkalović (2013) refers to the first two papers in the opposite order. What is 2011a here is 2011b there, and the other way around. The reason for this at the time was the order in which the papers came out in print. However, they were written in the order used in this thesis, which also presents the work in the three papers as a more coherent whole. I apologize for any inconvenience this might cause the reader while reading Šurkalović (2013).

Part I: Extended Introduction

1. Aim and Scope of the Dissertation

The central premise of this article-based dissertation is that language is modular. Modularity is the notion that language is divided into discrete modules: syntax, phonology and semantics. These modules are seen as independent of one another and unable to see into each other. They operate on distinct sets of primitives, much like the human senses operate on visual, auditory or olfactory information, and cannot process information that they are not designed for. As a result, for example, phonology cannot operate on syntactic primitives, such as syntactic features. The modular model of language originates in Chomsky (1965). It has been the basis for generative theories of grammar ever since (cf. Scheer 2011 for a detailed overview), although there are approaches that argue for phonology having direct access to Syntax (e.g. the Direct Syntax approach of e.g. Kaisse 1985, Odden 1987). In this dissertation, the term Direct Reference is used for such approaches. Indirect Reference is used in its intended meaning within the theory of Prosodic Phonology, for the view that phonology has access to some, but not all, syntactic information. The term No-Reference is introduced to refer to the fully modular approach developed in this dissertation.

The computational system of language assumed by this dissertation is derivational and unidirectional. This means that phonology follows syntax in the derivation, and the output of syntax is the input to phonology. The output of syntax is a hierarchical organization of syntactic features, commonly represented as a syntactic tree structure. However, phonological representations consist of a linear string of phonological forms. What translates the output of the syntactic computation into something that phonology can interpret and that consists of phonological primitives is referred to as the syntax-phonology interface, or the process of spell-out. This process consists of linearizing the syntactic hierarchical structure and performing the operation of lexical insertion, which retrieves from the Lexicon the phonological representation that matches a certain piece of the syntactic structure. Crucially, no syntactic features reach phonology, and phonology cannot perform operations that would need to recognize syntactic features or configurations.

However, there is crosslinguistic evidence of phonological processes that suggest that phonology does recognize some aspects of syntax, and that these syntactic properties affect the phonological computation. Three of the main arguments for the view that phonology does see parts of syntax, which are addressed in this dissertation, are that:

- phonology can see edges of syntactic constituents (Selkirk 1986 *et seq*, McCarthy and Prince 1993, Truckenbrodt 1995 *et seq*, *inter alia*),
- phonology distinguishes between lexical and functional elements in syntax (Inkelas and Zec 1993; Selkirk 1995; Chen 1987 *inter alia*).
- phonology recognizes Information Structure marking features, such as Focus and Topic (Truckenbrodt 1999, Samek-Lodovici 2005, Féry & Samek-Lodovici 2006 *inter alia*)

All three of these aspects of syntactic structure affect the prosodic phrasing and marking of utterances. This has been a problem for the most successful theories of the syntax-phonology mapping. As a result, they have been unable to maintain full modularity in their accounts of these phenomena.

Assuming modularity of language, the questions that this dissertation strives towards answering are the following:

- How can we derive the effects of syntactic structure on phonology listed above?
- How is mapping from syntax to phonology carried out?
- What is the nature of input to phonology?
- What is the nature of the phonological computation?

Being primarily a dissertation in phonology, but dealing with issues of its interface with syntax, this dissertation is also built on certain assumptions regarding the nature of the syntactic computation and representation. It adopts the following views of syntax:

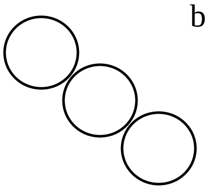
- the ‘decomposed’, or ‘syntax-all-the-way-down’ view of syntactic representation, present in a number of approaches, e.g. Distributed Morphology (Halle and Marantz

1993, Harley and Noyer 1999 *inter alia*), Nanosyntax (Starke 2009, Caha 2009, Ramchand 2008, Lundquist 2008 *inter alia*) or Borer's (2005) system. The particular approach adopted in this dissertation is that of Nanosyntax.

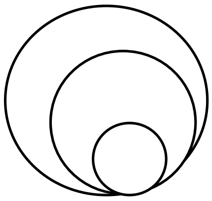
- the less traditional spell-out-at-each-merge view (Epstein and Seely 2002, 2006, Marvin 2002, Newell 2008) of the Multiple Spell-Out Hypothesis (MSOH) (Uriagereka 1999, Chomsky 2000, 2001, 2004, 2008) as the approach to syntactic computation.

Additionally, this dissertation argues for a modification of the multiple spell-out approaches, which is necessary to account for the process of linearization. The suggested modification is that spell-out does not proceed in separate chunks (1a) but in concentric circles (1b), where each spell-out domain includes the previous one:

(1) a.



b.



Nanosyntax presents an approach to lexical look-up that corresponds with (1b), thus giving us the first step in the spell-out to phonology by specifying how syntactic form is translated into phonological form. However, being a syntactic model, it does not address the issue of when and how this phonological form reaches the phonological computation. This dissertation expands this into the phonological domain, by arguing that material reaches phonology every time lexical matching is successful.

The dissertation is a collection of three papers:

- Paper 1 (Šurkalović 2011a) presents the challenges that the decomposition of traditional lexical categories in syntax into functional categories brings for the views on phonology and the syntax-phonology mapping that have relied on this distinction to account for some phonological phenomena. It also addresses the challenge of mapping syntactic constituents and Information Structure marking from syntax to phonology in a fully modular view of language. It analyzes data from English, focusing on the prosodification of function words and affixes, and prosodic marking of Focus and Contrastive Topic.

- Paper 2 (Šurkalović 2011b) further addresses the challenges of mapping syntactic domains to prosodic ones and distinguishing between lexical and functional categories. It also introduces the challenge of how outputs of different phases are linearized once they reach phonology, and proposes the solution represented in (1b) above. It analyzes data from Kayardild, focusing on the Prosodic Word domain and suffixation. It introduces a new category of constraints, Phase-Phase Faithfulness constraints[1]. It also compares Kayardild to Ojibwa and English, and shows how these constraints interact with other phonological constraints to produce language variety.
- Paper 3 (Šurkalović 2013) elaborates on the proposal and the English data presented in Papers 1 and 2. It takes a closer look at function words in English, and argues that the phonological distinction between function and lexical words is not as clear cut as the literature would suggest, since polysyllabic function words behave phonologically like lexical words. It provides an account that derives this difference in prosody from the difference in the derivational status of the words.

The answers to the questions posed above that are given in this dissertation are:

Q: How can we derive the effects of syntactic structure on phonology listed above?

A: What seem to be examples of phonology recognizing syntactic structure are actually the effects of the process of derivation itself. Phonology is not parsing syntactic elements. It is parsing the chunks it receives from spell-out. The reason it seems that it processes syntactic chunks is that these spell-out chunks correspond to syntactic units.

Q: How is mapping from syntax to phonology carried out?

A: Syntactic computation proceeds in phases. These phases are not separate chunks, as in

---

[1] The computational model adopted in this dissertation is that of Optimality Theory (OT; Prince and Smolensky 1993, McCarthy and Prince 1993, 1995).

(1a), but cumulative phases, which include the previous phase, as in (1b). Thus, Phase 1 does not need to be linearized with respect to Phase 2 after it is spelled out to phonology. It is, in fact, linearized with the new material as part of Phase 2, before it reaches the phonological computation.

Q: What is the nature of input to phonology?

A: The input to phonology is a linearized string of phonological underlying forms of lexical items. It is created as the output of spell-out, and it is a cumulative input including the previous phase. Crucially, it does not contain information about syntactic domains, categories or features.

Q: What is the nature of the phonological computation?

A: The phonological computation proceeds in phases, which parallel those in syntax. Whenever the output of a syntactic phase is spelled-out, the phonological input thus created is fully processed by the phonology. The phonological computation creates prosodic structure at each phase, which reflects the syntactic organization of the utterance. This prosodic structure is stored in working memory and referred to in the processing of the next phase. This reference to the previous phase is achieved by Phase-Phase Faithfulness constraints. What has been parsed a certain way in the first phase can remain identically parsed throughout the derivation, or its parsing can change, depending on the constraint interaction.

This extended introduction is organized into five sections. Having outlined the aim and the scope of the dissertation in Section 1, we will now move on to Section 2, which gives an overview of the theoretical framework the dissertation is built on, when it comes to both the phonological and the syntactic side of the interface. Section 3 presents the basic principles of the No-Reference Hypothesis, which this dissertation argues for, whereas Section 4 summarizes the three papers and their contribution to the dissertation. Section 5 discusses the No-Reference Hypothesis by answering some questions from audiences and reviewers of the papers, and by comparing it with other interface and phonological computation theories, before ending with a few concluding remarks.

2. The Theoretical Framework

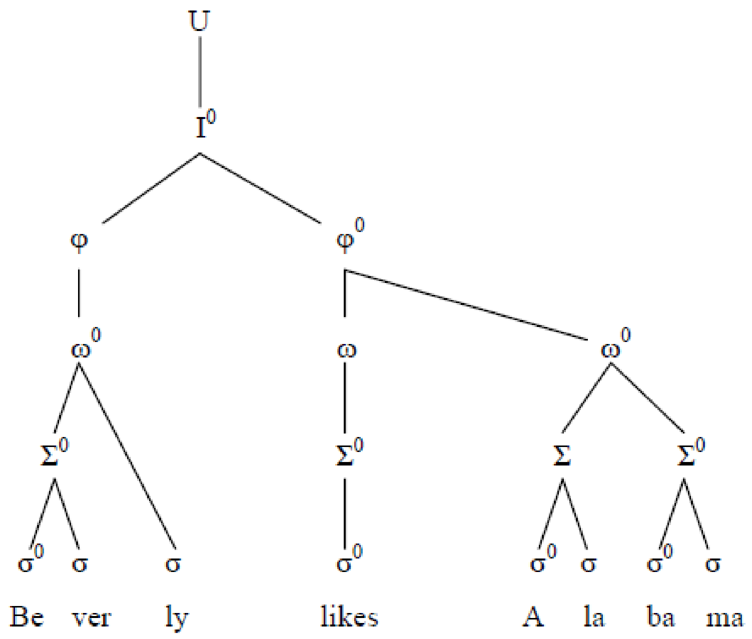
This section presents the theoretical background referred to in all three papers. Subsection 2.1 gives an outline of Prosodic Phonology, which is the phonological theory this dissertation uses as a starting point. Subsection 2.2 presents the theories of syntactic representation and computation that this dissertation assumes and builds on.

2.1 Prosodic Phonology

The work that has been done in this dissertation has taken as its starting point the theory of Prosodic Phonology (e.g. Selkirk 1981 *et seq*; Nespor and Vogel 1986; Hayes 1989; Truckenbrodt 1999 *inter alia*) as the most widely used approach to prosody and the syntax-phonology mapping in generative grammar. Prosodic Phonology is based on the notion that prosodic structure is organized as the Prosodic Hierarchy of domains (PH), consisting of Syllable (σ), Foot (Σ or Ft), Prosodic Word (ω or PWd), Prosodic Phrase (φ or PPh), Intonation Phrase (I), and Utterance levels (U)[2], origins of which are going back to Liberman (1975) and Liberman and Prince (1977). Below, in (2), is an example of the prosodic organisation of an English sentence (Šurkalovic 2007:16, adapted from Truckenbrodt 2007:2).

2 The list of different levels in the Prosodic Hierarchy varies in the literature, and other levels have been proposed, both as universals and as language-specific levels. Going into details of the levels of the hierarchy is orthogonal to and beyond the scope of this dissertation, and the levels listed here are the most commonly used ones.

(2[3])



The crosslinguistic evidence for the various prosodic domains comes from a number of segmental processes that are sensitive to them. Although the Prosodic Hierarchy was originally created to account for different domains of phonological rule application, its use has since been extended to accounting for the cases of syntax-phonology mapping. The central idea of Prosodic Phonology is the Indirect Reference Hypothesis, which assumes that prosodic constituents are what bridges syntactic and phonological representation. Since the modular view of language assumes that phonology cannot directly access syntax, it accesses it indirectly through the prosodic structure, which serves as the interface.

The following subsections present the account of syntax-phonology domain mapping, lexical and function word distinction processing and Information Structure marking within the theory of Prosodic Phonology. They also point out the modularity violations present in this theory.

---

[3] Superscript ^{0} marks the head of the higher level element.

2.1.1 Constraints for domain mapping

Work in Prosodic Phonology uses OT constraints and constraint interaction to model the phonological computation. The central constraints belong to the category of Alignment Constraints. They have their origins in the end-based theory of syntax-prosody mapping proposed by Selkirk (1986). They were developed into the Generalised Alignment theory by McCarthy and Prince (1993).

(3) Generalized Alignment (McCarthy and Prince 1993:2)

Align(Cat1, Edge1, Cat2, Edge2) $=_{def}$

$\forall$ Cat1 $\exists$ Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide.

Where

Cat1, Cat2 $\in$ PCat $\cup$ GCat

Edge1, Edge2 $\in$ {Right, Left}

These constraints are used to align edges of different domains, as well as to align the head of a domain with an edge of its respective domain. Selkirk (1995) uses the alignment constraints in (4) in her account of the prosodification of function words (the analysis is presented in more detail in the Papers 1, 2, and 3):

(4)

The Word Alignment Constraints (WdCon)

ALIGN (LEX, L/R; PWD, L/R)

The left/right edge of a Lexical Word coincides with the left/right edge of a Prosodic Word

The Prosodic Word Alignment Constraints (PWdCon)

ALIGN (PWD, L/R; LEX, L/R)

The left/right edge of a Prosodic Word coincides with the left/right edge of a Lexical Word

Phrasal Alignment Constraints

ALIGN (LEX^{MAX}, R; PPH, R)

The right edge of a maximal phrase projected from a lexical head coincides with the right edge of a Prosodic Phrase.

An example tableau from Paper 2 (Šurkalović 2011b) of Selkirk's (1995) analysis using the prosodic alignment constraints is given in (5) below, where we see the derivation of the prosodic phrasing of a function word to form a clitic to the lexical word, in a phrase such as "a table".

(5)

EXHAUSTIVITY

No Ci immediately dominates a constituent Cj, j < i-1 (No PWd immediately dominates a σ)

NONRECURSIVITY

No Ci dominates Cj, j = i (No Ft dominates a Ft)

[fnc lex]	WD CON L/R	NON REC	PWD CON L/R	EXH
a. ($\{fnc\}_{\omega}$ $\{lex\}_{\omega}$ $)_{\varphi}$			**!	
b. ☞(fnc { lex $\}_{\omega}$ $)_{\varphi}$				*
c. ({ fnc lex $\}_{\omega}$ $)_{\varphi}$	*!		*	
d. ({fnc $\{lex\}_{\omega}$ $\}_{\omega}$ $)_{\varphi}$		*!	*	

Selkirk (2005) uses similar alignment constraints, given in (6), to analyse Intonational Phrases in English, and their mapping from syntactic Comma phrases, exemplified in (7), taken from Selkirk (2005:7)

(6)

Align R (XP, MaP)

Align the right edge of a maximal projection in the interface syntactic representation with the right edge of a Major Phrase (aka Intermediate Phrase) in phonological representation.

Align R (CommaP, IP)

Align the R edge of a constituent of type Comma Phrase in syntactic (PF) representation with the R edge of a corresponding constituent of type $\boldsymbol{\pi}_{CommaP}$ (=Intonational Phrase, IP) in phonological (PR) representation.

(7)

$[_{DP}[_{DP}$[The Romans$]_{DP}$ [who arrived early$]_{Comma}]_{DP}$ [found [a land [of wooded hills]]]]

$_{IP}$((The Ro^{H*}mans^{L-}$)_{MaP}$ (who arri$^{!H*}$ved ea$^{!H*}$rly$^{L-H\%}$ $)_{MaP})_{IP}$// $_{IP}$(($^{\wedge\wedge!}$fou^{H*}nd a la$^{!H*}$nd…$)_{MaP})_{IP}$

Truckenbrodt (1995, 1999, 2006, 2007, 2012) also proposes an elaborate account of the syntax-phonology interface. His system uses Selkirk's edge alignment and introduces the WRAP constraint and constraints on stress placement:

(8)

ALIGN-XP,R/L: ALIGN(XP, R/L; P-PHRASE, R/L)

The right/left edge of each syntactic XP is aligned with the right/left edge of a p-phrase

WRAP-XP

For each XP there must be a p-phrase that contains the XP

STRESS-XP

Each XP must contain a beat of stress on the level of the p-phrase

Furthermore, Truckenbrodt (1999: 226) also argues that the distinction between lexical and function words is relevant in the phonological computation, and, building on Selkirk (1995), formalizes this in his Lexical Category Condition:

(9) Lexical Category Condition (LCC)

Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements and their projections.

More recently, Selkirk (2009, 2011), building on Selkirk (2005), puts forth a Match theory of the interface between the constituents of syntactic and prosodic structure.

(10) A Match theory of the syntax-prosodic structure interface (Selkirk 2009:40)

(i) Match Clause

A clause in syntactic constituent structure must be matched by a constituent of a corresponding prosodic type in phonological representation, call it ι[4].

(ii) Match Phrase

A phrase in syntactic constituent structure must be matched by a constituent of a corresponding prosodic type, in phonological representation, call it ϕ.

(iii) Match Word

A word in syntactic constituent structure must be matched by a constituent of a corresponding prosodic type in phonological representation, call it ω.

An example of the Match constraints, from Selkirk (2011), is given below. The examples show how Match constraints interact with the prosodic well-formedness constraints to give the output parsing of Prosodic Phrases in Xitsonga:

[4] ι stands for Intonation Phrase, ϕ stands for Prosodic Phrase, ω stands for prosodic word

(11)

Match (Phrase, ϕ)

A syntactic phrase corresponds to a prosodic phrase ϕ in phonological representation

BinMin(ϕ, ω)

A ϕ is minimally binary and thus consist of at least two prosodic words

a.

$_{clause}$[[verb [noun]$_{NP}$]$_{VP}$]$_{clause}$	BinMin(ϕ, ω)	Match (Phrase, ϕ)
a. $_ι$($_ϕ$(verb $_ϕ$(noun)$_ϕ$)$_ϕ$)$_ι$	*	
☞ b. $_ι$($_ϕ$(verb noun)$_ϕ$)$_ι$		*

b.

$_{clause}$[[verb [noun adj] [noun adj]]]$_{clause}$	BinMin(ϕ, ω)	Match (Phrase, ϕ)
☞ a. $_ι$($_ϕ$(verb $_ϕ$(noun adj)$_ϕ$ $_ϕ$(noun adj)$_ϕ$)$_ϕ$)$_ι$	*	
b. $_ι$($_ϕ$($_ϕ$(verb noun adj)$_ϕ$ $_ϕ$(noun adj)$_ϕ$)$_ϕ$)$_ι$		*
c. $_ι$($_ϕ$(verb $_ϕ$(noun adj noun adj)$_ϕ$)$_ϕ$)$_ι$		**

As we can see in (4), (6), (8) and (10), the constraints make reference both to syntactic constituents (Lex^{MAX}, XP, Comma Phrase, clause, phrase) and to the distinction between lexical and functional elements (Lexical Word). This means that, although there is no reference to syntactic features, phonology still makes direct reference to elements of the syntactic structure. Although prosody is seen as the channel of communication between syntax and phonology, it is nevertheless part of the phonological module. Due to that, constraints like these are a clear violation of modularity. Indirect Reference still assumes reference, which is why the model argued for in this dissertation is called the No-Reference Hypothesis.

It is interesting to point out that the notion of a lexical projection is problematically defined. The Prosodic Phonology literature assumes that all lexical projections share the common 'lexical' feature under their V, N or A head. This feature marks both the word inserted into that head and its projection as lexical. Truckenbrodt (1999: 227) states that in cases of complex VPs, where the verb moves from VP to vP, it is the vP that is "a lexically headed projection in the relevant sense". Once the verb moves and becomes head of vP, it is the vP that becomes a lexically-headed projection. However, as an anonymous reviewer of Paper 2 points out, in languages with overt V-to-T movement this would mean that the whole TP would need to be wrapped in one Prosodic Phrase. However, since the WRAP constraint was motivated largely to account for the (S)(VO) prosodic phrasing, if the subject is in the SpecTP and the verb is in T, then the whole TP is lexical and thus it should be wrapped, resulting in (SVO), and defeating the purpose of WRAP.

2.1.2 Information Structure marking

As mentioned in the introduction, another violation of modularity in Prosodic Phonology occurs in the domain of Information Structure marking. Information Structure features such as Focus, Topic or Contrastive Topic are assumed to be privative features in syntax (Jackendoff 1972), and they are taken to project their own phrasal nodes (Rizzi 1997). These features are realized in different ways in different languages: by syntactic movement (e.g. Polish: Szczegielniak 2005; Hungarian: Kiss 1998; Serbian: Migdalski 2006), by morpheme markers (e.g. Japanese: Yamato 2007; Kĩĩtharaka: Abels and Muriungi 2006), by prosodic phrasing (Chichewa: Truckenbrodt 1999) and by pitch accent and intonational contour (English: Ladd 1996, Büring 2007).

Analyses cast within Prosodic Phonology use constraints that make direct reference to these syntactic features, thus assuming that phonology has access to and can operate on syntactic primitives. Examples of these constraints are the following:

(12)

ALIGNF (Truckenbrodt 1999)

Align the right edge of an F constituent with a prosodic phrase

STRESSFOCUS **(**Samek-Lodovici 2005, Féry & Samek-Lodovici 2006)

The focused phrase has the highest prosodic prominence in its focus domain.

STRESSTOPIC **(**Samek-Lodovici 2005, Féry & Samek-Lodovici 2006)

The topic phrase has the highest prosodic prominence in its domain.

An example of how these constraints are used in the computation are given below. (13) is an example of contrastive focus from Féry & Samek-Lodovici (2006:138). Here, the words "American" and "Canadian" are contrastively focused, which results in the StressFocus constraint overriding the HP constraint which drives regular stress assignment.

(13)

HP: Align the right boundary of every P-phrase with its head(s).

[An American$_f$ farmer was talking to a Canadian$_f$ farmer]$_f$	SF	HP
a. (x) P An American$_f$ farmer	*!	
b. ☞ (x) P An American$_f$ farmer		*

Example in (14), from Samek-Lodovici (2005), shows how languages such as Italian satisfy StressFocus by moving the focused constituent instead of moving the prosodic marking for focus. Samek-Lodovici (2005) provides an OT analysis that integrates syntax and phonology in one tableau, making not only the constraints but the computation itself not modular. The StressFocus constraint in English is ranked lower than the constraints governing word order and movement in syntax, whereas it is ranked higher in Italian, making syntactic movement preferable to satisfy higher ranked prosodic constraints. Unfortunately, addressing cases of phonology-driven movement, such as these examples of focus in Italian, heavy NP shift, or prosodic scrambling of phonological phrases in Japanese (Agbayani, Golston and Ishii 2015) are beyond the scope of this dissertation. Accounting for these cases in a strictly modular framework would be an important next step in developing the No-Reference Hypothesis argued for here.

(14)

a. English

[John has LAUGHED]$_f$ vs. JOHN$_f$ has laughed.

b. Italian

[Gianni ha RISO]$_f$ vs. Ha riso GIANNI$_f$

In addition to not being modular, none of the constraints or accounts above addresses the issue of how the specific tones and intonational contours get associated with the specific features. For example, how the H* Pitch Accent, and not L*, marks Focus in English whereas the tonal contour L+H*L-H%, and not some other, marks Contrastive Topic. This issue is addressed in this dissertation, most specifically in Paper 1.

2.2 Syntactic representation and computation

2.2.1 Decomposition of lexical categories

Traditionally, the syntactic representation in generative grammar has consisted of heads as terminals and their projections as phrasal nodes. These heads could be lexical, like Noun, Verb, Adjective, or functional, like Case or Tense, and they would be hosting a bundle of features associated with that category. However, in the last few decades these heads have been decomposed into individual features. Initially it was the functional heads that were decomposed into multiple functional projections (e.g. Rizzi 1997, 2004; Svenonius 2010). More recently, there has been a lot of work on decomposing the lexical categories as well. This 'syntax-all-the-way-down' view of syntactic representation is present in e.g. Distributed Morphology (Halle and Marantz 1993, Harley and Noyer 1999 *inter alia*), Nanosyntax (Starke 2009, Caha 2009, Ramchand 2008, Lundquist 2008 *inter alia*) or Borer's (2005) system. The particular approach adopted in this dissertation is that of Nanosyntax.

In Nanosyntax, the elements syntax operates on are not words or bundles of features, but individual features. Each feature is a terminal in a syntactic tree. Thus, what was traditionally thought of as lexical words or the N or V heads is in fact a sequence of functional features in a hierarchical structure. The distinction between words and morphemes is erased, and all that exists is lexical items that spell out certain parts of the syntactic tree. Both the notion of "lexical" and "word" are thus nonexistent in syntax. This poses a problem for the theories of syntax-phonology interface which rely on these notions to account for the mapping patterns, such as, for example, Selkirk (2009:40) which states that "The Match constraints … pare syntactic constituent types to the minimum, exploiting the notions clause, phrase and word, which presumably play a role in any theory of morphosyntax."

For example, Ramchand (2008) decomposes the category of V and VP into three separate functional projections: Initiator Phrase, Process Phrase and Result Phrase. This system encodes verbal roots in the f-seq in a way that captures the relations between argument structure and event structure. In this approach phrases in the syntactic tree are necessarily functional. i.e.

there is no V or VP, only InitP, ProcP or ResP. Furthermore, neither of these is a necessary ingredient of what is traditionally thought of as a verb, so recasting the analysis by using a different primitive is not possible. Recognizing that a piece of syntactic structure corresponds to a lexical item that is a verb would require phonology to have Direct Reference to all aspects of the syntactic representation. When it comes to Nouns and Adjectives, Lundquist (2008) looks at structures where the distinction between categories of Verb, Noun and Adjective are blurred, such as participles and nominalizations. He adopts Borer's (2005) system of acategorial roots. In this view, roots are stored in the lexicon as bare roots, without categorical information about them being N, V or A. What determines their word class, i.e. what category they behave as in syntax, is the functional feature they merge with. Whatever defines N, V or A as such is not of lexical but of functional nature.

This view of syntactic structure and lexical matching poses a challenge not only for the mapping of prosodic domains, but also for other phonological theories that rely on the difference between lexical and functional categories, and among different lexical categories. One example is the relativized faithfulness of McCarthy and Prince's (1995) Correspondence Theory. They analyse cases of reduplication and posit "a universal metacondition on ranking, …, which ensures that faithfulness constraints on the stem domain always dominate those on the affixal domains." (McCarthy and Prince 1995:4). However, in the Nanosyntax model, there is no distinction between stem and affixes in their encoding in the lexicon. They are both simply lexical entries spelling out single features or feature combinations. While addressing the implications of Nanosyntax for McCarthy and Prince (1995) is beyond the scope of this dissertation, a similar challenge is addressed on a smaller scale in the discussion of Paper 1 in section 4.1. Another example is that of lexical category-specific effects, such as the stress distinction between nouns and verbs in English (e.g. cónvict.N vs convíct.V), addressed in e.g. Smith (2011). Although this dissertation does not address these, a possible way of analyzing them could be similar to the account of information structure marking by suprasegmental affixes presented in Paper 1. It is possible that the lexical entry for a functional feature in the N or V domain contains a suprasegmental phonological representation that results in a specific stress pattern.

2.2.2 Multiple Spell-Out and Phases

Another challenge in describing the process of transforming syntactic structure into phonological structure is accommodating for phases in spell-out. Phases originate in the Multiple Spell-Out Hypothesis (MSOH) (Uriagereka 1999, Chomsky 2000, 2001, 2004, 2008) approach to syntactic computation, also known as Phase Theory. According to MSOH, parts of the syntactic structure get spelled-out to PF and LF (Phonological Form, and Logical Form) before the full structure is computed. This partial spell-out happens at certain points in the structure that are designated as phases (literature varies on which nodes are considered phases). Once they are spelled out, these parts of structure become inaccessible to the rest of the computation.

However, this dissertation subscribes, more specifically, to the spell-out-at-each-merge view of MSOH, which is the less traditional view (Epstein and Seely 2002, 2006, Marvin 2002, Newell 2008). According to this view, spell-out does not happen only at specific points in the structure that are designated as phases. Spell-out happens as soon as all the features in a piece of structure are checked, making that piece of structure interpretable at the interface. This is compatible with Nanosyntax, where spell-out for the purpose of lexical matching is carried out at each merge. Once a lexical item is found that matches the syntactic structure that was built in syntax, that piece of structure can be spelled out. For example, in the case of irregular verbs in English there is a lexical item that corresponds to the piece of structure in syntax that includes both the features comprising the verb itself and the features that mark the past tense. On the other hand, in the case of regular verbs in English there is no such item. There is a lexical item that corresponds to the piece of structure representing the verb itself in its bare form, and the part of the structure marking past tense needs to be spelled out by a different lexical item, the suffix "ed".

3. The No-Reference Hypothesis (NRH)

The following section outlines the No-Reference Hypothesis view of the syntax-phonology interface argued for in this dissertation as a whole and in the papers it consists of.

3.1 Syntactic computation: cumulative spell-out at each merge

As stated above, the NRH assumes that syntactic computation proceeds in phases. Furthermore, it adopts the view that phases are not reserved for designate nodes in the syntactic structure, but that spell-out is attempted at each merge. The reason for this is twofold. First of all, if we are to derive prosodic phrasing of what is traditionally thought of as words from the course of the derivation, that derivation needs to provide us with domains smaller than phrasal ones. This is achieved by having smaller spell-out domains (cf. Newell 2008). Second of all, the theory which argues for specific points of spell-out is less minimal (Chomsky 1995) in that it needs to make more assumptions about the system in order to account for the distinction between the points of merger that do and do not trigger spell-out. A more minimal theory is the one that assumes that all points of merger trigger spell-out. Whether that spell-out is successful or not, in this case, depends on whether lexical matching can be achieved.

What the NRH introduces, however, is the claim that spell-out is cumulative. This dissertation argues that phases are not separate chunks (cf. 1a), but cumulative phases, which include the previous phase (cf. 1b). The reason for this is again twofold. Primarily, it is a way of solving the linearization challenge. Namely, if spell-out proceeds in discrete chunks, these chunks will reach phonology separately, unlinearized wrt each other. However, phonology has no preferences or mechanisms for linearizing these chunks. If it did, linearization would be based on phonological properties, since those are the primitives phonology operates on. Thus, these chunks might be ordered so that consonant clusters are avoided. For example, the two chunks “Anne loves” and “John” would be linearized as “John Anne loves” to avoid the “sj” sequence of "Anne loves John". However, since we know that the linear order of elements depends on their place in the hierarchical structure in syntax, and assuming a modular system, it cannot be the case that phonology is responsible for the linearization. If we assume a cumulative spell-out, Phase 1 does not need to be linearized with respect to Phase 2 after it is spelled out to phonology, since it is actually part of Phase 2. It is, in fact, linearized with the new material as part of the overarching Phase 2. This does not mean that the NRH excludes the possibility of phonology playing a part in linearization, e.g. in cases of heavy NP shift. What it does exclude is that all linearization happens in phonology. A more detailed discussion of linearization can be found in Section 4 of Paper 2.

An anonymous reviewer of Paper 2 points out that "the fact that phase material is accessible to probes in the next phase up is also recognized by Chomsky (2008), where it is assumed that by the completion of a phase the complement domain of the phase head is not Spelled-Out until the next phase up is completed". The reviewer suggests that this mechanism may also provide a solution to the linearization problem. However, in the system the reviewer refers to, once any material is spelled out, it does become inaccessible. To put it simply, even if "John" is not spelled out until "loves" or "Anne" is completed, "John" is still spelled out before the phases above it in the hierarchy are, and separately from them. Once it is spelled out it is no longer accessible and thus cannot be spelled-out again. I argue that it is spelled out separately (which gives us domain mapping) but is crucially still accessible and spelled out again (which gives us linearization and accommodates for reordering due to movement which happens after spell-out of lower merges in this system).

Furthermore, any view that does not allow for previously spelled-out material to be accessible in the next spell-out has a difficulty accounting for cases such as the spell-out of regular and irregular past tense in English (and suppletive morphology in general). If what was once lexically matched and spelled out could not be spelled out again, all verbs would be regular. This is the secondary reason why cumulative spell-out is argued for in the NRH.

3.2 Modularity: the nature of input to phonology

Once a piece of syntactic structure is successfully spelled-out, the input that reaches phonology consists of a linearized string of phonological underlying forms of lexical items. It is a cumulative input that includes a spell-out of the syntactic structure that was spelled out in the previous phase. Sometimes the result of spelling out the same chunk will be the same input to phonology (as in the example of regular verbs). Sometimes it will be different because there exists in the lexicon an entry which matches the whole of the newly created structure (as in the example of irregular verbs). Crucially, this input does not contain information about syntactic domains, categories or features. Anything that might seem on the surface as mapping of syntactic categories or domains onto phonological ones is actually the effect of parsing chunks of syntax that were successfully spelled out and thus reached phonology.

Furthermore, the approach presented in this dissertation shows how it is not necessary to assume that phonology sees Information Structure features in order to account for their prosodic marking. In the system assumed here any feature can be spelled out by an individual lexical item. This makes suprasegmental markers of Information Structure features just like any other lexical entry, consisting of a piece of syntactic structure (the feature) and the corresponding phonological representation (the tone or tonal contour). Although it is not a widespread approach in generative literature, treating tones as lexical entries spelling out syntactic features is standard in literature on Bantu (e.g. Kula 2007).

3.3 Phonological computation: phonological phases

The NRH approach argued for in this dissertation claims that examples of phonology recognizing syntactic structure that are discussed in literature are actually examples of the effects of the process of derivation itself on the prosodic structure. Phonology is not recognizing and mapping syntactic elements. It is parsing the chunks it receives from spell-out. The only reason it looks as if it processes syntactic chunks is that these spell-out chunks correspond to syntactic units of various sizes.

The NRH approach assumes that phonological computation proceeds in phases, which parallel those in syntax. When a piece of the syntactic structure is successfully spelled out, it reaches phonology in form of a phonological input. This means, crucially, that not every Merge creates a structure that can be successfully lexically matched with phonological material. The reason phases will look different on the phonological side of the interface is that, although syntax sends structures off to spell out every time, there is no successful lexical match every time. This results in fewer phases in phonology, because they only happen when phonological material actually reaches phonology. The input that does reach phonology is then fully parsed in an OT computational system. In that way, prosodic structure is created at each phase, and these prosodic constituents correspond to the spell-out chunks in size. Since spell-out can happen at each merge, these prosodic constituents can be of any size and phonological content: a single phoneme, tone, morpheme, word, phrase, utterance. In this way not only prosodic phrasing is accounted for, but also the prosodic organization below PPh level (in cooperation, of course, with prosodic well-formedness constraints). This prosodic structure is stored in working memory and referred to in the processing of the next phase. What has been parsed a certain way in the first phase can remain identically parsed throughout the derivation, or its parsing can change, depending on the constraint interaction.

The approach presented in this dissertation also claims that the difference in the prosodic behavior of function words and lexical words comes from the fact that what is thought of as lexical words actually spells out parts of the syntactic structure that are merged first into the syntactic tree. These parts are then fully prosodified and parsed as Prosodic Words (and all the levels above). This PWd status is then kept throughout the derivation. This approach also captures the fact that polysyllabic function words behave prosodically like lexical words, in that they can be parsed as PWd and carry word stress. This is the result of the fact that the requirements of prosodic well-formedness constraints in this case do not clash with those of Phase-Phase Faithfulness constraints that outrank them. Furthermore, since in this system any functional material added to the initial "lexical" phase gets treated equally, regardless of whether it is a function word or an affix, this dissertation provides an account of the difference in prosodification of the two.

This reference to the previous phase is achieved by Phase-Phase Faithfulness constraints. The constraints proposed in this dissertation are the following:

(15)

PHASE-ANCHOR-L(PWd) – PAL PWD

Assign a violation mark if a Prosodic Constituent which is at the Left edge of a prosodic word in Phase *n* is not at the Left edge of that Prosodic word in Phase *n+1*

PHASEMAX - PMAX

Every prosodic constituent in phase *n* must have a correspondent in phase *n+1,* for example:

PHASEMAX(FT)

Every Foot in phase *n* must have a correspondent in phase *n+1*

PHASEDEP

If a prosodic constituent is part of another prosodic constituent in phase *n*, it must be part of the same constituent in phase *n-1*

The anchoring constraint stems from the alignment constraints, and is derived from the template for anchoring constraints given in McCarthy and Prince (1995: 123), where (S_1, S_2) are pairs of representations, e.g. Input-Output, Base-Reduplicant, or, in this case, Phase n-Phase n+1:

(16) {Right, Left}-ANCHOR(S_1, S_2)

Any element at the designated periphery of S_1 has a correspondent at the designated periphery of S_2

Let *Edge*(X, {L, R}) = the element standing at the *Edge* = L, R of X

RIGHT-ANCHOR – If x = Edge(S_1, R) and y = Edge(S_2, R) then x $\mathscr{R}$ y

LEFT-ANCHOR. likewise, mutatis mutandis.

Sections 2 and 3 have provided an overview of the theoretical framework this dissertation assumes, and of the No-Reference Hypothesis it puts forth. The following section, Section 4, summarizes the contributions of each of the three papers to the theory of syntax-phonology interface argued for here. Subsequently, Section 5 presents a discussion of the theory and some concluding remarks.

4. Summaries of the Papers

4.1 Paper 1: Šurkalović, D. (2011a). Lexical and Functional Decomposition in Syntax: A view from Phonology. *Poznan Studies in Contemporary Linguistics (PSiCL)* 47(2). pp. 399–425.

Paper 1 was the first of the three to be written, and as such it sets the stage for the work presented in the two papers that followed. Its importance lies in that it was the first to present the need for revising our view of the interface based on changes in our understanding of syntax. It was also the first to utilize the decomposed view of syntax argued for by the Nanosyntax theory in addressing the syntax-phonology interface.

The paper presents the challenges that featural decomposition in syntax brings for the theories of phonological computation and of the syntax-phonology interface that are based on Prosodic Phonology. It discusses two particular issues. The first issue is that prosody, and by that phonology, recognizes edges of syntactic constituents, and lexical elements and projections but not functional ones (cf. Selkirk 1995; Truckenbrodt 1999, 2007 *inter alia*). The second issue is that, for Information Structure to be prosodically marked, prosodic constraints (Align-F, Stress-Focus) need to 'see' these syntactic features, which is undesirable if modularity is to be maintained.

The proposal presented in Paper 1 is that the Lexicon is the locus of communication between the two modules, since that is where syntactic and phonological information co-occur within a single lexical entry. Lexicon subcategorisation (cf. Paster 2005; Bye 2006) and/or Extended Exponence (Bye and Svenonius 2012 [to appear]) are offered as modular solutions to the challenge of recognizing the difference between lexical and function words. These two categories of words are seen as two distinct subsets in the lexicon. The phonological part of the lexical entry that reaches the phonological module after spell-out has the lexicon subset information encoded in it. This is then recognized in the phonological computation, which results in the different treatment of lexical and function words. Paper 1 also uses the Nanosyntactic view that features are merged into the tree individually, and suggests that Lexical entries for e.g. F and CT features in English are suprasegmental affixes, and that the phonological information in their lexical entry is only suprasegmental, namely a H* tone for the F feature and a L+H*L-H% contour for the CT feature.

As we can see, the solution to the challenges Paper 1 presents is different from what Papers 2 and 3, and indeed this dissertation as a whole, argue for. Paper 1 argues for the Lexicon as the solution to the modularity issues presented in the paper, whereas the proposal argued for in this dissertation is that the computation itself is the source of and the solution to what seem to be modularity violations. Footnote 1 in Paper 1 (Šurkalović 2011a:400) anticipates the competition between these two approaches, and promises a comparison of the two in Šurkalović (in prep.), which is the current dissertation. This comparison is addressed below in subsection 4.1.1, and the analysis of Information Structure marking is updated in subsection 4.1.2, to reflect the later findings and the proposed No-Reference Hypothesis theory.

4.1.1 Interface through the Lexicon vs. No-Reference Hypothesis

As mentioned above, Paper 1 presents a solution to the modularity issues that differs from that of the No-Reference Hypothesis. It argues for the use of the lexicon as the interface, through Lexicon Subcategorisation (cf. Paster 2005; Bye 2006) and/or Extended Exponence (Bye and Svenonius 2012 [to appear]). The question that needs to be addressed is why the subsequent work departs from this analysis.

The reason for departing from this analysis is that using the lexicon as the interface tool does not give us the solution to the problem of multiple spell-out and linearization discussed in section 3.1 of this introduction. One of the challenges that the views on syntactic computation assumed by this dissertation bring for the interface and the phonological computation is that of how the outputs of different phases of syntactic spell-out get linearized with respect to one another once they reach the phonological module. The lexicon cannot be used to solve this problem because the linear ordering of elements is based on their syntactic configuration in the tree, which changes from one structure to another and is not permanent information about any lexical entry that can be encoded in the lexicon.

Using the computation and the phases as the interface tool, however, does account both for the linearization of spell-out chunks and for the issues addressed by this paper. Furthermore, one could also argue that introducing indices to mark membership to what is traditionally defined as the lexical or functional category does not account for the source of the difference, but merely encodes it in a different way. In effect, it still represents (morpho)syntactic features in a phonological input. The No-Reference Hypothesis approach of using the computation itself to account for the difference between lexical and functional items is superior in that it demonstrates the underlying source of that difference.

The linearization issue and the issue of how phonology recognizes syntactic units and the difference between lexical and functional elements are addressed in Papers 2 and 3. In particular, Paper 3 (Šurkalović 2013) addresses in more detail the similarities and differences in the prosodification of affixes and function words, which are mentioned in Footnote 8 and briefly addressed in sections 4.1.1. and 4.1.2 in Paper 1 (Šurkalović 2011a). Since the issue of Information Structure marking is not analyzed within the current framework in any existing work, it is addressed in the following subsection.

4.1.2 Updated analysis of Information Structure marking

As we have seen in section 2.1.2, the analysis of prosodic marking of Information Structure in Paper 1 relies on the Nanosyntax view that all features, including Focus and Topic ones, are merged into the syntactic tree as individual terminals. These features have lexical items associated with them that pair the feature with its phonological realization. Thus, prosodic markers of Focus and Contrastive Topic in English are lexical items (morphemes) that spell out certain syntactic material (the feature) as certain phonological material (the suprasegmental information about tone).

The analysis presented in Paper 1 states that "The Lexicon provides the tonal contour, the spell-out (linearization) provides the domain of realization, and phonology places the tones within that domain with Prosodic Well-formedness Constraints, which make sure that the suprasegmental affix is properly placed on an appropriate Tone Bearing Unit (TBU) within its domain, e.g. that the H* tone marking Focus in English is realized on the main stress unit of the focused constituent." (Šurkalović 2011a:416) As we can see, Paper 1 takes linearization for granted, and assumes a single input to phonology, without multiple phases.

In tableaux (20) and (21) in Paper 1 (Šurkalović 2011a: 419), cited below as (17) and (18) respectively, the lexical indexation and extended exponence approaches are applied respectively. We see that the suprasegmental affix H* is either indexed as a part of the lexical subset of suffixes in (17), or it includes place information about being located on the inside of a PWd in (18). The optimal candidate in (17a) satisfies the high-ranking constraint AlignR(suff, PWd), which requires phonological material indexed as a suffix to be aligned with the right edge of a PWd. This constraint, along with AssocPA, result in the focused preposition being realized as a PWd. In (18a) the outcome is the same, but this time due to IO-Faithfulness which forces the right edge of a PWd onto the focused preposition.

(17)

ASSOCPA

A Pitch Accent associates to (aligns with) a stressed syllable (head of a Ft) (Selkirk 1995)

ALIGN (SUFFIX, R; PWD, R)

The right edge of a suffix coincides with the right edge of a Prosodic Word

ALIGN (FNC, R; PWD, L)

The right edge of a fnc coincides with the left edge of a Prosodic Word

ALIGNL/R (ROOT; PWD)

The left/right edge of a Root coincides with the Left/right edge of a Prosodic Word

ALIGNL/R (PWD; ROOT)

The left/right edge of a Prosodic Word coincides with the Left/right edge of a Root

HP

Align the right boundary of every P-phrase with its head(s). (Féry and Samek-Lodovici 2006)

Throw it to$_{fnc}$-H*$_{Suff}$ the$_{fnc}$ dog$_R$ (not at it)	ASSOCPA	ALIGNR (SUFFIX, PWD)	ALIGNR (FNC, R; PWD, L)	ALIGNL/R (ROOT, PWD)	ALIGNL/R (PWD, ROOT)	HP
a. H* ☞((**tʊ**)$_ω$ (ðə (dɔg)$_ω$)$_φ$)$_φ$					**	*
b. H* (tə (ðə (**dɔg**)$_ω$)$_φ$)$_φ$	*!	*				

(18)

Throw it to-H*)$_ω$ the dog$_R$ (not at it)	ASSOCPA	I-O FAITH	ALIGNL/R (ROOT, PWD)	ALIGNL/R (PWD, ROOT)	HP
a. H* ☞((**tʊ**)$_ω$ (ðə (dɔg)$_ω$)$_φ$)$_φ$				**	*
b. H* (tə (ðə (**dɔg**)$_ω$)$_φ$)$_φ$	*!	*			

However, as stated above, this analysis needs to be updated within the current approach, which utilizes phases in spell-out to achieve domain mapping. Coupled with the notion of individual features as terminals, this means that, in order for the preposition to be focused and marked with the appropriate tonal affix, the two need to be spelled out in the same phase. One of the questions for further research posed in the conclusion to Paper 1 is "if all features are terminals and information structure markers are encoded as lexical items/prosodic affixes, and we know that e.g. in English any word can be focused, what is the position of the information structure features in the f-seq? Do they freely adjoin at any point or is there a fixed functional hierarchy?" (Šurkalović 2011a: 421). In the system presented in this dissertation the answer would be that there is no one fixed position. The Focus feature, in this case, needs to be able to adjoin to any part of the structure and be spelled out in a phase with it in order to mark it as focused. This also accounts for why focused function words are parsed as Prosodic Words. They are spelled out in a phase of their own, with the Focus feature, and not just added to a PWd in Phase 2.

In tableau (19) below we see the derivation of "to the dog" without focus, which is parallel to the derivation of "for a massage" given in tableau (29) in Šurkalović (2013: 317). We see that the optimal parsing in (19a) is that of two separate function words adjoined to the lexical word at the phrasal level, without having PWd status themselves. This PWd status in candidate (19c) is prevented by the violation of the PHASEDEP constraint. Namely, since "the" was not part of a Foot in the previous phase, it cannot become part of one in this phase, and thus it cannot be part of a PWd either.

(19)

PHASE-ANCHOR-L(PWD) – PAL PWD

Assign a violation mark if a Prosodic Constituent which is at the Left edge of a prosodic word in Phase *n* is not at the Left edge of that Prosodic word in Phase *n+1*

PHASEDEP

If a prosodic constituent is part of another prosodic constituent in phase *n*, it must be part of the same constituent in phase *n-1*

PARSESYLLABLE

Assign a violation for each syllable not dominated by a foot

PARSEFT

Assign a violation for each foot not immediately dominated by a PWd

phase: |{ðəµ σ ([dɔg]Ft)PWd}PPh | input: /təµðəµdɔgµ/	PALPWD	PDEP	PARSESYL	PARSEFT
a ☞ {təµ σ ðəµ σ ([dɔg]Ft)PWd}PPh			**	
b { [təµ ðəµ]Ft ([dɔg]Ft)PWd}PPh		*!		*
c {([təµ ðəµ]Ft)PWd ([dɔg]Ft)PWd }PPh		*!		
d {([təµ ðəµ] Ft [dɔg]Ft)PWd }PPh	*!	*		

In tableau (20) below we see the derivation of "TO the dog" with focus. We see that "to" is spelled out with the suprasegmental affix in a phase of its own before joining "the dog". There are two ways Phase 1 in focused function words can occur. The first is that these are separate lexical items, "to" and Focus marking, and they get merged and spelled out together as a PWd. In this case there are two options, either the underlying form is /tə/, and prosodic well-formedness forces the vowel to lengthen so that it can form a PWd and carry word stress and with that the suprasegmental marking, or the underlying form is /tʊ/ and reduction to schwa occurs when the vowel is not carrying stress. The other option for Phase 1 is that there are two lexical entries for function words, one that spells out the functional element alone, and one that spells out the functional element with the Focus feature. For the purpose of the argument presented here, it is irrelevant in what way Phase 1 occurs. What is important is that the function word forms a phase with the Focus marking which defines the domain of that marking, and which results in that function word forming a PWd on its own. As we can see, the constraint PHASEMAX, introduced in Paper 2, prevents the parsing identical to that of the unfocused preposition.

(20)

PHASEMAX - PMAX

A prosodic constituent in phase *n* must have a correspondent in phase *n+1*

phase: |{ðə$_{\mu\ \sigma}$([dɔg]$_{Ft}$)$_{PWd}$}$_{PPh}$| phase: |{ ([tʊ*H]$_{Ft}$)$_{PWd}$}$_{PPh}$| input: /tə$_{\mu}$*Hðə$_{\mu}$dɔg$_{\mu}$/	PMAX	PARSESYLL	PARSEFT
a {tə$_{\mu\ \sigma}$ *H ðə$_{\mu\ \sigma}$ ([dɔg]$_{Ft}$)$_{PWd}$}$_{PPh}$	*!	**	
c ☞ { ([tʊ*H]$_{Ft}$)$_{PWd}$ ðə$_{\mu\ \sigma}$ ([dɔg]$_{Ft}$)$_{PWd}$ }$_{PPh}$			

The same spell-out sequence would apply to lexical words as well, such as the example (22) in Paper 1 (Šurkalović 2011a: 420), cited below as (21), which illustrates CT marking and is taken from Büring (2007:16).

(21) (What did the pop stars wear?)

L+H* **L- H%** **H*** L- L%

The FEMALE$_{CT}$ pop stars wore CAFTANS$_{F}$.

The input to phonology in Phase 1 is /fi:meil L+H* L-H%/, and the prosodic well-formedness constraints ensure that the suprasegmental affix is associated with the appropriate nuclei. The output of Phase 1 is thus a CT marked “female”, which continues as such throughout the phases of the computation.

4.2 Paper 2: Šurkalović, D. (2011b). Modularity, Linearization and Phase-Phase Faithfulness in Kayardild. *Iberia: An International Journal of Theoretical Linguistics* 3(1). pp. 81-118

Paper 2 was the second of the three to be written. It builds on the issues discussed in Paper 1, and it is the first paper to present the No-Reference Hypothesis approach argued for in this dissertation. As in Paper 1, its primary concern is achieving a modular mapping of syntax to phonology, and it relies on the decomposed view of syntax argued for in the Nanosyntax approach. However, it departs from Paper 1 in that it assumes multiple spell-out and phases in syntax.

Paper 2 explores the effects of the multiple spell-out view of syntactic computation on phonology. It argues that what seem to be syntactic domains mapping onto phonological ones is, in fact, syntactic phases being mapped to phonological domains. It shows how we can achieve a modular mapping of syntactic domains to phonological ones by using the process of derivation itself, and not the Lexicon, as the tool of syntax-phonology mapping. Paper 2 argues that phonological computation also proceeds in phases, matching those in syntax. The additional challenge this poses on the interface is that of linearization of the outputs of different phases when they reach the phonological module. This is resolved in the NRH model by assuming a cumulative cyclic spell-out, and an explicit account of linearization is provided. Paper 2 also provides a formalization of this approach within Optimality Theory, and introduces Phase-Phase Faithfulness constraints.

This paper focuses on data from Kayardild, and takes a brief look at Ojibwa and English. Kayardild is chosen because of its interesting case-stacking properties and the interaction of syntax and phonology. In Kayardild, each root and its suffixes form a Prosodic Word domain (Evans 1995, Round 2009). In traditional terms, this would mean that the left edge of a PWd aligns with the left edge of a lexical word. This is illustrated in example (22) below, taken from Evans (1995: 115) and cited in Šurkalović (2011b: 84):

(22)

maku yalawu-jarra yakuri-na dangka-karra-nguni-na mijil-nguni-na

[(maku)$_{\omega}$ (jalawucara)$_{\omega}$ (jakuɻina)$_{\omega}$ (ʈaŋkakaraɲŋunina)$_{\omega}$ (micilŋunina)$_{\omega}$]

woman *catch*-PST *fish*-MABL *man*-GEN-INSTR-MABL *net*-INSTR-MABL[5]

‘The woman caught the fish with the man’s net.’

(Evans 1995: 115, transcription following Round 2009)

The category of CASE illustrated by the suffixes in (22) above encodes various syntactic and semantic relations among the elements of a clause, such as tense, mood or aspect, on the nouns participating in the event expressed by the verb. Due to the fact that spell-out of these features is delayed until the verbal domain features are merged into the tree, the order in which the elements of the clause reach spell-out, and thus phonology, does not correspond with the final linear order of the utterance. This creates a challenge for the linearization of spell-out chunks, if we assume, as is common, that linearization happens in discrete chunks which do not overlap. To solve this linearization problem the NRH model argues that spell-out proceeds in cumulative cycles, and each phase includes the material that was already spelled-out and the newly merged material. This way, the material that would otherwise have needed to be infixed into the material from the previous phase gets linearized by the regular algorithms.

In phonology, each phase is parsed as a prosodic domain. Lexical words reach phonology as the first phase, and are fully parsed, which accounts for them having PWd status. Function words, such as suffixes in Kayardild, are merged in later phases, and adjoin the PWd formed around the lexical word. Phase-Phase Faithfulness constraints recognize the previously parsed material and force faithfulness to the parsing that has already been carried out. The extent to which a language is faithful to a parsing in the previous phase depends on the interaction between these constraints and prosodic well-formedness constraints. Kayardild is an example of a language which maintains the left edge of the PWd throughout the phases, whereas the right edge is extendable and it freely incorporates new material, making Kayardild prone to

5 PST = Past, MABL = Modal Ablative (Case that is assigned by the Tense of the Verb), GEN = Genitive, INSTR = Instrumental)

extensive suffixation.

Kayardild is contrasted with Ojibwa, where faithfulness to Feet that were parsed in the initial phase outranks many prosodic well-formedness constraints, which results in suboptimal parsing of the final string. Paper 2 also addresses the prosodification of function words in English, and derives the difference in prosodic marking of function and lexical words from their derivational status. This is explored in more detail in Paper 3.

4.3 Paper 3: Šurkalović, D. (2013). Modularity, Phase-Phase Faithfulness and Prosodification of Function Words in English. *Nordlyd* 40(1). pp. 301-322

Paper 3 extends the argument for the No-Reference Hypothesis model introduced in Paper 2 by focusing on the prosodification of function words in English. As stated in sections 4.1 and 4.2 above, some of the challenges involved in capturing the difference between the prosodification of function and lexical words that have been mentioned in Paper 1 and 2 are explored in more detail in Paper 3, such as the differences in the prosodic behavior of affixes and function words. Furthermore, Paper 3 addresses the fact that not all function words behave prosodically the same. While monosyllabic function words behave the way function words are commonly described, polysyllabic function words side prosodically with lexical words. The paper additionally shows how the effects of LAYERDNESS and HEADEDNESS, the inviolable half of the Constraints on Prosodic Domination (Selkirk 1995, capturing the Strict Layer Hypothesis of Selkirk 1984), can be captured by use of the PARSE family of constraints, thus removing the need for two inviolable constraints being postulated.

Function words in English are a recurring theme in all three papers because of their relevance for the argument that phonology sees the difference between lexical and functional categories in syntax (cf. Selkirk 1981, 1995, 2011 inter alia). This paper applies the NRH model to this data and shows how the difference in prosodic behavior can be derived from the difference in derivational status. Section 2.2 of Paper 3 looks at determiners, and addresses the fact that monosyllabic determiners are unstressed and do not form a PWd (unless focused), while polysyllabic ones do carry stress and form a PWd on their own. It contrasts the prosodic behavior of “a” and “some” with that of “any”. Section 2.4 addresses the same difference in behavior in prepositions, contrasting “for” with “under”. Finally, section 2.5 illustrates the interaction of functional and lexical material in a longer stretch of a derivation.

5. Discussion and Concluding Remarks

5.1 Answers to questions from audiences and reviewers

The three papers that comprise this thesis have benefited greatly from comments and suggestions given by conference abstract reviewers, presentation audiences and by the anonymous reviewers of the papers themselves. As it is usually the case, some of these questions and comments went unaddressed for reasons of space. Since space is not an issue in a dissertation, I will address some of them here.

5.1.1 The Prosodic Hierarchy

An anonymous reviewer of Paper 1 states:

> "reference to prosodic words, prosodic phrases etc. supposes that prosodic structure exists independently: only then can the lexical specifications be compared via IO-Faith. But how do prosodic words and prosodic phrases come into being? The way they are created in OT is precisely what the author shows to be incompatible with modularity. So an alternative way to create prosodic structure is needed, and the author needs to be explicit about its genesis."

The second reviewer of the same paper also wonders:

> "there is a critical ingredient of the approach that is not made explicit (but is implicit from the practice of the author): the prosodic hierarchy as such is not called into question… However, the PH has been called into question in recent literature by Scheer precisely because it violates modularity".

The account argued for in this dissertation does assume the existence of the Prosodic Hierarchy. However, it is seen merely as a model of phonological representation of suprasegmental structure, and as such it does not violate modularity. What does violate modularity is the computation assumed by the Prosodic Phonology, which makes reference to both syntactic elements and the elements in the Prosodic Hierarchy. This computation is used to create the prosodic structure, and its non-modular reputation has been unfairly transferred to the representation itself. Scheer (pc) also does not deny the existence of prosodic organization of utterances, but he objects to deriving it by mapping it from syntactic categories, which is what the PH has become identified with.

The alternative way of creating the prosodic domains, that the first reviewer is asking to be made explicit, is through the use of PARSE constraints introduced in Paper 2. As the paper shows, they replace the non-violable constraints on prosodic representation that form the Strict Layer Hypothesis of Selkirk (1984), and create the prosodic structure. In a way, they can be thought of as similar to the Merge operation in syntax, which creates syntactic structure.

5.1.2 Prosodic Phrase level computation in Kayardild

An anonymous reviewer of Paper 2 states:

> “The proposed analysis deals with the prosodification at the lower levels of the prosodic hierarchy (i.e. foot, PrW). There is no reference to the higher levels of the prosodic hierarchy such as PPhs. … It is not clear whether the analysis proposed can account for the prosodification at this level and in what ways. The author is advised to address this issue, especially since almost all the previous Multiple Spell-Out approaches to the syntax-phonology interface are concerned with the prosodification at this level.“

While Paper 3 does address prosodification above PWd level using English as the example, there are two reasons why the analysis of Kayardild prosodification above PWd is not included in Paper 2. First was, of course, space. The scope of the paper needed to be limited, and it was so, to the levels below PWd. Partly precisely because there have been few accounts that refer to the effects of MSOH on levels below PPh.

The second reason is that Kayardild is a difficult language to analyse at levels above PWd, for the following reason. Neither Evans (1995) nor Round (2009) give any prosodic structure above PWd. Namely, Round (2009) states that the levels above PWd are Breath group and Utterance, and states that:

> "for the purposes of cross-linguistic comparison, the breath group can be considered on par with many other languages' utterance domains. An alternative to the analysis presented in this chapter would be to label the breath group as a subordinate utterance constituent, in a system which permits recursive embedding of the utterance domain" (Round 2009: 313, fn1)

Breath Groups are defined as "a stretch of speech bounded by planned pauses… and are characterised at their right edge by truncation processes … and by distinct intonation" (Round 2009: 315). Round leaves the details of BG in Kayardild for future research, and provides very few examples of BG-parsed utterances, but from what can be seen there seems to be no binarity requirement and they seem to be dependent more on the information structure of the utterance than its prosodic structure at lower levels. Thus, for lack of sufficient data and understanding of the data provided I do not address this issue in this paper.

5.2 Comparison with other interface theories

This dissertation focuses on issues related to Prosodic Phonology as the most influential theory of the Syntax-Phonology interface. However, since I began work on this dissertation several different works that address this interface and connect multiple spell-out and phases in syntax with phonological computation and structure have appeared and become notable. This section compares the current proposal with these theories. I will limit this comparison to theories that adopt the Optimality Theory view of phonological computation, to the exclusion of Scheer (2012), whose work, although seminal in nature, is set within the CVCV theory of phonology.

5.2.1 Non-modular interface theories

Non-modular interface theories are clearly distinct from the No-Reference Hypothesis presented in this dissertation in that they do not assume a modular view of the language system. One set of non-modular theories has been discussed in detail in the previous sections and in the papers that comprise this dissertation. Those are the theories belonging to the Prosodic Phonology tradition (e.g. Selkirk 2005, 2009, 2011). Prosodic Phonology assumes the existence of prosodic structure that mediates between syntax and phonology. However, the constraints mapping that structure, such as Align and Match constraints in (4), (6), (8) and (10) make reference syntactic elements, which violates modularity. As previously discussed, the NRH argued for in this dissertation assumes that input to phonology consists only of phonological primitives, and no syntactic information survives, so no reference is made to it in the phonological computation.

The other category of non-modular interface theories assumes no prosodic structure exists. Phonological computation has direct access to syntactic structure and operates on syntactic domains and primitives. Ishihara (2003, 2007) analyzes the focus intonation pattern (FIP) by using the phase spell-out domains as domains of prosodic prominence assignment. However, unlike this dissertation, his work assumes there are no prosodic domains, and that prosodic prominence is assigned within syntactic spell-out domains. Phonological rules have direct access to syntactic features, such as the FOCUS feature, and can manipulate them by e.g. deleting them. For example, "the FIP Rules do not apply at any early Spell-Out cycles until the FOCUS phrase/wh-phrase is assigned a FOCUS feature… after the FIP Rules applied to a FOCUS feature at one Spell-Out cycle, the feature is deleted. Consequently, they become invisible to operations at later Spell-Out cycles." (Ishihara 2003:95). Seidl (2001) and Pak (2008) also argue that there is no prosodic hierarchy, but that phonological rules refer directly to syntax, as does Samuels (2009). Their arguments are based on the related phenomena of domain paradoxes (Seidl) and multiple-domain and variable-domain effects (Pak), where phonological rules seem to make reference to different but overlapping domains, and there is no one to one correspondence between syntactic and prosodic domains.

5.2.2 Phase-based interface theories

A category that intersects the previous one to a great extent is the phase-based interface theories. In Ishihara (2003, 2007) and Pak (2008) the spell-out is assumed to happen at specific points in the syntactic derivation, vPs, and CPs, not at each merge, like in the NRH. Kratzer and Selkirk (2007), Revithiadou and Spyropoulos (2009), and to some extent the Match theory of Selkirk (2009, 2011) are also based on the notions of specific points at which spell-out happens, but differ from Ishihara (2003, 2007), Seidl (2001) and Pak (2008) in that they assume the existence of a prosodic hierarchy of domains. Adger (2007) also assumes specific spell-out points, and refers to prosodic structure in the form of prominence and bracketed domains, but does not incorporate the Prosodic Hierarchy in the analysis. Revithiadou and Spyropoulos (2009) further differ from the proposal presented in this dissertation in that they argue that the derivational domains, products of each spell-out cycle, "are mapped onto separate prosodic constituents. More specifically, [they] argue that, since these derivational cascades reach PF as individual units, they are independently processed and thus, are mapped onto separate p-phrases" (Revithiadou and Spyropoulos 2009:206). This means that in their view spell-out proceeds in individual chunks, such as in (1a), and not in cumulative phases, such as in (1b), as is argued for in the NRH.

Unlike the works listed above, the No-Reference Hypothesis argued for here is based on the idea of spell-out happening at each merge. What the theories adopting the spell-out-at-specific points have in common is that they analyze higher-level prosodic domains, from Prosodic Phrase and upwards. However, if we want to map all prosodic domains, including lower level ones, such as Prosodic Words, by using phases in syntactic spell-out, and if we want to capture what is traditionally called word-level phenomena, we need to assume smaller spell-out domains. This is discussed in more detail in the three papers that comprise this dissertation, as well as in the previous sections of this extended introduction.

An approach that has more aspects in common with the approach presented in this dissertation is that of Bye and Svenonius (2012), who look at non-concatenative effects in productive inflectional morphology and work towards eliminating mechanisms such as morphological subcategorization and morpheme-specific alignment constraints from the phonological computation. Like the NRH, their approach is based on the syntax-all-the-way-down view present in Distributed Morphology and Nanosyntax, and they adopt a modular view of language in that they "uphold the view that lexical, morphological and syntactic information is unavailable to the phonological component" (Bye and Svenonius 2012:2). They also assume spell-out is cyclic. However, they also state that only certain syntactic heads are designated as phase heads.

A phase-based approach that does assume spell-out at each point where spell-out is possible is that of Newell (2008). She looks at languages such as Ojibwa, where we see cyclic effects within words, suggesting that there are phases below phrase level. The difference between Newell (2008) and the approach presented in this dissertation is the treatment of linearization and the formalization of the phonological computation in phases within the OT constraint-based system. While Newell (2008: 32) states that "at PF and LF, the output of each phase is stored and integrated according to the principles that are operative in each branch of the computation", the NRH presented in this dissertation recognizes that phonology has no principles for integrating two phonological strings that arrive from syntax. NRH presents an explicit account of the nature of the input to phonology after cyclic, phase-based, spell-out, and of the OT constraints used in mapping prosodic domains in this system.

Another phase-based syntax-phonology interface approach that shares certain traits with the NRH argued for in this dissertation is that of Cheng and Downing (2012**,** *to appear*). They look at data from Bantu and argue for a non-cyclic model, against the idea that the output of each spell-out reaches phonology, which is an important part of NRH. Due to the fact that phonology has access to syntax only at the end of the derivation, the mapping constraints in Cheng and Downing (*to appear*) such as the one in (23) below still violate modularity in that they refer to syntactic objects such as phase edges[6].

[6] Since the input to phonology arrives as a single spell-out at the end of the derivation, phase edges need to be encoded in that input. In a modular system, the only source of phonological information in the input is the phonological information stored in lexical items. Unless phase edges are spelled out by specific phonological material, those edges are syntactic in nature, which means that syntactic information reaches phonology.

(23)

a. ALIGNR[PHASE, INTPH] (ALIGNR-PHASE): Align the right edge of every phase (*v*P/CP) with the right edge of an Intonation Phrase (IntPh).

b. ALIGNR[INTPH, PHASE] (ALIGNR-INTPH): Align the right edge of every Intonation Phrase (IntPh) with the right edge of a phase (*v*P/CP).

Cheng and Downing (*to appear*) do, however, show that phase edges need to be recognized by phonology, which parallels the findings of this dissertation. It would be an important step in developing the NRH to account for the Bantu data using the Phase-Phase Faithfulness constraints, e.g. a PHASEANCHOR, in conjunction with prosodic well-formedness constraints.

5.3 Comparison with Stratal OT

This dissertation argues that phonological computation proceeds in phases that are caused by phases in the syntactic computation. Although the idea of basing phonological cycles on syntactic phases is relatively new, the idea of the phonological computation happening in cycles is well established within OT in form of Stratal OT. This section compares the current proposal with this theory.

Stratal OT (Bermúdez-Otero 2011, 2012, 2014, Kiparsky 2000) is a theory of phonological computation combining the classical OT parallel constraint-based computation with the idea of the phonological cycle and phonological stratification, originating in the theory of Lexical Phonology (LP). Phonological computation is assumed to operate on phonological domains, starting with the smallest domains created early on in the (morpho)syntactic concatenation of an utterance, and recursively applying to all subsequent larger domains created at later stages of (morpho)syntactic concatenation. Thus, although Stratal OT follows the classical OT in achieving the mapping of input to output by a parallel constraint-based computation, there is no one parallel computation of a single input string, but multiple parallel computations of different input strings provided by the different cycles.

The stratal architecture of phonology in this theory assumes that (morpho)syntactic constituents exist in three types: stem-level, word-level and phrase-level. Each level (stratum) is associated with its own constraint ranking, which is where this theory departs from the classical OT notion of a unique ranking for a given language. Thus, the stem-level constituent triggers a cycle which creates a domain for stem-level phonology, the inflectionally complete grammatical word triggers a cycle creating a domain for word-level phonology, and the cycle triggered by the highest node of the utterance creates the domain of phrase-level phonology. There are no restrictions on the amount of divergence between rankings at different levels within the phonology of one language.

In addition to the cyclic approach, giving multiple input-output computations, and the different rankings for different levels, Stratal OT differs from mainstream OT in its repertoire of constraints used in the computation. It rejects the Output-Output constraints as a means to capture (morpho)syntactic and lexical effects on phonological computation, and due to its modular approach to the (morpho)syntax-phonology interface it rejects constraint indexation as a way of referring to non-phonological information in a phonological computation. Access to syntactic information is indirect and local, via morphological levels (stem, word, phrase). Thus, the grammar has the classical modular unidirectional architecture, with syntax preceding morphology, morphology preceding phonology and phonology preceding phonetics

Beyond the obvious difference of multiple vs. one constraint rankings, Stratal OT is similar to the No-Reference Hypothesis argued for here in that it strives towards a modular account of the syntax-phonology interactions. However, the two approaches differ greatly in their assumptions about the nature of (morpho)syntax. While a separate morphological module is necessary for Stratal OT, the NRH adopts the decomposed view of syntax where there is no separate morphological module, and thus no morphological categories, especially that of “word”. Furthermore, the cycles in Stratal OT are related to these morphological categories/levels, whereas the NRH derives them from independently motivated syntactic cycles. This results in prosodic domains corresponding with cyclic domains in the phase-based NRH, but not in Stratal OT.

Stratal OT has had great success in accounting for many language phenomena, especially at word level, such as stress and affixation, and a true comparison of the two approaches is not possible within the boundaries of this dissertation. A brief analysis of Belfast English dentalization will be presented for illustrative purpose, to compare the two theories and show how NRH could potentially account for the types of cases Stratal OT has accounted for.

Belfast English dentalization (Bermúdez-Otero 2011) is the process of dentalizing /t, d, n, l/ in front of /(ə)r/, for example in "train", "drain", "Peter", "ladder" etc. However, dentalization underapplies when the environment is created by agentive –er and comparative –er, for example in "waiter", "loader", "runner" etc. This gives us the difference between the dentalized 'better' (comparative of "good") and non-dentalized 'better' ("one who bets"). Within Stratal OT, "In the case of Belfast English, one must assume that dentalization applies only within stem-level domains, and that agentive -er and comparative -er are word-level suffixes unless attached to bound roots. This yields the appropriate counterfeeding relationship between stem level dentalization and word-level suffixation" (Bermúdez-Otero 2011:6).

Within the framework of the No-Reference Hypothesis argued for in this dissertation, the distinction between the two cases is made by appealing to the difference in the derivation. The dentalization process applies at all cycles, but Phase Faithfulness constraints would block the application in the second cycle. We see in tableau in (24) below, how in the derivation of "train" the dentalization trigger is present in Phase 1, whereas it is not in "wait". The Phase faithfulness constraint, PhaseID Dental, demanding that the dental features of segments remain identical to the previous phase, is not activated in Phase 1, since there is no previous phase. The constraint that favours dentalization (a placeholder constraint is used here for simplicity) outranks Input-Output Identity constraint for the dental feature, which means that in the case of "train" the dentalized candidate is optimal, as opposed to "wait". In Phase 2 of "waiter", in tableau (25), the trigger is there, but faithfulness to the output of the previous phase is outranking the constraint that favours dentalization, whuch results in underapplication.

(24) Phase 1

/train/	PhaseID Dental	Dentalize before /(ə)r/	IO-ID Dental
a. ☞ train.Dental			*
b. train		*!	
/wait/			
a. wait.Dental			*!
b. ☞ wait			

(25) Phase 2

Phase1 Output: | wait |			
/waiter/	PhaseID Dental	Dentalize before /(ə)r/	IO-ID Dental
a. waiter.Dental	*!		*
b. ☞ waiter		*	

5.4 Conclusion

This extended introduction had the purpose of presenting the three articles that comprise this thesis as a coherent whole. Section 1 outlined the aims and scope of the dissertation. Section 2 placed the papers in a theoretical context, before Section 3 presented the No-Reference Hypothesis the dissertation argues for. Section 4 summarized the contributions of each of the papers, and section 5 took the discussion further by answering some questions that were left unaddressed in the papers for reasons of space, and by comparing the theory presented here with some other theories within the similar frameworks for syntax, phonology and the syntax-phonology interface.

The dissertation addresses the questions of how we can derive the effects of syntactic structure on phonology, how mapping from syntax to phonology is carried out, of the nature of input to phonology and of the phonological computation. It argues that syntactic computation proceeds in phases, producing cumulative cyclic input to phonology consisting solely of phonological primitives. The No-Reference Hypothesis manages to formalize a fully modular approach to the syntax-phonology interface within the Optimality Theoretical computation, by introducing PhasePhase Faithfulness constraints. Furthermore, it provides an explicit account of how the outputs of the different phases are linearized on their way to the phonological module.

The clear limitations of this dissertation lie in its narrow empirical coverage. Directions for future research include looking into cyclic effects at word level (such as those Stratal OT successfully accounts for), cases where prosody seems to drive syntactic movement (such as Focus movement in Italian, heavy NP shift or prosodic scrambling of phonological phrases in Japanese touched on in section 2.1.2.), and lexical category-specific effects, mentioned in section 2.2.1.

References

Abels, K. and P. Muriungi. (2006). The focus particle in Kĩĩtharaka. *ZAS Papers in Linguistics* 46, 1-20.

Adger, D. (2007). Stress and phasal syntax. *Linguistic Analysis* 33, 238-266.

Agbayani, B., Golston C. and Ishii, T. (2015). Syntactic and prosodic scrambling in Japanese. *Natural Language and Linguistic Theory* 33, 47-77.

Bermúdez-Otero, R. (2011). Cyclicity. In M. van Oostendorp, C. Ewen, E. Hume, and K. Rice (eds). *The Blackwell companion to phonology*. Malden, MA: Wiley-Blackwell

Bermúdez-Otero, R. (2012). The architecture of grammar and the division of labour in exponence. In J. Trommer (ed.), *The Morphology and Phonology of Exponence*. Oxford: Oxford University Press

Bermúdez-Otero, R. (2014) *Stratal Optimality Theory: an overview*. Retrieved from http://www.bermudez-otero.com/Stratal_Optimality_Theory.htm?B1=Stratal+OT

Borer, H. (2005). *Structuring Sense*. Oxford: OUP

Büring, D. (2007). Semantics, Intonation and Information Structure. In G. Ramchand & C. Reiss (eds.) *The Oxford Handbook of Linguistic Interfaces*. Oxford: OUP.

Bye, P. (2006). Allomorphy - selection, not optimization. In M. Krämer, S. Blaho, and P. Bye (eds.) *Freedom of Analysis?* Berlin: Mouton.

Bye, P. and P. Svenonius. (2012). Non-concatenative morphology as epiphenomenon. In J. Trommer (ed.), *The Morphology and Phonology of Exponence*. Oxford: Oxford University Press

Caha, P. (2009). *The Nanosyntax of Case*. PhD Dissertation, University of Tromsø, Tromsø.

Chen, M. Y.(1987). The syntax of Xiamen tone sandhi. *Phonology Yearbook* 4, 109–149.

Cheng, L. and L. Downing. (2012) Prosodic domains do not match spell-out domains. *McGill Working Papers in Linguistics*, 22 (1).

Cheng, L. and L. Downing. (*to appear*). Phase syntax = cyclic phonology?. *Syntax*

Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge: The MIT Press

Chomsky, N. (1995). *The Minimalist Program*. Cambridge, MA: MIT Press

Chomsky, N. (2000). Minimalist inquiries: The framework. In R. Martin, D. Michaels & J. Uriagereka (eds.), *Step by Step: Essays on Minimalist Syntax in Honor of Howard Lasnik*, 89-155. Cambridge, MA: MIT Press.

Chomsky, N. (2001). Derivation by phase. In M. Kenstowicz (ed.), *Ken Hale: A Life in Language*, 1-52. Cambridge, MA: MIT Press.

Chomsky, N. (2004). Beyond explanatory adequacy. In A. Belletti (ed.), *Structures and Beyond: The Cartography of Syntactic Structures*, vol. 3, 104-131. Oxford: Oxford University Press.

Chomsky, N. (2008). On Phases. In R. Freidin, C. P. Otero & M. L. Zubizarreta. *Foundational Issues in Linguistic Theory. Essays in Honor of Jean-Roger Vergnaud*. Cambridge, MA: The MIT Press. pp. 133–166.

Epstein, S. D. and T. D. Seely. (2002). Rule applications as cycles in a level-free syntax. In S. D. Epstein & T. D. Seely (eds.) *Derivation and explanation in the minimalist program*. Oxford: Blackwell

Epstein, S. D. and T. D. Seely. (2006). *Derivations in Minimalism*. Cambridge: Cambridge University Press.

Evans, N. (1995). *A grammar of Kayardild*. Berlin: Mouton de Gruyter.

Féry, C. and V. Samek-Lodovici. (2006). Focus Projection and Prosodic Prominence in Nested Foci. *Language* 82(1).

Halle, M. & A. Marantz. (1993). Distributed Morphology and the Pieces of Inflection. In K. Hale & S.J. Keyser (eds.), *The View From Building 20*, 111-176. Cambridge, Mass.: MIT Press.

Harley, H. and R. Noyer. (1999). Distributed Morphology. *Glot International*, 4(4), 3-9.

Hayes, B. (1989). The prosodic hierarchy in meter. In P. Kiparsky and G. Youmans (eds.), *Phonetics and Phonology. Rhythm and Meter*. New York: Academic Press. pp. 201-260.

Inkelas, S. and D. Zec. (1993). Auxiliary reduction without empty categories: a prosodic account. *Working Papers of the Cornell Phonetics Laboratory* 8. 205–253.

Ishihara, S. (2003). *Intonation and Interface Conditions*. PhD Dissertation, MIT.

Ishihara, S. (2007). Major Phrase, Focus Intonation, Multiple Spell-Out (MaP, FI, MSO). *The*

Linguistic Review 24, 137–167.

Jackendoff, R. (1972). S*emantic Interpretation in Generative Grammar*. Cambridge, MA: MIT Press

Kaisse, E. M. (1985). *Connected speech: the interaction of syntax and phonology*. Orlando: Academic Press.

Kiparsky, P. (2000). Opacity and cyclicity. *The Linguistic Review* 17. 351–367.

Kiss, K. É. (1998). Identificational Focus versus Information Focus. *Language* 74, 245-273.

Kratzer, A. and E. Selkirk. (2007). Phase theory and prosodic spell-out. *The Linguistic Review* 24, 93-135

Kula, N. C. (2007) Effects of phonological phrasing on syntactic structure. *The Linguistic Review* 24, 201-231

Ladd, D. R. (1996). *Intonational phonology*. Cambridge Studies in Linguistics 79. Cambridge: CUP.

Liberman, M. (1975) [1979]. *The Intonational System of English*. New York: Garland.

Liberman, M. and A. Prince, (1977). On Stress and Linguistic Rhythm. *Linguistic Inquiry* 8, 249-336.

Lundquist, B. (2008). *Nominalizations and Participles in Swedish*. PhD Dissertation, University of Tromsø.

Marvin, T. (2002). *Topics in the Stress and Syntax of Words*. PhD Dissertation. MIT.

McCarthy, J. and A. Prince. (1993). Generalized Alignment, *Yearbook of Morphology,* pp.79–153.

McCarthy, J. and A. Prince. (1995). Faithfulness and Reduplicative Identity. In J. Beckman, S. Urbanczyk and L. Walsh Dickey (eds.) *University of Massachusetts Occasional Papers in Linguistics* 18: Papers in Optimality Theory. Pp. 249–384.

Migdalski, K. (2006). *The Syntax of Compound Tenses in Slavic*. LOT Dissertation Series 130.

Nespor, M. and I. Vogel. (1986). *Prosodic Phonology*. Foris, Dordrecht.

Newell , H. (2008). *Aspects of the morphology and phonology of phases*. PhD Dissertation, McGill University, Montréal

Odden, D. (1987). Kimatuumbi phrasal phonology. *Phonology yearbook* 4. 13-36.

Pak, M. (2008). *The postsyntactic derivation and its phonological reflexes*. PhD dissertation, University of Pennsylvania.

Paster, M.. (2005). Subcategorization vs. output optimization in syllable counting allomorphy. In *WCCFL 24 Proceedings*.

Prince, A, and Smolensky P. (1993). *Optimality theory: Constraint interaction in generative grammar.* Ms. Brunswick, New Jersey, and Boulder, Colorado: Rutgers University and University of Colorado, Boulder. [http://roa.rutgers.edu/files/537-0802/537-0802-PRINCE-0-0.PDF].

Ramchand, G. (2008). *Verb Meaning and the Lexicon: A First Phase Syntax*. Cambridge University press, Cambridge.

Revithiadou, A. and V. Spyropoulos. (2009). A dynamic approach to the syntax-phonology interface: A case study from Greek. In K. Grohmann (ed.) *InterPhases*. Oxford: Oxford University Press.

Rizzi, L. (1997). The Fine Structure of the Left Periphery. In L. Haegeman (ed.) *Elements of Grammar*. Dordrecht: Kluwer.

Rizzi, L. (2004). *The Cartography of Syntactic Structures, Vol. 2:The Structure of CP and IP*. Oxford: OUP

Round, E. (2009). *Kayardild morphology, phonology and morphosyntax*. PhD dissertation. Yale

Samek-Lodovici, V. (2005). Prosody-Syntax Interaction in the Expression of Focus. *Natural Language and Linguistic Theory* 23, 687–755.

Samuels, B. (2009). *The Structure of Phonological Theory*. PhD Dissertation, Harvard University

Scheer, T. (2011). *A guide to morphosyntax-phonology interface theories: how extra-phonological information is treated in phonology since Trubetzkoy's grenzsignale.* Berlin: Mouton de Gruyter.

Scheer, T. (2012). *Direct Interface and One-Channel Translation. A Non-Diacritic Theory of the Morphosyntax-Phonology Interface*. *Vol.2 of A Lateral Theory of phonology.* Berlin: Mouton de Gruyter.

Seidl, A. (2001). *Minimal indirect reference: A theory of the syntax-phonology interface*. Outstanding dissertations in Linguistics. London, New York: Routledge.

Selkirk, E. (1981). [1978]. On prosodic structure and its relation to syntactic structure. In T. Fretheim (ed.) *Nordic Prosody II*. Trondheim: TAPIR. 111-140.

Selkirk, E. (1984). *Phonology and Syntax: The Relation between Sound and Structure.* Cambrdige, Mass.:MIT Press.

Selkirk, E. (1986). On derived domains in sentence phonology. *Phonology* 3, 371-405.

Selkirk, E. (1995). The prosodic structure of function words. In J. Beckman, L. W. Dickey, & S. Urbanczyk (eds.) *Papers in Optimality Theory. University of Massachusetts Occasional Papers 18*. Amherst, Mass: GLSA. 439-469.

Selkirk, E. (2005) Comments on intonational phrasing. In S. Frota, M. Vigario and M. J. Freitas (eds.) *Prosodies*, 11–58. Berlin: Mouton de Gruyter.

Selkirk, E. (2009). On clause and intonational phrase in Japanese: The syntactic Grounding of Prosodic Constituent Structure. *Gengo Kenkyu* 136, 35–73.

Selkirk, E. (2011) The syntax-phonology interface. In J. Goldsmith, J. Riggle and A. Yu (eds.) *The Handbook of Phonological Theory*. Oxford: Blackwell.

Smith, J. L. (2011). Category-specific effects. In M. van Oostendorp, C. Ewen, B. Hume, and K. Rice (eds.), *The Blackwell Companion to Phonology*, 2439-2463. Malden, MA: Wiley-Blackwell.

Starke, M. (2009). Nanosyntax: A short primer to a new approach to language. *Tromsø Working Papers in Language and Linguistics: Nordlyd* 36(1), 1-6

Svenonius, P. (2010). Spatial p in English. In G. Cinque and L. Rizzi (eds.) *The Cartography of Syntactic Structures*, Vol 6. Oxford University Press, Oxford.

Szczegielniak, A. (2005). Clitic positions within the Left Periphery: evidence for a phonological buffer. In Heggie, L. & P. Ordoñez (eds.) *Clitic and Affix Combinations: Theoretical perspectives*. Benjamins, 283–299.

Šurkalović, D. (2007). *Function Words at the Discourse-Prosody Interface*. MA Thesis, University of Tromsø.

Šurkalović, D. (2011a). Lexical and Functional Decomposition in Syntax: A view from Phonology. *Poznan Studies in Contemporary Linguistics (PSiCL)* 47(2). pp. 399–425.

Šurkalović, D. (2011b). Modularity, Linearization and Phase-Phase Faithfulness in Kayardild. *Iberia: An International Journal of Theoretical Linguistics* 3(1). pp. 81-118

Šurkalović, D. (2013). Modularity, Phase-Phase Faithfulness and Prosodification of Function Words in English. *Nordlyd* 40(1). pp. 301-322

Truckenbrodt, H. (1995). *Phonological phrases: their relation to syntax, focus and prominence.* Unpublished Ph.D. dissertation, MIT.

Truckenbrodt, H. (1999). On the relation between syntactic phrases and phonological phrases. *Linguistic Inquiry* 30(2), 219-255.

Truckenbrodt, H. (2006). Phrasal stress. In K. Brown (ed.), *The Encyclopedia of Languages and Linguistics*, 2nd Edition. Vol. 9. Oxford: Elsevier,

Truckenbrodt, H. (2007). The syntax-phonology interface. In P. de Lacy (ed.), *The Cambridge Handbook of Phonology*, Cambridge: Cambridge University Press.

Truckenbrodt, H. (2012). On the prosody of German wh-questions. In G. Elordieta & P. Prieto (eds.), *Prosody and meaning*, 73-118. Berlin: de Gruyter.

Uriagereka J. (1999). Multiple Spell-Out. In S. D. Epstein & N. Hornstein (eds.), *Working Minimalism*, 251-282. Cambridge, MA: MIT Press.

Yamato, N. (2007). *On Topic and Focus: An Account of –wa/–ga-Markers in Japanese*. MA Thesis, University of Tromsø.

Part II

The Papers