

THE PHONOLOGICAL DIMENSION OF GRAMMATICAL MARKEDNESS

by

Cristian Iscrulescu

A Dissertation Presented to the
FACULTY OF THE GRADUATE SCHOOL
UNIVERSITY OF SOUTHERN CALIFORNIA
In Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
(LINGUISTICS)

December 2006

UNIVERSITY OF SOUTHERN CALIFORNIA
THE GRADUATE SCHOOL

This dissertation, written by

CRISTIAN ISCRULESCU

*under the direction of his dissertation committee
and approved by all its members, has been presented to
and accepted by the Graduate School in partial
fulfillment of the requirements for the degree of*

DOCTOR OF PHILOSOPHY

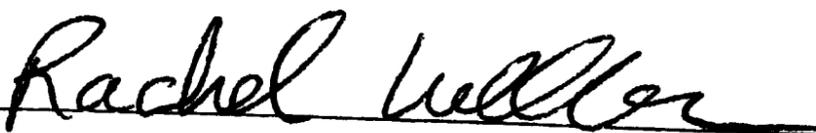


Jean Morrison
Associate Vice Provost for Graduate Programs

DEC 12 2006

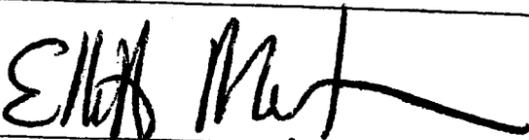
Date _____

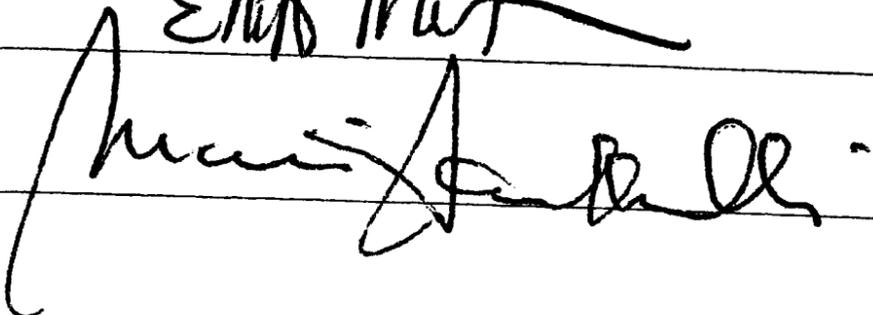
Dissertation Committee



Chair

Anna Lubowicz





ACKNOWLEDGEMENTS

Having completed this dissertation, it is time to take a moment and thank those people who have offered me help and support during my years at USC. First and foremost, my gratitude goes to my long time advisor and committee chair, Rachel Walker. She offered her constant support in the pursuit of my research project and, through countless meetings and thorough revisions of the material, offered numerous suggestions and critical advice. Rachel has been a mentor in the true sense of the word. Not only did she patiently discuss with me the successive versions of the research hypothesis, but also encouraged me to put things into perspective and always think of further developments and implications of the theory. For all this, I am deeply grateful to her.

Warm thanks go to the other committee members. I benefited from Ania Lubowicz's insights into the nature of the morphology-phonology interface, Mario Saltarelli offered me an encyclopedic perspective of Romance morphology and phonology, and Elliott Moreton (currently at the University of North Carolina) patiently went over my handouts and stimulated me with challenging questions. A special thanks to Jack Hawkins (now at Cambridge University) who was a member of my Ph.D. screening committee and introduced me to the field of linguistic typology.

Thanks are also due to a number of special people at USC's Linguistics Department from the interaction with whom I gained what I hope to be a better understanding of the main issues in contemporary linguistics: Hagit Borer (my first

academic advisor, a wonderful instructor and a model researcher), Jean-Roger Vergnaud, Dani Byrd, Maria Luisa Zubizarreta, Todd Haskell, Elsi Kaiser and Roumi Pancheva, to mention only a few. I am indebted and thankful to many of my fellow graduate students at USC: Asier Alzacar, Agnieszka Lazarczyk, Bella Feng, Rebeka Campos, Michal Martinez and Carolina Gonzalez, who have helped me over the years. I am also grateful to the audience of USC's PhonLunch group, an ideal forum for discussion and stimulating ideas where I have had the chance to present parts of the dissertation. Same thanks go to linguists who gave me feedback on my work at various stages: Armin Mester, Keren Rice, John McCarthy, Mike Hammond, Joe Pater, Donca Steriade and Martin Haspelmath, to mention only a few.

Warm thanks to the staff of the Linguistics Department (Joyce Perez, Frankie Hayduk and Karma Dolma), from whose availability and help I have benefited during my stay at USC.

Finally, I would like to express my gratitude to my family and friends, whose patience and moral support have surrounded me over the years.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
LIST OF TABLES	vii
LIST OF FIGURES	xi
ABSTRACT	xii
CHAPTER 1	
INTRODUCTION	1
CHAPTER 2	
GRAMMATICAL AND PHONOLOGICAL MARKEDNESS	23
0. Introduction.....	23
1. Criteria for grammatical markedness.....	24
1.1 Structural coding.....	24
1.2 Frequency.....	28
1.2.1 The failure of the iconicity approach to grammatical markedness.....	28
1.2.2 Markedness as a consequence of economy.....	30
1.2.3 Markedness reversals as a consequence of frequency effects.....	38
2. Towards a correlation between inflectional markedness and phonology: size.....	40
3. Criteria for phonological markedness.....	51
3.1 Phonological markedness as complexity.....	52
3.2 Markedness as (non-)occurrence in inventories.....	57
3.3 Summary: grammatical and phonological markedness.....	60
4. Frequency of occurrence and phonological markedness.....	62
4.1. Open vs. closed class categories.....	62
4.2. Roots vs. affixes.....	64
5. The functional grounding of Marked in the Marked Effects.....	67
5.1 Production: MIM and form minimization.....	69
5.2 Perception, retrieval and acquisition.....	73
5.3 The locus and emergence of MIM effects.....	79
6. Conclusion.....	86
CHAPTER 3	
MODELING MARKEDNESS IN OPTIMALITY THEORY	88
0. Introduction.....	88
1. Grammatical markedness and Optimality Theory.....	89
1.1 Functional grounding of OT constraints.....	90
2. Licensing.....	94

2.1 Positional faithfulness.....	96
2.2 Positional markedness.....	98
3. Positive licensing in privileged positions.....	102
4. Licensing of marked phonological structure in marked categories.....	104
5. The Marked in the Marked Schema.....	124
5.1 The emergence of the Marked in the Marked Schema.....	124
5.2 Factorial typology.....	128
6. Summary.....	132

CHAPTER 4

MARKED METRICAL STRUCTURE IN OLD SAXON.....	133
0. Introduction.....	133
1. Data and descriptive generalizations.....	134
2. Uneven trochees as marked prosodic structure.....	142
3. Analysis.....	146
4. Discussion.....	152
4.1 An apparent counterexample: uneven trochees in the unmarked category.....	152
4.2 Alternative accounts.....	154
4.2.1 MIM with licensing constraints for individual case values.....	154
4.2.2 Positional Faithfulness.....	158
5. Summary.....	161

CHAPTER 5

SEGMENTAL MARKEDNESS IN ROMANIAN.....	163
0. Introduction.....	163
1. Number expression in Romanian nominal morphology.....	166
1.1 Data.....	167
1.2 Evidence for underlying /u/ in masculines and neuters.....	169
1.2.1 Lexicon optimization.....	169
1.2.2 Morphological exponence in nominal inflection.....	171
1.2.3 Phonotactic evidence for underlying /u/.....	174
1.2.4 Evidence from loanwords.....	178
1.3 Romanian Plural morphology.....	181
1.3.1 Restrictions on the distribution of high vowels in Romanian.....	181
1.3.2 Analysis.....	183
1.3.2.1 The Sonority Hierarchy and the distribution of theme vowels.....	183
1.3.2.2 High vowel deletion in the Singular.....	185
1.3.2.3 Secondary articulation in the Plural.....	187
1.3.2.4 Licensing marked phonological structure in the Plural....	190
1.3.2.5 Palatalized consonants as marked phonological structure.....	193
1.3.2.6 The emergence of the Marked in the Marked Schema.....	196
2. Number expression in dialects of Romanian.....	200

2.1 North-Western Transylvanian.....	200
2.2 Aromanian.....	203
3. Towards a factorial typology of Number marking in Romance.....	205
4. An alternative approach: Morpheme Realization.....	216
5. Summary.....	220
CHAPTER 6	
PHONOTACTIC MARKEDNESS IN MAYAK.....	223
0. Introduction.....	223
1. Background data on Mayak phonology and morphology.....	224
1.1 The sound system and prosody of Mayak.....	224
1.2 Morpho-phonological processes.....	227
2. Lenition and phonological markedness.....	232
3. Analysis.....	235
3.1 Relevant constraints.....	235
3.2 Inputs with intervocalic stops.....	236
3.3 Inputs with intervocalic fricatives or approximants.....	238
3.4 Interactions with allophonic variation.....	239
4. Residual issues.....	245
4.1 The representation of the Passive suffix.....	245
4.2 An alternative analysis: Positional Faithfulness.....	247
5. Summary.....	251
CHAPTER 7	
CONCLUDING REMARKS.....	253
1. Empirical coverage and predictions.....	255
2. Issues for further research.....	270
REFERENCES.....	272

LIST OF TABLES

Table 1: C ₁ , C ₂ » C ₃	14
Table 2: Overt versus null inflection in Number.....	25
Table 3: Frequencies of occurrence of Number category values.....	33
Table 4: Frequencies of occurrence of Case category values.....	33
Table 5: Frequencies of occurrence of Person category values.....	34
Table 6: Frequencies of occurrence of Voice category values.....	34
Table 7: Frequencies of occurrence of Tense category values.....	34
Table 8: Marked versus unmarked oppositions.....	51
Table 9: Unmarked versus marked consonant features.....	58
Table 10: IDENT[onset seg] » *LABIAL » IDENT[seg].....	97
Table 11: *LABIAL(CODA) » IDENT[seg] » *LABIAL.....	100
Table 12: Plain and palatalized consonants in Romanian Number.....	122
Table 13: Assessment of LICENSE(C ^j , PLURAL).....	122
Table 14: Applications of the MIM Schema.....	126
Table 15: Case marking in u-stem nouns (Singular).....	139
Table 16: Old Saxon u-stem paradigms.....	141
Table 17: MAX-IO » *(HL) (affix retention in Oblique forms).....	147
Table 18: LICENSE (HL, OBL.) » MAX-IO (HL prohibited in the Nominative)....	149
Table 19: LICENSE (HL, OBL.) » MAX-IO » *(HL) (Nominative).....	150
Table 20: LICENSE (HL, OBL.) » MAX-IO » *(HL) (Oblique).....	150
Table 21: LICENSE (HL, OBL.) » MAX-IO » *HL (Nominative).....	151
Table 22: LICENSE (HL, OBL.) » MAX-IO » *(HL) (Oblique).....	151

Table 23: LICENSE (M,D), LICENSE (M,I) » MAX-IO » *M.....	156
Table 24: LICENSE (M,D), LICENSE (M,I) » MAX-IO » *M (Dative).....	157
Table 25: LICENSE (M,D), LICENSE (M,I) » MAX-IO » *M (Instrumental).....	157
Table 26: Case marking in u-stem nouns (Singular).....	158
Table 27: *(HL) » MAX-IO (Nominative deletion).....	159
Table 28: MAX-IO _O » *(HL) » MAX-IO » *PK/hi.....	160
Table 29: The vocalic ending [u] surfacing before consonantal suffixes.....	171
Table 30: The realization of French loanwords in the indefinite form (with [u] as epenthetic).....	179
Table 31: The definite form of French loans.....	179
Table 32: Romanian vowel chart.....	182
Table 33: *PK/[hi] » MAX-IO (general deletion of high vowels).....	185
Table 34: SONCON » *PK/[hi] (high vowels retained avoiding illicit coda).....	186
Table 35: MAX-IO » UNIFORMITY-IO (coalescence in the Plural).....	188
Table 36: MAX-IO » UNIFORMITY-IO (coalescence wrongly predicted in the Singular).....	189
Table 37: Frequencies of occurrence of Number category values.....	191
Table 38: LICENSE (C ^{Sec.} , PL.) » MAX-IO (no coalescence in the Singular).....	193
Table 39: Summary rankings for Romanian.....	196
Table 40: MAX-IO » *C ^{Sec.} (secondary articulation preferred to deletion).....	196
Table 41: *C ^{Sec.} » IDENT[hi] (minimal occurrence of secondary articulations)....	198
Table 42: *PK/[hi], MAX-IO » *C ^{Sec.} , LICENSE(C ^{Sec.} , PL.).....	202
Table 43: *PK/[hi], MAX-IO » *C ^{Sec.} , LICENSE(C ^{Sec.} , PL.).....	203
Table 44: MAX-IO, LICENSE(C ^{Sec.} , PL.) » *PK/[hi], *C ^{Sec.}	204

Table 45: MAX-IO, LICENSE(C ^{Sec.} , PL.) » *PK/[hi] » *C ^{Sec.}	205
Table 46: Constraint rankings for Romanian dialects.....	206
Table 47: *PK/[hi] » LICENSE(C ^{Sec.} , PL.) » FAITH (MAX/DEP-IO) » *C ^{Sec.}	211
Table 48: MAX-ROOT-IO, SONCON » *PK/[hi] » FAITH (MAX/DEP-IO).....	211
Table 49: Factorial typology with Morpheme Realization.....	220
Table 50: Mayak consonants.....	225
Table 51: IDENT[cont] » *VTV (no lenition in the Passive).....	237
Table 52: LICENSE(VTV, PASS.) » IDENT[cont] (lenition in the Active).....	237
Table 53: Active: /maað-er _{Act} / → [maaðer] _{Act}	238
Table 54: Passive: /maað-ir _{Pass} / → [maatɪr] _{Pass}	239
Table 55: LICENSE(VTV, PASS.) » *ð (lenition in the Active).....	241
Table 56: LICENSE(VTV, PASS.) » *ð (no lenition in the Passive).....	242
Table 57: LICENSE(VTV, PASS.) » *ð, IDENT[cont].....	243
Table 58: *ð » IDENT[cont] (no fricatives in the Passive).....	243
Table 59: Passive: /maatɪr _{Pass} / → [maatɪr] _{Pass}	248
Table 60: Active: /maatɪr _{Act} / → [maað-er] _{Act}	248
Table 61: Active: /maað-er _{Act} / → [maaðer] _{Act}	249
Table 62: Passive: /maað-ir _{Pass} / → [maatɪr] _{Pass}	249
Table 63: The distribution of Tiwi tense prefixes.....	260
Table 64: Singular: LICENSE([-back, +round], PLURAL) » FAITH » *[-back, +round].....	263

Table 65: Plural: LICENSE([-back, +round], PLURAL) » FAITH » *[-back, +round].....	264
Table 66: Plural: LICENSE([-back, +round], PLURAL) » FAITH » *[-back, +round] (failed ranking).....	265
Table 67: Stems with underlying /u/ IDENT[rd] » LICENSE(y, PLURAL) » » IDENT[bk] » *y.....	266
Table 68: Stems with underlying /y/ IDENT[rd] » LICENSE(y, PLURAL) » » IDENT[bk] » *y.....	267
Table 69: The distribution of M and M'.....	268

LIST OF FIGURES

Figure 1: Morphological and Phonological Structure.....	10
Figure 2: Licensing of marked phonological material in the marked category.....	18
Figure 3: Prosodic Hierarchy.....	54
Figure 4: Licensing of marked phonological material in the marked category...	110
Figure 5: The Schema/Filter Model of CON applied to licensing.....	113
Figure 6: Schema/Filter Model variants for a three-way category.....	114
Figure 7: Morphological and Phonological Structure of Italian definite outputs.....	120
Figure 8: Morphological and Phonological Structure.....	149
Figure 9: Morphological Structure as a level of representation.....	172
Figure 10: Assigning morphological exponence.....	173
Figure 11: Constraint lattice for Number marking in Romanian.....	199
Figure 12: Constraint reranking in the evolution of Romanian.....	215
Figure 13: Assessing Morpheme Realization.....	218

ABSTRACT

This dissertation explores the correlation between grammatical markedness and the phonological properties of outputs inflected for morpho-syntactic categories on a grammatical markedness hierarchy. The main claim made in the thesis is that, under otherwise similar phonological conditions, outputs carrying specifications for a marked member (g) of a given grammatical category (G) can license a given type of marked phonological structure (M) to an extent that is equal or greater than outputs inflected for the unmarked category.

I label this generalization ‘Marked in the Marked’ (MIM). Within the theoretical framework assumed for the dissertation (Optimality Theory, Prince and Smolensky 1993/2004), I propose that the universal repository of constraints (CON) be enriched so as to include a family of formal licensing constraints LICENSE(M, g) that license marked phonological structure (M) in output words that carry the morpho-syntactic specifications of the marked member (g) of G . I propose that the licensing constraint is functionally grounded in the sense that the marked value g is determined by recourse to language use factors such as frequency of occurrence in discourse. Only licensing constraints for marked values g are allowed in CON.

The content of the notions ‘grammatical markedness’ and ‘phonological markedness’ is reviewed and criteria for the two kinds of markedness are discussed. Manifestations of phonological markedness and their grammatical category underpinnings are discussed at the following levels: prosodic (Old

Saxon), segmental (Romanian) and phonotactic (Mayak). For all these cases, the Marked in the Marked constraint schema (in interaction with other relevant constraints) and the factorial typology associated with it are shown to make the correct empirical predictions.

A functional grounding account of the MIM effects discussed in the dissertation is laid out. MIM phenomena are assumed to arise from factors of economy in language production in the sense that confining marked phonological structure to less frequent, grammatically marked forms contributes to minimization of speaker's effort. Also, the presence of marked phonological material in outputs inflected for the marked grammatical category may have certain advantages in language perception, retrieval and acquisition.

CHAPTER 1

INTRODUCTION

The present dissertation discusses the correlation between grammatical (or inflectional) markedness and the phonological properties of outputs that are inflected for the marked/unmarked members of grammatical categories. The main claim put forth in the thesis is that, under otherwise similar phonological conditions, outputs inflected for the marked member of a category are characterized by equal or greater phonological markedness than outputs inflected for the unmarked category, a generalization that I label ‘Marked in the Marked’ (MIM).

A considerable body of work in linguistics has long acknowledged the importance of markedness, a concept first developed by the Prague School (Jakobson 1932/1984, 1939/1984, Trubetzkoy 1939/1969) and conceived as a language internal property of category values. Within this view, markedness is described in terms of polar oppositions between linguistic objects such that the unmarked member of the opposition is simpler and more general than the marked one. It can be noted that in the original Praguean sense the marked and unmarked members of a category are in a privative opposition in the sense that the marked term is characterized by the presence of a mark or feature while the unmarked one, by the absence of the mark.

To take a very simple example, in a language like English, where the plural is usually expressed in nouns by the suffix *-s* and the singular has no overt affixal expression, one can say that with respect to the category of Number the marked term of the Singular-Plural opposition is the Plural. It should be noted that the Praguean approach to markedness (and grammatical markedness in particular) is largely language-specific and makes no explicit claims as to the universality of categories and processes involved.

In more recent years, the concept of markedness has been incorporated into a theory of typological universals developed by Greenberg (1966ab). Throughout this dissertation I will assume a Greenbergian perspective on markedness, which I will henceforth refer to as grammatical, inflectional or typological markedness. In contrast with the view held by the Prague School, the Greenbergian approach capitalizes on the universal asymmetries in the grammatical properties of items that are otherwise equal on a certain dimension of analysis. These asymmetries are the outcome of higher complexity in the more marked element, expressed in terms of structural makeup, richness of inflectional paradigms and allomorphy (all of which fall under the label 'structural coding' (Croft 2003), or language use factors such as frequency of occurrence.

The topic of the present dissertation is the relation between grammatical or inflectional markedness (as reflected in markedness hierarchies) and the phonological properties of the output forms characterized by various degrees of such markedness. The dissertation is intended as a contribution to bridging the

existing gap between research on markedness in linguistic typology, broadly understood as “the study of patterns that occur systematically across languages” (Croft 2003:1) and research on markedness in phonology.

In the dissertation I review the notion of grammatical and phonological markedness, respectively, and address the issues in (1a.) and (1b.) below:

- (1) Main issues addressed in the dissertation
 - a. what is the correlation between grammatical and phonological markedness and how can it be stated?
 - b. how can the correlation in (a) be accounted for?

Three case studies are brought to bear on these issues. To preview the phenomena discussed in the thesis, first consider case marking in Old Saxon nouns. In Old Saxon, both the Nominative-Accusative (Direct) and the Dative-Instrumental (Oblique) Case are expressed underlyingly by the same high vowel suffix /-u/. However, in the grammatically unmarked Nominative-Accusative, the Case marker deletes whenever it would lead to a metrically marked uneven trochee (HL) consisting of a heavy (H) and a light syllable (L):

(2) Nominative-Accusative: the case suffix /-u/ deletes whenever its realization would lead to uneven (HL) trochees:

/her-u _{Nom.} / → [(hé.ru)] _{Nom.}	(LL)	*[(hér)]	‘sword’
/luft-u _{Nom.} / → [(lúft)] _{Nom.}	(H)	*[(lúf.tu)]	‘air’

In contrast, the grammatically marked Dative-Instrumental (or Oblique) case is characterized by retention of the Case marker /u/ no matter what kind or trochee (even or uneven) obtains:

(3) Oblique: the case suffix /-u/ is retained irrespective of metrical properties:

/her-u _{Obl.} / → [(hé.ru)] _{Obl.}	(LL)	*[(hér)]	‘sword’
/luft-u _{Obl.} / → [(lúf.tu)] _{Obl.}	(HL)	*[(lúft)]	‘air’

On a Greenbergian grammatical markedness scale, the Oblique (Dative-Instrumental) Case is ranked higher than the Nominative-Accusative. Also, the Oblique Case allows for a type of phonologically marked metrical structure (the uneven trochee), which is systematically avoided in the Nominative-Accusative. The grammatically marked Case can therefore allow for a more diverse range of metrical structures, including marked metrical structure never seen in the grammatically unmarked Case.

A more complex instance of connection between grammatical and phonological markedness is provided by Number marking in Romanian nominals.

In Standard Romanian, the Singular and the Plural of masculines and neuters are expressed by high vowel suffixes, /u/ and /i/, respectively. In word-final position high vowels are generally avoided in the language's phonology. The suffix of the grammatically unmarked Singular typically deletes in outputs (4a.) and surfaces only when compelled by syllabification requirements, as in (4b.), given the fact that in Romanian coda clusters with rising sonority are strictly forbidden:

(4) Singular marking in Romanian

- a. /moʃ+u_{sg}/ → [(móʃ)]_{sg}. 'old man' *[(mó.ʃu)]
- b. /akr+u_{sg}/ → [(á.kru)]_{sg}. 'sour-Sg.' *[(ákr)]

Unlike the Singular forms, in the grammatically marked Plural the high vowel affix always has an expression in outputs, either it as palatalization on the final consonant of the stem (5a.) or as the full vowel (5b.), in avoidance of an illicit coda:

(5) Plural marking in Romanian

- a. /moʃ+i_{pl}/ → [(móʃ^j)]_{pl}. 'old men' *[(mó.ʃi)]
- b. /akr+i_{pl}/ → [(á.kri)]_{pl}. 'sour-Pl.' *[(ákr)]

What the data in (4) and (5) show is that the phonological content of the grammatically marked Plural never deletes completely and is retained in outputs

even at the cost of creating a consonant with secondary articulation, a segmental marked structure that is never encountered in Standard Romanian in the grammatically unmarked Singular.

Finally, consider the behavior of Voice morphemes in Mayak (Western Nilotic). Mayak voiceless stops normally undergo intervocalic lenition and become voiced fricatives or approximants. Active and Passive suffixes are both vowel-initial and, when attached to a consonant-final stem, should both trigger lenition of the consonant if it is preceded by a vowel. This is what we see in the grammatically unmarked Active Voice:

(6) Active Voice: underlying intervocalic voiceless stops lenite

/maat-ɛr_{Act.}/ → [maaðɛr]_{Act.} ‘eat-Active’ *[maatɛr]

Outputs inflected for the grammatically marked Passive resist lenition under circumstances similar with those above:

(7) Passive Voice: underlying intervocalic voiceless stops are parsed faithfully

/maat-ɪr_{Pass.}/ → [maatɪr]_{Pass.} ‘eat-Passive’ *[maaðɪr]

The explanation developed in this dissertation is that Passive affixation creates a type of marked phonotactic structure (a voiceless stop flanked by two

vowels) that is banned in the grammatically unmarked Active Voice, even if the phonological makeup of the Voice markers is relatively similar.

The Old Saxon, Romanian and Mayak phenomena all point in the same direction: the presence of marked phonological structure in the marked grammatical category. This is the correlation between grammatical and phonological markedness referred to in (1a.). The answer to question (1a.) that I offer in this dissertation is that there is a correlation between grammatical and phonological markedness. The link between the two types of markedness is a positive one; that is, marked grammatical categories are apt to license marked phonological structure to an extent that is equal or greater than in the less marked categories. I label this the Marked in the Marked (MIM) generalization:

(8) The Marked in the Marked (MIM) generalization

If g_1 and g_2 are members of the grammatical category G such that g_2 ranks higher than g_1 on the grammatical markedness hierarchy ($g_2 > g_1$), outputs O inflected for g_2 can license marked phonological structure to an extent that is equal or greater than g_1 (the unmarked term).

MIM will be shown to make the right empirical predictions in a number of language cases (Old Saxon, Standard Romanian and other dialects of Romanian, Mayak). In order to understand better the content of the MIM generalization, a few

clarification points are in place here regarding the notions ‘grammatical category’ and ‘licensing’.

A grammatical category (G) is understood, following Bybee (1985), Crystal (1985) and Hopper (1992), as a set of syntactic features that express meanings from the same conceptual domain. For example, the category of Number (in an inflected output) is represented by the relevant syntactic features for ‘number’ in the morpho-syntactic representation (Morphological Structure, MS¹) of that output. The category is usually represented by two or more values, that correspond to specific settings of the ‘number’ features. For Number, the members are represented by Singular, Plural, Dual etc., each of them having the required syntactic specification on the ‘number’ syntactic node in MS. In this dissertation, grammatical categories are represented by upper case G, while their members are represented by lower case letters (g_i)². For a system with three values of the category of Number (Singular, Plural and Dual), the members of G are represented by the set {g₁ (Singular), g₂ (Plural), g₃ (Dual)}, arranged on the grammatical markedness scale in the decreasing order of their markedness as g₃ > g₂ > g₁ (Dual > Plural > Singular). In defining a grammatical category, complementarity plays an important role. Indeed, in a two-way (Singular-Plural) Number system, the two members are in complementary distribution, and in a multi-way system the members divide the conceptual space without a residue. An inflected form does not assume two or more values of a given grammatical category at the same time –

¹ For the concept of Morphological Structure (MS) see Halle and Marantz (1993).

² When used without a subscript, g is understood as the marked member of G.

for example, a noun can either be ‘Singular’ or ‘Plural’, but never both. In contrast, members of different categories can coexist in the Morphological Structure of one and the same inflected output – for instance, a noun can be both ‘Plural’ (category of Number) and ‘Dative’ (category of Case).

The fact that an output O is inflected for category G means that there is a syntactic node for G in the Morphological Structure of the output. Moreover, the node in question has the specific setting ‘g_i’ for the particular value of G that O is inflected for. For instance, a Singular output has a Number node in its Morphological Structure whose morpho-syntactic feature interpretation is ‘singular’. This is not to say that the grammatical features in question are necessarily assigned to a particular phonological constituent, but rather that the Grammatical Word for O carries those features, presumably due to feature percolation. Consider, for illustration, the Standard Romanian data in (4), repeated below as (9):

(9) Singular marking in Romanian

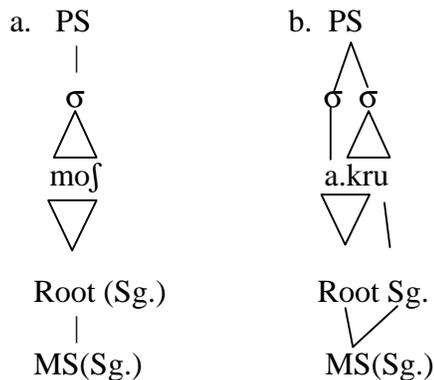
- a. /moʃ+u_{Sg}/ → [(mó.ʃ)]_{Sg.} ‘old man’ *[(mó.ʃu)]
- b. /akr+u_{Sg}/ → [(á.kru)]_{Sg.} ‘sour-Sg.’ *[(ákr)]

In (9) above, both outputs (9a.) and (9b.) are inflected for Number, specifically, they are both Singular forms. However, for reasons that will be discussed in detail in Chapter 5, the Singular marker /-u_{Sg}/ surfaces only in output

(9b.), but deletes in output (9a.). This is not to say that the bare stem output (9a.) does not count as a Singular form, although in its phonological representation the Number node carrying Singular morpho-syntactic specifications does not have an overt expression. The whole Morphological Structure (MS) in (9a.) counts as ‘Singular’ due to percolation of the feature ‘singular’ from the syntactic node to the word level (for the mechanism of percolation, see Lieber (1980) and Williams (1981)).

For convenience, diagrams representing the Phonological Structure (PS) and Morphological Structure (MS) of the two Romanian outputs are given in (10), following Kager (1999):

(10) Figure 1 Morphological and Phonological Structure



The Morphological Structure of output (10a.) above contains a stem/root with no Singular suffix attached. Although the suffix is not superficially present, the word still counts as a Singular form due to percolation of the ‘singular’

Number feature from the syntactic node to word level in MS. In Phonological Structure, the stem/root equals a syllable (σ). In (10b.) the Singular morpho-syntactic features are assigned to a suffix that has an overt expression in PS and forms the nucleus of the second syllable. We note in passing that in (10b.) there is a mismatch between the organization of MS (consisting of a stem/root plus a Singular suffix) and that of PS (consisting of two syllables), in the sense that stem/root segments in MS are distributed over two syllables in PS. It should be noted that MS and PS do not constitute separate levels of analysis, but different facets of one and the same output (more details on PS and MS are provided in Chapter 5 §1.2.2). To conclude the discussion, in the formulation of the MIM generalization the level of description at which grammatical categories are relevant is the Morphological Structure of the inflected output. It carries the morpho-syntactic features of grammatical categories, although affixal markers may not always be phonologically realized (and therefore present in Phonological Structure).

An important component in the statement of the MIM generalization (8) is licensing of marked phonological structure (M) in outputs inflected for a marked member (g) of a grammatical category G. In this dissertation licensing is viewed as a material implication relation. The fact that marked phonological structure M in an output is licensed in a marked member g of G should be understood as a material implication of the type 'M \supset g'. This implication says that the presence of marked phonological structure M in the Phonological Structure of an output entails

the presence of morpho-syntactic features for *g* in the Morphological Structure of the output. As an illustration, consider Old Saxon Case. Recall that in the grammatically marked Oblique Case uneven (HL) trochees, an instance of marked metrical structure, are allowed (3). In contrast, in the unmarked Nominative-Accusative ('Direct' Case) uneven trochees are prohibited (2). In terms of licensing, uneven trochees are licensed in the Oblique because their presence in an output grammatical word entails the presence of the morpho-syntactic feature 'oblique' in the Morphological Structure of that output. In contrast, uneven trochees are not licensed in the unmarked Nominative-Accusative in Old Saxon as their presence in an output does not entail the presence of the unmarked morpho-syntactic feature 'nominative-accusative' in the Morphological Structure.

Given the way licensing is conceived of in this dissertation as a material implication from Phonological to Morphological Structure, it is not the case that all Oblique forms should contain the marked phonological structure in question. In particular, there are instances of Oblique outputs that have (LL) even trochees, as in the first datum in (3) shows. What is not predicted is a situation where the output inflected for the unmarked grammatical category may contain marked phonological structure that is consistently absent from the output of the marked category. I will return to this important prediction of MIM in Chapter 3 §5. Also, the logical formulation of licensing will be made more specific in Chapter 3 §4. As discussed below, licensing is conceived of here as an optimality-theoretic

constraint, and the degree to which it is enforced therefore depends on its ranking in a given language's constraint hierarchy.

The theoretical framework assumed for the phonological analyses in the thesis is Optimality Theory (OT, Prince and Smolensky 1993/2004)³. A central idea in OT is that grammars are systems of forces in conflict represented by constraints. Constraints are universal and make up the so-called constraint repository CON. An important property of OT constraints is the fact that they are violable and rankable, such that no output form can satisfy all constraints at the same time and the actual outputs emerge as the forms that incur fewer violations of the high-ranking constraints.

The object of evaluation by the constraints in CON is represented by a potentially unlimited number of output candidates generated by another component of the OT architecture, GEN. GEN is a functional application that generates a set of candidates starting from an input. The evaluation of these candidates against the set of ranked constraints is performed by EVAL, a mechanism that maps the set of possible outputs produced by GEN (cand_i) onto a unique output form (the most harmonic one given the particular configuration of the constraint hierarchy), which represents the actual output. The way the functional applications GEN and EVAL work is shown in the schema below, following Kager (1999):

³ The seminal work on Optimality Theory is Prince and Smolensky (1993/2004), with developments by McCarthy and Prince (1993, 1995). For general introductions to OT, see Archangeli and Langendoen (1997), Kager (1999) and McCarthy (2002b).

(11) The input-output mechanism of an OT grammar

GEN (input) \Rightarrow {cand₁, cand₂... cand_n}

EVAL {cand₁, cand₂... cand_n} \Rightarrow output

As a generative theory of language, OT in its classic form uses two levels of representations, input and output, but unlike in other generative models, there are no intermediate stages between these levels or any derivations. There are two kinds of forces in conflict in OT, encapsulated in relevant constraints: markedness, which enforces well-formedness conditions on outputs, and faithfulness, which militates for the identity of input and output⁴. A central notion in OT is factorial typology, representing all of the possible rankings ('grammars') for a given constraint set. Factorial typologies make predictions as regards linguistic variation along the dimensions or properties represented by the constraints in question. The empirical adequacy of such predictions can be tested against attested language data.

As an illustration of the evaluation mechanism in Optimality Theory, consider a grammar consisting of three constraints C₁, C₂ and C₃ in CON, ranked such that C₁ and C₂ dominate C₃ (C₁, C₂ » C₃). The object of evaluation by EVAL is made up of three conceivable outputs (cand₁, cand₂, cand₃) produced by the application of GEN to an input. The evaluation is usually represented in a tableau

⁴ Constraint conflicts are not only between markedness and faithfulness. For example, two markedness constraints can be in conflict with each other.

form, where the actual candidate selected by GEN is by convention indicated by a pointing hand:

(12) Table 1 $C_1, C_2 \gg C_3$

/Input/	C_1	C_2	C_3
a.  cand ₁			*
b. cand ₂	*!		
c. cand ₃		*!	

In the top row of Tableau (12), the three relevant constraints are arranged from left to right so as to reflect their position on the constraint hierarchy. By convention, strict domination relations on the hierarchy are shown by solid vertical lines, as between C_2 and C_3 . The fact that C_1 and C_2 are not crucially ranked with respect to each other is indicated by a dotted line. Constraint violations are indicated by asterisks, while exclamation marks indicate fatal violations. Tableau cells that are shadowed are not relevant for evaluation.

An examination of the three candidates in Tableau (12) with respect to the constraint hierarchy shows that candidates (12b.) and (12c.) violate constraints C_1 and C_2 , respectively, which make up the upper stratum of the hierarchy. Thus they incur fatal violations (*!) and lose to candidate (12a.) which, although incurring a violation of C_3 , emerges as the winner. Thus (12a.) represents the optimal output for the given constraint hierarchy, in spite of the fact that it does not satisfy all three constraints. The fact that it violates a bottom-ranked constraint (C_3) does not prevent it from becoming the winner, as long as it satisfies top-ranked C_1 and C_2 ,

which are violated by either one of the two competitors. Had C_3 been top-ranked, (12b.) and (12c.) would have had the chance to win, and in order to establish the actual output we would have needed a ranking argument for C_1 and C_2 .

To return to the MIM generalization, recall that one of its essential ingredients is licensing. Couched in optimality-theoretic terms, the dissertation introduces a family of formal licensing (markedness) constraints dubbed $LICENSE(M,g)$ ⁵, where M is a marked phonological structure and g , a marked member of grammatical category G . $LICENSE(M,g)$ is satisfied by outputs containing M in their Phonological Structure that are inflected for g , and violated by outputs containing M that are not inflected for the marked member of G . For example, in Old Saxon outputs with uneven trochees in the Oblique Case satisfy the licensing constraint, while outputs with uneven trochees in the Direct (Nominative-Accusative) Case violate it.

The MIM generalization and its workings find an OT expression as a particular constraint hierarchy that I label ‘The MIM Schema’ shown in (13):

(13) The Marked in the Marked Schema

$LICENSE(M,g) \gg FAITH \gg *M$

⁵ For the notion of licensing in phonology, see Itô (1986/1988), Goldsmith (1990), Itô, Mester and Padgett (1995), Zoll (1996, 1998), Crosswhite (2001), Walker (2001ab, 2004, 2005) etc. For a discussion of licensing and a formal definition of $LICENSE(M,g)$ see Chapter 3 §§3-4.

In (13) FAITH represents an instantiation of faithfulness and *M, a context-free markedness constraint that disallows the presence of phonological structure M in outputs. The effect of the activity of (13) is that phonologically marked structure M is permitted only in the marked grammatical category g. Under this particular ranking scenario, M would occur with contrastive distribution in g but be excluded elsewhere. A case involving M that shows allophonic distribution is discussed in Chapter 6.

The advantages of using the OT approach to the phenomena under investigation become apparent if we consider the implications of factorial typology. Indeed, the hierarchy in (13) represents only one possible ranking of the three constraints in question, under which MIM effects are predicted to emerge (marked phonological structure M occurs only in the marked member g of grammatical category G). Without going into details, the factorial typology associated with (13) predicts two other situations: one in which M can occur both inside and outside g ('full contrast') and one in which M never occurs in a language irrespective of category and lexical specification (see Chapter 3 §5.2 for a detailed discussion of the factorial typology). Crucially, what is not predicted is a language where marked phonological structure M occurs only in the unmarked member of grammatical category G and is excluded from the marked member g.

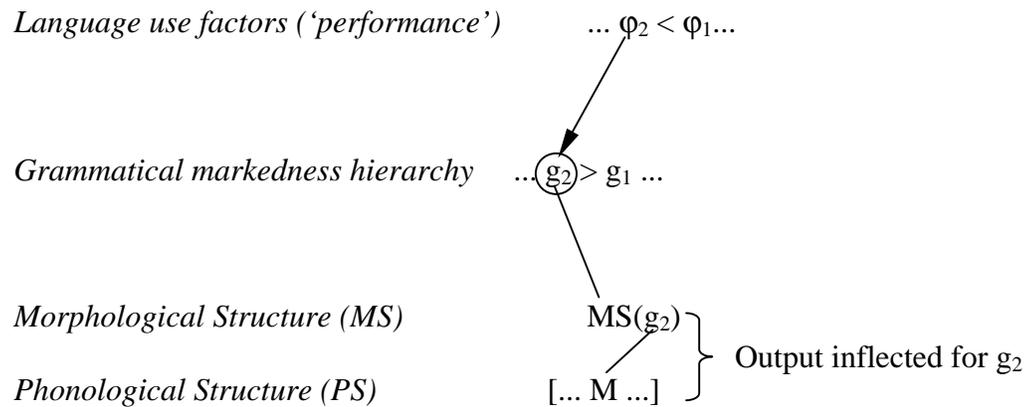
The main advantage of the OT approach to phenomena involving MIM phenomena resides in the typological predictions that can be made, which are intrinsic to the architecture of OT. Specifically, due to the universality and

rankability of constraints, the factorial typology yields exactly the expected language types with respect to the relation between marked phonological structure and grammatical categories on a grammatical markedness scale. In contrast, a rule-based approach is incapable of yielding the predicted typology. This matter will be taken up in Chapter 3, where the advantages of OT are discussed in more detail.

Let us now turn to the second question (1b.) that this dissertation provides an answer to, namely how to account for the correlation between phonological and grammatical markedness. In this regard, a formal account grounded in functional considerations is put forth for MIM. I claim that MIM phenomena emerge as instances of phonological grammars which are shaped by functional factors that ultimately reside in economy and frequency of occurrence of inflected outputs.

As already shown, I claim that marked phonological structure is licensed in outputs inflected for marked grammatical categories. In turn, the marked status of a grammatical category is determined by the frequency (ϕ) of occurrence of inflected outputs. In Chapter 2, frequency of occurrence will be shown to represent a major criterion in establishing the status of a grammatical category on a markedness scale, in the sense that frequency inversely correlates with markedness. The morpho-syntactic features of the marked grammatical category can act as licensors of marked phonological material in inflected output words, as illustrated schematically in (14):

(14) Figure 2 Licensing of marked phonological material in the marked category



The schema in (14) has two parts. The top one relates factors of language use, specifically, the frequency of occurrence, and the grammatical markedness hierarchy. Frequency (φ) of occurrence determines the place of the members (g_1 and g_2) of a morpho-syntactic category G on the markedness hierarchy. If the frequency of occurrence φ_1 of g_1 is greater than the frequency of occurrence φ_2 of category g_2 ($\varphi_1 > \varphi_2$), the markedness relation between g_1 and g_2 is $g_2 > g_1$ (g_2 is more marked than g_1), as shown in (14). In other words, the more marked member of the grammatical hierarchy (g_2) is characterized by a lower frequency of occurrence than the unmarked member (g_1).

The licensing mechanism described above relies on the notion of 'frequency of occurrence'. While there may be certain degrees of variation with respect to the frequency of individual elements, the frequency data for a given linguistic system hold as relatively fixed. As an illustration, it has been shown that in English the frequency of negative clauses is 12% of all clauses in fictional

varieties of language, and only 5% in academic varieties (Givón 1993). Despite the higher frequency of negatives in the fictional domain, affirmative clauses remain overwhelmingly more frequent, irrespective of the language variety considered. This statistic behavior renders negative constructions a marked morpho-syntactic status as compared to their affirmative counterparts. It is in this sense that the ‘fixedness’ of frequency parameters should be understood.

The bottom part of schema (14) represents the licensing of marked phonological structure (M) in words that are inflected for the marked grammatical category (g_2). The Morphological Structure ($MS(g_2)$) of those words contains the morpho-syntactic node that carries the specifications for g_2 , according to the way grammatical categories were defined above. If we consider the Phonological Structure (PS) of an output inflected for G, a given marked phonological structure within PS is said to be licensed by the marked member g_2 of a given category G if the Morphological Structure (MS) of that output word has the morpho-syntactic specifications for g_2 ($MS(g_2)$). The optimality-theoretic implementation of the licensing mechanism and the constraint LICENSE(M,g) are discussed in detail in Chapter 3.

As an illustration of the schema in (14), the phonologically marked structure ‘uneven trochee’ in Old Saxon (2-3) is licensed in the Phonological Structure of Oblique nominals by the presence of the relevant marked ‘oblique’ case feature in the Morphological Structure of the inflected output. The marked character of the Oblique case is given by a language use factor represented by its

lower frequency of occurrence as compared to other Case forms, notably the Nominative-Accusative (or Direct) case. Unmarked phonological structures are not subject to licensing and can occur in either the grammatically marked category or in the grammatically unmarked one. As we shall see in Chapter 3, it is the frequency of occurrence that acts as a substantive filter on licensing constraints and allows only licensing constraints for less frequent, grammatically marked categories to be part of the universal constraint repository CON in Optimality Theory (Prince and Smolensky 1993/2004).

The way in which grammatical markedness is conceived of in this dissertation and the claimed relation between grammatical and phonological markedness raise the issue of how functional factors can shape grammars. The effect of language use factors on grammars has been emphasized in recent years by proponents of the functional-typological approach (starting with Greenberg 1966ab), who claim that grammars are shaped by forces that have to do with economy and distinctiveness in communication. In this dissertation I highlight the impact of functional factors on grammars. In particular, the workings of language use forces can be seen in the licensing constraint LICENSE(M,g) which, I claim, is part of the universal constraint repository CON of Optimality Theory. In the statement of this constraint, the marked member (g) of grammatical category G, whose morpho-syntactic features license marked phonological structure M in inflected outputs, is ultimately determined by a language use factor represented by the frequency (φ) of occurrence. The adequacy of LICENSE(M,g) is supported by

the factorial typology associated with the MIM schema, which makes the right predictions as to the range of patterns involving the presence of M inside and outside outputs inflected for g. Also, given the way in which it is defined, LICENSE(M,g) represents an instance of functionally grounded constraint⁶. The issue of how functional factors impact grammar is dealt with in Chapters 2-3.

MIM patterns are also shown to favor economy in speech production in the sense that confining marked phonological material to less frequent, grammatically marked categories represents a communicative advantage on the part of speakers. Certain advantages may also exist on the hearer's part and can be noted in perception, retrieval and acquisition of inflected forms. These issues are dealt with in more detail in Chapter 2 §5.

The dissertation is organized as follows. Chapter 2 provides an overview of grammatical and phonological markedness and discusses the criteria used in assessing the two kinds of markedness. Frequency of occurrence is highlighted as the main criterion for grammatical markedness, while structural and articulatory complexity together with (non-)occurrence in phonological inventories across languages is regarded as the most robust criterion of phonological markedness. Also, the chapter proposes a functional account of the Marked in the Marked effects arising from the licensing of marked phonological structure in marked grammatical categories.

⁶ For the issue of functional grounding of OT constraints, see Chapter 3 §1.1.

Chapter 3 introduces the optimality-theoretic tools to be employed in analyzing Marked in the Marked effects, in particular, a class of formal licensing constraints grounded in language use, and introduces the MIM schema from a formal point of view. The chapter ends with a discussion of the factorial typology that the MIM schema is part of and the typological predictions that can be made are laid out.

Chapters 4-6 are illustrations of the activity of MIM in three languages: Old Saxon (Chapter 4), Romanian (Chapter 5) and Mayak (Chapter 6), which provide the case studies necessary to support and illustrate the hypothesis.

Chapter 7 states the conclusions of the dissertation and directions for future research.

CHAPTER 2

GRAMMATICAL AND PHONOLOGICAL MARKEDNESS

0. Introduction

This chapter is devoted to a review of the notion ‘markedness’ in morpho-syntax (‘grammatical markedness’) and phonology (‘phonological markedness’).

According to the main claim of this dissertation, a connection exists between these two kinds of markedness in the sense that marked grammatical categories sponsor marked phonological material to an extent greater or equal than in the unmarked grammatical category.

I start by discussing grammatical markedness in §1, where the most important criteria for grammatical markedness are presented, with emphasis on frequency of occurrence. §2 looks into the expression of marked versus unmarked grammatical categories and refutes relative phonological size as a reliable property of the respective output forms. In §3 the most important criteria for phonological markedness are laid out. §4 tests the frequency of occurrence – phonological markedness correlation expressed by the Marked in the Marked (MIM) generalization on open versus closed class items and roots versus affixes. §5 is devoted to a functional grounding account of MIM effects introduced in §4. §6 is a brief recapitulation of the issues discussed in the chapter.

1. Criteria for grammatical markedness

1.1 Structural coding

An important criterion for distinguishing the marked from the unmarked member of an opposition involving grammatical (morpho-syntactic) categories is structural coding, defined in (15) below following Croft (2003):

(15) Structural coding

The marked value of a grammatical category will be expressed by at least as many morphemes as the unmarked value of that category. (Croft 2003:92)

For example, it may often be the case that the unmarked value of a category has a null grammatical morpheme as the specific marker, so the output for the category is equivalent to the bare root. The marked category will have either a null affix mark, or a non-null one, which attaches to the root. Either way, there are at least as many phonologically overt morphemes in the marked value of the category as in the unmarked one.

When applied to the category of number, structural coding allows for the following situations (16):

(16) (a) zero coding for the unmarked value (Singular) and overt coding for the marked value (Plural), as in English:

dog-Ø_{Sg.} vs. dog-s_{Pl.}

(b) zero coding for both values, Singular and Plural, as in Minor Malabri (Croft 2003:89):

ʔεεw ‘child/children’

(c) overt coding for both the singular and plural, as in Zulu (Croft 2003:88):

umu-ntu ‘Singular-person’

aba-ntu ‘Plural-person’

A fourth, conceivable case is represented by languages that overtly code the Singular but have a zero Plural. The markedness criterion of structural coding predicts that this type is non-existent⁷. The predictions made on the basis of structural coding are illustrated in (17):

(17) Table 2 Overt versus null inflection in Number

	<i>Null singular morpheme</i>	<i>Overt singular morpheme</i>
<i>Overt plural morpheme</i>	English	Latin, Greek, Russian, Romanian, Zulu
<i>Null plural morpheme</i>	Minor Malabri Mandarin Chinese	-

⁷ Such cases would only be predicted to occur if independent factors prevented the realization of the Plural in some language.

An important insight into the nature of markedness is the statement of grammatical markedness properties as implicational universals rather than absolute properties. For the pattern illustrated in (17) the implicational universal is stated in (18):

- (18) If a language uses an overt inflection in the singular, then it also uses an overt inflection in the plural. (Croft 2003:89)

In a two-way (Singular - Plural) system, the implicational universal for the category of Number (15) is conventionally stated as Plural > Singular. This formalism, understood as ‘Plural is more marked than Singular’, is also meant to express the implication in (18).

Starting with the seminal work of Greenberg (1966ab) and the advent of the implicational perspective in grammatical typology, grammatical markedness has been expressed in terms of universal feature hierarchies, where features are understood as the abstract expression of morpho-syntactic categories. Grammatical markedness hierarchies have been proposed for a large variety of categories, including cross-categorial relations. Examples of hierarchies are given in (19) below, following Croft (2003). In (19) members or values of the categories are arranged in the decreasing order of their markedness:

(19) Examples of morphological markedness hierarchies

Number (noun, pronoun, adjective, verb): trial (paucal) > dual > plural >

> singular

Gender (noun, adjective): neuter > feminine > masculine

Case (noun, adjective): oblique > nominative

Person (verb): 2nd > 1st > 3rd (or 1st, 2nd > 3rd)

Tense (verb): future > preterit (past) > present

Aspect (verb, verb phrase): perfective > imperfective

Mood (verb, sentence): hypothetical (subjunctive) > indicative

Voice (verb): passive > active

Inflectional categories: gender > number

Likewise, in the area of phonology hierarchies have been proposed for distinctive features (20)⁸:

(20) Examples of phonological feature hierarchies

Nasality (vowels): [+nasal] > [-nasal]

Voice (vowels, sonorants): [-voice] > [+voice]

Voice (obstruents): [+voice] > [-voice]

⁸ For work on phonological feature hierarchies, see Jakobson and Halle (1956), Dresher (2003) and the references therein, and Croft (2003).

The last two decades have witnessed a revival of the interest in grammatical markedness. Proponents of Natural Morphology (Dressler 1985ab, Mayerthaler 1981/1988, 1987, Wurzel 1989, 1998 etc.) capitalize on the predictability and ‘naturalness’ of unmarked members of oppositions. Other authors (notably Battistella 1990, 1996) concentrate on criteria for the evaluation of markedness from a logical perspective and implications for language change. Finally, from the perspective of Distributed Morphology (Halle and Marantz 1993) grammatical markedness has been analyzed in terms of morphological features and feature neutralization (Bonet 1991, Noyer 1992, Bobaljik 2002, Bailyn and Nevins 2004, Harley 2004, Nevins 2006 etc.).

The main question remains what the very nature of grammatical markedness is. While structural coding remains an important diagnostic of markedness, a fuller understanding of the concept is impossible without reference to frequency of occurrence, as we shall see in §1.2.

1.2. Frequency

1.2.1 The failure of the iconicity approach to grammatical markedness

Survey work on grammatical linguistic typology (Croft 1990, 2003) has attempted to establish a possible connection between markedness and iconicity, the latter understood as a way in which “the structure of language [...] reflects the structure of experience” (Croft 2003:102). While a detailed discussion of the iconicity criterion for grammatical markedness would take us too far afield, suffice it to say

that less marked elements are generally more iconic than more marked ones. The idea, appealing at first sight, has considerable drawbacks.

According to the iconicity approach, Plural forms that are overtly marked by inflection can be said to reflect conceptual complexity in that they have more phonological material than the corresponding Singular forms. However, if we examine a three-way (Singular, Plural, Dual) system, we can see that the iconicity approach is confronted with a problem. The key observation is that the Plural can be realized by reduplication, but the Dual is always marked by affixation (cross-linguistically, reduplicated duals seem to be unattested). Within a theory of markedness based on iconicity, this behavior is hard, if not impossible, to accommodate, because we would expect the less marked member of the category (Plural) to be more iconic and reflect reality more faithfully than the more marked one (Dual). Yet it is the Plural that encodes duality from a phonological point of view (reduplicated forms contain a stem and a copy thereof, in other words, a pair of entities), and the Dual just reflects some general conceptual complexity (stem plus affix).

A similar difficulty is encountered when one assesses the iconicity of other grammatical categories. In a study of reduplication in Australian languages, Fabricius (1998) notes a number of mismatches between iconicity and markedness. For example, reduplication is unexpectedly used to express the ‘stative truth’ aspect in Kuku Yalangi, or the ‘attenuative’ aspect in Yankunytjatjara, and no iconicity account seems available for such cases.

As a matter of fact, as Haspelmath (2003) points out, both iconicity and (global) markedness are vague, polysemous notions⁹. With respect to iconicity, he convincingly argues that it should be replaced by a concept of economy (perhaps incorporating distinctiveness and parsability). As regards (global) markedness, Haspelmath proceeds to a deconstruction of the cover term ‘markedness’ and concludes that what has traditionally been regarded as markedness oppositions in the Greenbergian tradition are in fact frequency asymmetries motivated by a principle of economy.

1.2.2 Markedness as a consequence of economy

The hierarchies that express grammatical markedness can therefore be viewed as the manifestations of an economy principle that translate into differences in the frequency of use of the respective forms, an idea already present in the work of Greenberg (1966a). While it might be agreed that the grammatical markedness illustrated by the hierarchies in (19) is reflected in structural coding, there is no such consensus for the phonological hierarchy in (20). Some phonologists subscribe to underspecification or monovalent features, but this is not without controversy.

Nevertheless, the question arises whether markedness hierarchies represent primitives of linguistic description or derived objects.

⁹ Haspelmath (2003) distinguishes no less than twelve acceptations of ‘iconicity’ and ‘markedness’, respectively.

Most contemporary researchers in morpho-syntactic typology favor the latter answer, especially given the complexity and heterogeneous nature of the concept of markedness. In a review, Haspelmath (2003) argues that there are as many as twelve possible acceptations of the term ‘markedness’ that nevertheless share important characteristics and he attempts to identify the unifying factor, which he believes to lie in language use (or linguistic performance¹⁰). Along similar lines, Hawkins (2004) shows that grammatical hierarchies are derived notions representing cross-linguistic generalizations that emerge from the interaction between grammar and performance.

Performance is a concept that can be traced back to the early days of linguistic structuralism (‘parole’ in the sense of de Saussure 1916/1972, as opposed to ‘langue’) to generative linguistics (‘performance’ (Chomsky 1965), ‘E-language’ (Chomsky 1986), as opposed to ‘competence’ and ‘I-language’, respectively). Although the labels used in linguistic parlance may differ, the term ‘performance’ is used essentially to designate the actual, physical and observable manifestations of the abstract linguistic system that speakers/ hearers are endowed with (‘competence’). Performance covers aspects of language use such as production and perception or constraints imposed by the cognitive system (processing, memory load or pragmatic/informational factors).

Although since the advent of generative linguistics the focus of investigation has mainly been on the side of competence, performance issues

¹⁰ A brief discussion of the concept of performance is given below.

cannot be overlooked. A striking example of the problems performance factors pose for the understanding of how language works is provided by center embedding phenomena. Center embedding arises due to multiple recursion of linguistic structure and is well known in syntax (Chomsky 1957; Chomsky and Miller 1963; Miller and Chomsky 1963, Miller and Isard 1964 etc.)¹¹.

An example of center embedding sentence is represented by the English sentence # *The rat the cat the dog chased ate died.*¹² This sentence is perfectly grammatical in the sense that no rule of English syntax (i.e. competence) is violated. Yet most speakers consider the sentence hard, if not impossible to process altogether, most probably due to performance factors such as memory span limitations that lead to processing difficulty.

Center embedding phenomena show that performance factors, traditionally regarded as marginal in classical generative linguistics, need to be paid due attention, as they may cast doubt on the unbounded applicability of grammatical rules. Ultimately, it may be the case that language use (performance) can lead to shaping grammars in the direction of performance preferences, as advocated by Hawkins (1994, 2003, 2004). This issue will be dealt with in §5, in relation to the account offered for the connection between grammatical and phonological markedness.

¹¹ For a recent general discussion of center embedding and numerous references, see Uehara (2003).

¹² The symbol # shows that the sentence is hard to process.

Functional factors like minimization of effort in perception and production have been shown to form the underpinnings of other rules, such as heavy (complex) NP shift (CNPS), a process whereby a complex noun phrase direct object undergoes extraposition over a prepositional phrase and moves to the right (Ross 1967, Postal 1974, Culicover 1976, 1984 etc.).

A performance factor that has been shown to systematically correlate with grammatical or inflectional markedness is the frequency of occurrence of forms as measured in linguistic corpora. In recent years, frequency has often been considered the most important criterion for grammatical markedness.

The correlation between morphologically-marked forms and their frequency of occurrence has been noted since the early days of linguistic typology. As pointed out by Greenberg (1966a:32), the frequency of occurrence of words inflected for Number, as measured in the Sanskrit, Latin, Russian and French corpora considered for analysis, decreases from the (unmarked) Singular to the (marked) Dual. The sense in which frequency of occurrence correlates with grammatical markedness is that the higher a category ranks on a markedness hierarchy, the lower its frequency of occurrence:

(21) Table 3 Frequencies of occurrence of Number category values

<i>Language</i>	<i>Size of Sample</i>	<i>Singular</i>	<i>Plural</i>	<i>Dual</i>
Sanskrit	93,277	70.3	25.1	4.6
Latin (Terence)	8,342	85.2	14.8	N/A
Russian	8,194	77.7	22.3	N/A
French	1,000	74.3	25.7	N/A

Greenberg measured the frequency of occurrence of other categories (Case, Person, Number and Voice in verbs etc.) and obtained similar correlations with grammatical markedness, as exemplified in (22) - (25) below:

(22) Table 4 Frequencies of occurrence of Case category values

<i>Language</i>	<i>Size of Sample</i>	<i>Direct Case</i>	<i>Oblique Case</i>
Sanskrit	93,277	72.5	27.5
Latin	8,342	68.7	31.3
Russian	6,194	65.2	34.8

(23) Table 5 Frequencies of occurrence of Person category values

<i>Language</i>	<i>Size of Sample</i>	<i>3rd person</i>	<i>1st person</i>	<i>2nd person</i>
Sanskrit	93,277	54.1	11.3	34.6
Latin	8,342	45.3	29.3	25.4
Russian	6,194	50.4	31.9	17.7

(24) Table 6 Frequencies of occurrence of Voice category values

<i>Language</i>	<i>Active (%)</i>	<i>Passive (%)</i>
Latin	90.2	9.8
Sanskrit	73.1	26.9

(25) Table 7 Frequencies of occurrence of Tense category values

<i>Language</i>	<i>Present (%)</i>	<i>Past (%)</i>	<i>Future (%)</i>
Sanskrit	53.6	46.3	0.1
Latin	62.1	26.6	11.3

The sample sizes in (22) and (23) refer to the total number of words in the stretch of language considered for analysis. Frequencies of occurrence of individual members of grammatical categories are calculated as percentage values

for words inflected for the relevant grammatical category. For example, for the category of Number, in a language with a three-way Singular-Plural-Dual system, the frequency of occurrence of the Singular is represented by the percentage ratio of words inflected for the Singular over the total number of words inflected for Number, and similarly for the Plural and Dual. For extinct languages like Latin and Sanskrit, since no spoken language data are available, frequency was estimated based on written corpora. For other languages, frequency values were measured using transcripts of conversations, speeches and fictional prose of various genres. Ideally, the frequency of occurrence of grammatical categories should be computed on corpora of spoken language that include transcripts from various stylistic registers (for the methodology of spoken corpus design, see Svartvik 1990 and Atkins, Clear and Ostler 1992).

An important issue that requires clarification is the variation of frequency values across individual speakers and registers. Such variations do exist (see Biber 1993 for the importance of considering such variation in corpus studies), so it is important to determine to what extent frequency values measured on a particular stretch of language represent reliable parameters on the basis of which grammatical markedness can be assessed.

While there may be certain degrees of variation with respect to the frequency of individual elements across styles, individuals or language use situations, the frequency data for a given linguistic system can be said to hold as relatively fixed. To see in what sense one can talk about the 'fixedness' of

frequency values of grammatical categories, consider the behavior of negative versus affirmative constructions in English. Givón (1993) measured the frequency of occurrence of English negative clauses in several type of style varieties. At one end of the style continuum represented by fictional varieties of language, he found that negative clauses represent about 12% of all clauses. At the other end of the continuum (academic varieties), Givón found only 5% of clauses to be negative. The frequency of occurrence of negatives in other stylistic varieties, as measured on language corpora, ranges between 5 and 12%. If we examine these results, we note that despite the higher frequency of (grammatically marked) negatives in the fictional domain as compared to the one in the academic register, (grammatically unmarked) affirmative clauses remain overwhelmingly more frequent as compared to their negative counterparts, irrespective of the language variety considered. In general, although frequency values can vary across speakers, registers or situations, the ratio of marked over unmarked categories is skewed in favor of unmarked ones. This ‘statistic invariant’ behavior renders negative constructions a marked morpho-syntactic status as compared to their affirmative counterparts. It is in this sense that the ‘fixedness’ of frequency parameters in a linguistic system is understood in this dissertation.

The data in (22) - (25) show that the frequency of occurrence of a grammatical category as measured in linguistic corpora follows the same tendency as its ranking on the relevant grammatical markedness hierarchy (see (19) above). Similar results were obtained on Czech, German and Russian by Kučera and

Monroe (1968). In the case study on Number in Romanian (Chapter 5) I computed the frequency of occurrence of number-inflected nominals in a sample of fictional prose. The results are comparable to the ones obtained by Greenberg (1966a) for other languages.

Frequency of usage is a facet of language use that has emerged in recent years as one of the most robust criteria for grammatical markedness¹³. Research on markedness effects in morpho-syntax has led to the idea that the very term ‘markedness’ can be to a large extent replaced by ‘frequency’ (Werner 1989; Fenk-Oczlon 1991, 2001; Haspelmath 2005). An essentially similar approach to phonological markedness is taken by Gurevich (2001), Hume (2004) and Blevins (2004), who question the status of markedness as a primitive notion and emphasize the role of language use and predictability in shaping grammatical or phonological hierarchies.

Advocates of the frequentionist view of markedness maintain that the frequency of use of linguistic forms reflects the cognitive costs involved in their processing. Forms with high frequency of use presuppose more familiarity and predictability on part of the speaker/hearer and involve a minimization of the processing load on the human processor¹⁴.

At the same time, frequency of occurrence represents a corollary of economy in language use. The idea of ‘economy’ has long been shown to play a

¹³ Frequency of occurrence has been used to elucidate cases of semantic markedness that were considered ambiguous according to other criteria (Hatzivassiloglou and McKeown 1995).

¹⁴ See §5.1 for a discussion of the issue of effort minimization and economy.

role in shaping morphological patterns, the general principle being that linguistic expressions should be kept to a minimum whenever possible, thus contributing to a minimization of the processing burden placed on the speaker-hearer. Economy in language use is encapsulated in the Principle of Least Effort (see Zipf 1949); more recently, further evidence for similar claims in phonetics was brought by Ladefoged (1982) and Lindblom (1990). In syntax, the Minimalist Program (Chomsky 1995) acknowledges economy as one of the fundamental principles of grammar.

As shown as early as by Zipf (1949), the connection between economy and frequency can be informally stated as a statistically significant tendency for expressions that contain less material (or are, in general, structurally less complex) to occur more frequently than forms that are more complex or are ‘bulkier’ in point of expression.

The empirical adequacy of the economy-frequency approach has been tested on a number of phenomena that otherwise constituted notable exceptions to predictions of grammatical hierarchies that do not take language use into account, as we shall see in the following section.

1.2.3 Markedness reversals as a consequence of frequency effects

An important area of success of the frequentionist stand is represented by its ability of account for apparently problematic instances of so-called ‘markedness reversals’ (Mayerthaler 1981, Tiersma 1982, Croft 1990). The phenomenon in

question is seen in situations where categories that are assumed to be grammatically unmarked show an unusual behavior and have overt coding, while the marked counterparts have zero coding.

For example, in Welsh the Singular of some nouns is characterized by an overt suffix, but the corresponding Plural has null marking, as in *plu-en_{Sg.}* ‘feather’ versus *plu-∅_{Pl}* ‘feathers’. Similarly, we sometimes unexpectedly see overt coding in the third person of the Imperative and, in contrast, null marking in the second person of the same mood, as in Latin *lauda-to_{3rd}* (‘let him/her praise!’) versus *lauda-∅_{2nd}* (‘praise!’). In a theory where grammatical categories represent entities arranged in a universally fixed order on a grammatical or inflectional hierarchy such phenomena seem to be hard to accommodate. However, if we consider the functional, frequency-motivated underpinnings of such reversals, the effects no longer appear exceptional¹⁵.

It is worth noting that most often these cases have a semantic or pragmatic basis; for example in nouns denoting entities that naturally occur in groups or pairs, it is the Plural that is (locally) unmarked, as the category which occurs with higher relative frequency. Similarly, in the Imperative, the second person qualifies as the unmarked/default category, since it encodes the addressee of an utterance, and accordingly it occurs more frequently than the third person. The null marking of the more frequent forms is thus in accordance with economy in language use.

¹⁵ It should be mentioned that markedness reversal phenomena can be dealt with in the constraint-based framework provided by Optimality Theory. For an illustration, see the discussion of the Hebrew root-affix asymmetry in Hebrew in §4.2

Along similar lines, Tiersma (1982), who discusses a considerable number of markedness reversals (in Spanish, English, German, Dutch etc.), formulates the following principle:

- (26) When the referent of a noun naturally occurs in pairs or groups, and/ or when it is generally referred to collectively, such a noun is unmarked in the plural. (Tiersma 1982:835)

Instances of (apparently exceptional) markedness reversals can be easily predicted in a theory of markedness that relies on economy and frequency of use. If a principle of economy is assumed to play a relevant role in language use ('performance'), it is possible for a category that is more frequent in point of use (like the Plural of nouns designating entities that occur in pairs or groups) to be apt to receive less expression than the less frequent category.

In this dissertation I assume a similar mechanism to be responsible for the correlation between inflectional markedness and phonological behavior. In (27) below a statement of the pivotal generalization made in this dissertation is given:

- (27) If g_1 and g_2 are members of the grammatical category G such that g_2 ranks higher than g_1 on the grammatical markedness hierarchy ($g_2 > g_1$), outputs inflected for g_2 can sponsor marked phonological structure to an extent that is equal or greater than g_1 (the unmarked term), as a reflection of the economy principle in language use.

The generalization in (27) will be fleshed out in Chapter 3 §4. Informally, if a term has a high frequency of occurrence (due to conceptual, cognitive and pragmatic factors), economy dictates that language users will prefer to avoid marked phonological structure in that term. In grammatically marked items, marked phonological structure is allowed, as its presence is relatively less costly in point of language economy (occurrence in fewer items).

Before discussing the above claim in more detail, let us consider possible correlations between grammatical markedness and the phonological behavior of the respective forms. Economy suggests that such a correlation may be established with phonological bulk or size.

2. Towards a correlation between grammatical markedness and phonology: size

In keeping with the principle of economy discussed in the previous section, one may expect that marked grammatical categories (which have a relatively low frequency of occurrence) are likely to receive less phonological expression than their more frequent, less marked counterparts.

To adapt an everyday example due to Haspelmath (2003), consider phone numbers in the Los Angeles area, which has three area codes: 213, 310 and 323, and where a complete phone number is of the form 213-XXX-XXXX, 310-XXX-XXXX or 323-XXX-XXXX. If a full number is necessary for successful communication in the greater area, which is diverse, people living in the same neighborhood can leave out the area code, which is both predictable and highly

frequent, thus making economy possible. Moreover, people living in the same building can afford to omit both the area code and the first three digits of the phone number (the exchange), for similar reasons. Therefore the more frequent (and predictable) a form is, the more likely it is to receive less expression and to be of less size.

Research on economy and morphological coding of grammatical categories has shown that Haspelmath's 'phone number model' can be illustrated by the behavior of grammatical categories in natural languages.

Considerations of economy have lead Haiman (1983) to state a generalization on the size of Case forms that is in line with the status of Case values on the grammatical markedness hierarchy:

- (28) In no language will the phonological expression of a direct case [nominative/accusative] be bulkier than that of the corresponding indirect case [dative/locative/instrumental etc.] (Haiman 1983:792)

A straightforward example for Haiman's generalization comes from Turkish, a language with a rich Case system. In Turkish, the Nominative has zero inflectional marking, the Accusative is characterized by the suffix *-i* and the Locative, by the affix *-de* (Lewis 2000), as shown below for the relevant Case hierarchy:

(29) Locative > Accusative > Nominative

ev-Ø ‘house-Nom.’

ev-i ‘house-Acc.’

ev-de ‘house-Loc.’

Haiman states that his generalization is confirmed in a variety of languages (Walpiri, Greenlandic Eskimo, Kalkatungu, Hungarian and Indo-European (French, German, Russian)). Although the claim is credible in light of the economy principle that demands that frequent, unmarked forms, be less ‘bulky’ than infrequent, marked ones, the demonstration lacks the support of a language sampling technique that would make statistically significant the result according to which marked categories are bulkier than unmarked ones. Also, the generalization covers only the grammatical category of Case; it is not clear whether it could carry onto other morpho-syntactic categories.

The relation between grammatical markedness and phonological expression instantiated by size is also discussed in a recent study by Brunner (2003). Brunner undertook to test the prediction made by Dryer (p.c., cited in Croft 2003) according to which the less marked value of a grammatical category should be no longer phonologically than the more marked category (‘length’ being estimated as segment or syllable count in inflected outputs). Brunner tested Dryer’s prediction for the category of Number on a sample consisting of 42 languages, compiled following the sampling method in Dryer (1989, 1992).

For the category of Number, the prototypical situation in a three-way (Singular, Plural, Dual) system is the one in a language like Yimas (Foley 1991), with null marking in the Singular, and non-null marking in the Plural and Dual, with more phonological material in the Dual:

(30) Dual > Plural > Singular

yura-Ø	‘dog’
yura-y	‘dogs’
yura-ntrm	‘two dogs’

With respect to segment count, the analysis found that in nouns the Singular was longer than the Plural only in 8% of the languages, and the Singular and the Plural never exceeded the Dual. Comparable results were obtained for Number in other lexical categories (verbs, adjectives, pronouns). When phonological size was expressed as syllable count, there were no exceptions, and the marked category was always equal to or longer than the unmarked one.

The size correlation between grammatical markedness and phonological form is also attested for grammatical categories other than Case and Number (Tense, Mood, Gender etc.)¹⁶. However, the quantitative approach to the correlation between grammatical markedness and phonological properties is faced with a number of problems.

¹⁶ See Haspelmath (2003) and Newmeyer (1998) for examples.

First, as already noted, studies need to be based on reliable language samples, a desideratum that is not always met (see Dryer 1989, 1992 for the importance of language sampling in linguistic typology). Second, and more importantly, the correlations represent statistical tendencies rather than categorical results, and although they are significant in a number of cases, exceptions do exist. The theory should be able to account for such exceptions, but explanations do not readily suggest themselves (markedness reversal solutions are not always available). For example, Limbu (Tibeto-Burman, van Driem 1987) distinguishes between a zero-marked Singular and a suffix-marked Plural and Dual. In Limbu, the Plural suffix consists of three segments, while the Dual suffix has only two. Barring other phonological adjustments in number affixation that would delete material from the stem, the overall segment count of the Plural is higher than both the Singular and Dual segment counts:

(31) Number affixes in Limbu

Singular: -Ø

Plural: -haʔ

Dual: -si

Similarly, English verbs take the *-s* suffix in the 3rd person of the Present Indicative, while the 1st and 2nd persons have zero marking, while in point of

grammatical markedness the 3rd person is the least marked member of the category of Person.

Third, analyses based on phonological size are bound to be confronted with a confounding factor that is hard to tease out. This factor is represented by morphological complexity expressed by the property of structural coding already discussed in §1.1. As we have seen, marked members of grammatical categories are prototypically characterized by higher morpheme counts than the unmarked members. As morphemes typically consist of segments or syllables, it is to be expected that categories with a higher morpheme count will also have a higher segment or syllable count, which makes it difficult to disentangle the effect on morphology from the one on phonology. For example, the English plural ‘dogs’ has a higher segment count than the singular form ‘dog’, but it is hard to tell whether this is the result of the Plural form having a higher count of non-null morphemes that come with their own segmental material or it is just an independent property of the (marked) Plural to be inherently bulkier than the (unmarked) Singular. Also, especially when inflection is expressed by affixation, it may be the case that affixes have different lexical shapes or allomorphs, and while it is true that considerations of frequency or economy can help explain surface distributions, there is no universally valid account for both regular behaviors (more phonological material in the less marked category) and apparent exceptions (smaller size of the marked category).

The Somali case is one where similar phonological material finds a different expression in outputs that represent different grammatical categories. As Bendjaballah (1998) points out, with respect to morphological constituency (morpheme boundaries, number of morphemes) the two forms similar. The respective differences can hardly be attributed to the phonology of Somali alone, and their source lies most probably in some other property of the morphological system.

Cases like Somali potentially represent the ground where hypotheses on the correlation between morphological and phonological properties can be tested. However, there are no accounts in the linguistic typology literature on the relative grammatical markedness of the Causative and the Infinitive, but it is worth noting that the Causative is cross-linguistically a marked category (Haiman 1983). Although there is no difference in size between the Somali Causative and the Infinitive in point of segment or syllable count, it can be seen that the formation of the Causative leads a kind of marked phonological structure as compared to the Infinitive (affricate versus stop). As an additional complication, it is not entirely clear that the Causative is the phonologically marked form. One may argue that the presence of a plain stop before the front vowel [i] in the Infinitive can also be regarded as some kind of marked phonological structure. At the same time, along another dimension, a voiced obstruent is deemed more marked than a voiceless one.

Although not entirely conclusive, the Somali data are helpful in previewing the research agenda that this dissertation addresses. Recall that the claim put forth in this dissertation is that inflectional (grammatical) markedness has a phonological correlate, in that other things equal, categories that are grammatically marked are characterized by the presence of marked phonological material to an extent that is higher or equal than in the unmarked categories, a generalization that I label ‘Marked in the Marked’ (MIM).

It is important to note that the comparison between the phonological shape of outputs inflected for asymmetrically marked categories is relevant only to the extent to which the morpho-phonological markers employed are relatively similar.

The Somali case does meet the similarity criterion, since the Infinitive and Causative affixes are both underlying /i/, but the MIM hypothesis cannot be tested due to the facts mentioned above (impossibility to compare the Infinitive and Causative in point of grammatical markedness and also difficulty in assessing the degree of markedness of phonological structure).

To see how important the similarity criterion is, consider the case of Hessian German Plural formation (Golston and Wiese 1996).

In Hessian German there is a class of nouns that form their Plural by apparent deletion of the final consonant of the root if it ends in an obstruent:

(33)	Singular	Plural	Gloss
	hond̥	hon	‘dog’
	end	ɛn	‘end’
	ʃuk	ʃu	‘shoe’
	vɛk	vɛ	‘way’

Hessian German Plural formation seems to contradict the claim according to which the category ranking higher on the grammatical markedness hierarchy (Plural) displays more marked phonological structure than the lower-ranking category (Singular). Indeed, as the data in (33) show, if the Singular has a complex coda, the corresponding Plural has a simple coda, or, even more dramatically, if the Singular has a closed syllable, the Plural has an open one¹⁷. This behavior would constitute a counterexample to the MIM generalization.

Nevertheless, Golston and Wiese’s examination of Hessian German’s inflectional system shows that what is at first sight subtractive morphology is in fact a means of satisfying a requirement that Plural forms end in a segment that carries the [+sonorant] feature (the Singular is represented by the bare root, and no such requirement is enforced)¹⁸. Plural formation by apparent subtraction is only a strategy whereby final sonorancy is satisfied; final consonant deletion in the Plural

¹⁷ As we shall see in §3.1, complex codas and closed syllables are more marked phonologically than simple codas and open syllables, respectively.

¹⁸ Furthermore, Golston and Wiese (1996) suggest that the Plural formative is the [+sonorant] floating feature that needs to be aligned to the right edge of the prosodic word.

may just be a bi-product of suffixation of [+sonorant]. In fact, as Stonham (1994) points out, inflectional non-concatenative morphology (including subtraction) is in most cases an instance of concealed affixation and has no independent status in morphological theory. In sum, Hessian German employs different strategies for expressing the Singular and the Plural. The fact that the Plural is less marked phonologically than the Singular cannot be used to falsify the MIM generalization, which is assumed only for forms with relatively similar morphological marking. This is not the case in Hessian German, where the Singular has a zero marker and the Plural, a subsegmental [+sonorant] affix.

So far we have reviewed the notion of grammatical or inflectional markedness and we have discussed two widely accepted criteria for this kind of markedness, structural coding and frequency of occurrence as measured in corpora. Grammatical markedness hierarchies were introduced as an expression of structural coding. We have seen that frequency of occurrence is superior to other criteria such as iconicity and can help explain markedness reversals phenomena. Also, I introduced the Marked in the Marked generalization and I have shown that the correlation between grammatical markedness and the phonological properties of outputs inflected for the respective grammatical categories is not one of mere size, but rather one that has to do with the phonological markedness of those outputs.

Having established the substantive content of inflectional markedness and having previewed its connection with the phonology, we can now proceed to

discuss in more detail the notion of phonological markedness. The more specific issue of how markedness is dealt with in Optimality Theory (Prince and Smolensky 1993/2004), which constitutes the theoretical framework assumed for the analysis, will be discussed in Chapter 3.

3. Criteria for phonological markedness

Since the main claim of this dissertation involves the notion of ‘phonological markedness’, it is important to first establish what criteria can be employed in assessing it.

In a survey of markedness in phonology, Rice (2003) lists a number of criteria that can be used to characterize marked versus unmarked oppositions in phonology:

(34) Table 8 Marked versus unmarked oppositions

<i>Marked</i>	<i>Unmarked</i>
Less natural	Natural
More complex	Simpler
More specific	More general
Less common	More common
Unexpected	Expected
Not basic	Basic
Less stable	Stable
Appear in few grammars	Appear in more grammars
Later in language acquisition	Earlier in language acquisition
Subject to neutralization	Neutralization targets
Early loss in language deficit	Late loss in language deficit
Implies unmarked feature	Implies marked feature
Harder to articulate	Easier to articulate
Perceptually more salient	Perceptually less salient

To the criteria reviewed by Rice we can add the one of predictability within a particular phonological system, as claimed by Hume (2004), who proceeds to a deconstruction of the notion ‘markedness’ in phonology and claims that it is not a primitive of linguistic description.

It appears that phonological markedness is a multifaceted property. Also, there is no consensus in the literature as to exactly how many of the properties in (34) a phonological structure should have in order to qualify as (relatively) marked. One may also wonder whether there is some ‘core’ and ‘periphery’ in the concept of markedness, so that forms that have the ‘core’ properties can be considered marked.

Among the many possible diagnostics for phonological markedness I will discuss two that are relatively uncontroversial: complexity and occurrence in phonological inventories.

3.1 Phonological markedness as complexity

Despite the difficulties in approaching phonological markedness that I hinted at above, many researchers believe that phonological markedness is robustly correlated with complexity. Phonological markedness can be viewed as complexity from a structural or articulatory point of view.

Structural complexity has been adopted as a criterion for markedness in a number of studies (Dresher and Rice 1993, Dyck 1993, 1995, Ghini 1993, 2001,

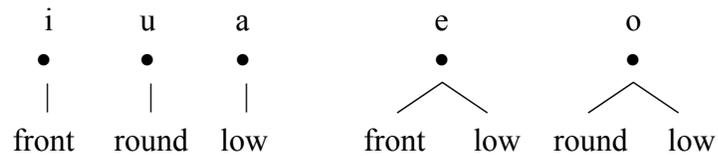
Dresher, Piggott and Rice 1994, Dresher and van der Hulst 1998, Rice and Avery 2004 etc.).

As noted by Dresher and Rice (1993), the notion of phonological complexity is relevant and can manifest itself at various levels.

For instance, at the segmental level, the ability of units to participate in phonological processes varies as a function of their internal (featural) complexity or makeup. Markedness can be said to be encoded in the representation of segments and increases with the amount of structure. A similar claim is made by Rice and Avery (1995).

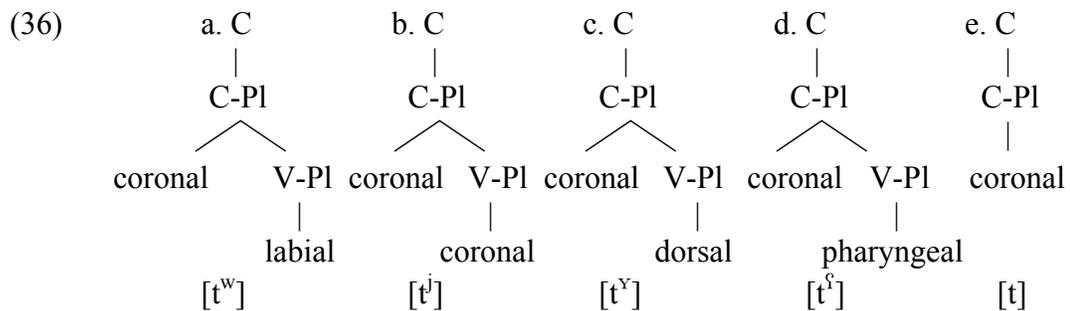
Dresher and van der Hulst (1998) use the same kind of argument in discussing the relation between vowel distribution and segment complexity in a number of languages. As an illustration, in Russian strong (stressed) syllables can have one of the five vowels [i, u, e, o, a] as a nucleus, but in weak (unstressed) syllables only [i, u, a] can occur as nuclei. The authors correlate this kind of distribution with the relative degree of complexity in vocalic segments, according to the representations in (35), which view vowels as combinations of particles or elements in the spirit of theories that employ unary features, like Particle Phonology (Schane 1984) or Government Phonology (Kaye, Lowenstamm and Vergnaud 1985):

(35) Vowel structure (after Dresher and van der Hulst 1998)



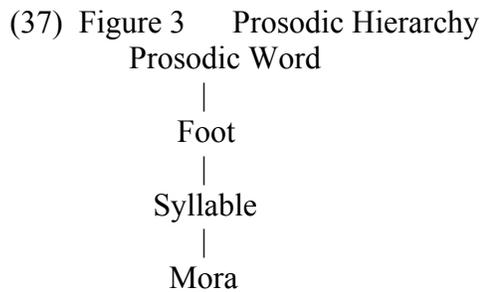
According to this metric, the relatively less complex vowels [i, u, a] are less marked than [e, o].

Segment complexity is also acknowledged in autosegmental representations. For example, Clements (1985) represents consonants with a secondary articulation by subordinating a V-Place node corresponding to the secondary articulation to a consonant's C-Place node:



According to the representations in (36) above, consonants with a secondary articulation (36a. - d.) are more complex (and consequently, more marked) than the one with only a primary place of articulation (36e.). For complex segments involving place features see also Sagey (1986/1990).

Segment complexity relates markedness and the internal makeup of units of analysis at the same level of representation. Complexity effects can also be noted at various levels of representation, for example with respect to the Prosodic Hierarchy (Selkirk 1980, McCarthy and Prince 1986):



What is relevant for the correlation between complexity and phonological markedness is the constituency of a category, not necessarily the place of that category on the Prosodic Hierarchy. Thus at the syllable level closed CVC syllables are more marked than open CV syllables, heavy (bimoraic) syllables are more marked than light (monomoraic) syllables etc. (see Dresher and van der Hulst (1998) for a review of phonological complexity that correlates with levels of prosodic structure)¹⁹. A similar relation holds for bimoraic versus monomoraic syllables.

Articulatory and/or perceptual complexity has also been shown to closely correlate with phonological markedness. The idea of articulatory or perceptual

¹⁹ Closed syllables differ in structure from open syllables at the root node. There may also be differences in moraic structure.

grounding of phonological markedness is by no means new and can be seen as early as in the work of Trubetzkoy (1931), who regards articulatory complexity as an essential criterion of phonological markedness.

More recently, the relative markedness of a various segment classes has been correlated with articulatory complexity by Chomsky and Halle (1968), Lindblom and Maddieson (1988), Willerman (1994) etc. According to Chomsky and Halle, a class of segments is marked because it is harder to articulate in comparison with a class that is easier to articulate (unmarked). For example, a retroflex sound is considered more marked than an apical alveolar or a dental because retroflexes involve a raising and displacement of the tongue tip towards the post-alveolar region, whereas an apical alveolar involves only a tongue tip raising (Hamann 2003). Similar observations have been made for other instances of segmental markedness, like clicks in relation to consonants articulated with a pulmonic airstream mechanism (Engstrand 1997) or palatalized consonants in relation to plain consonants (Ní Chiosáin and Padgett 2001, Zygis 2004). With respect to the articulatory complexity of palatalized consonants (discussed in this dissertation in Chapter 5, in relation to Number expression in Romanian), they have been shown to be articulatory complex because they involve the superimposition of an [i]-like gesture upon a labial, dental, alveolar or post-alveolar (velar) consonant (Ladefoged 1971, Ladefoged and Maddieson 1996).

More generally, the phonetic and psycholinguistic underpinnings of phonological markedness as well as their optimality-theoretic implementations

have been highlighted by Flemming (1995), Steriade (1995c), Boersma (1998), Hayes (1999) and many others²⁰. Within a pre-OT framework, the issue is addressed by Archangeli and Pulleyblank (1994).

To conclude the discussion of complexity as a criterion for phonological markedness, it should be mentioned that structural and articulatory complexity often correlates with perceptual difficulty. There is a sizable body of evidence that points to the correlation between perceptual difficulty and phonological markedness (see, among others, Flemming (1995), Steriade (1997, 2001), Beckman (1998/1999), Boersma (1998), Kirchner (1998), Haspelmath (1999), Hayes (1999), Côté (2000), Pierrehumbert (2000), Bye (2001), Smith (2002/2005), Curtin (2002), Padgett (2003ab), Hume (2004), Walker (2005) and the contributions in Hayes, Kirchner and Steriade (2004)). As an expression of the correlation between markedness and perceptual difficulty, unmarked phonological structures, which are relatively easy to perceive due to rich perceptual cues, tend to occur in more words than marked phonological structures, characterized by weaker perceptual cues (Hume 2004). The importance of the perceptual difficulty criterion for phonological markedness is also highlighted by the fact that perception and production often go hand in hand, in that marked elements, which are perceptually difficult, may require more extreme articulation to improve their perceptibility, and conversely, reducing articulatory effort often threatens perceptual distinctness. Also, the neural systems supporting speech perception and speech production

²⁰ Interestingly, in sign languages a correlation was recently noted between the complexity of hand shapes ('ease of articulation') and frequency of occurrence ('markedness') (Ann 2006).

partially overlap in the superior temporal lobe, as shown by Hickok and Poeppel (2000) and Hickok (2001).

A second, widely used diagnostic for markedness in phonology is the frequency of occurrence in grammars or inventories across languages, a topic which will be addressed in the following section.

3.2 Phonological markedness as (non-)occurrence in inventories

As in the case of grammatical markedness, frequency of occurrence within individual languages or in inventories has been shown to correlate with phonological markedness. The observation, made as early as in the studies of Jakobson (1932/1984, 1939/1984), Trubetzkoy (1939/1969) or Greenberg (1966a), is that marked phonological material at various levels of representation (features, segments, syllables etc.) occurs less frequently in inventories than unmarked material.

Greenberg (1966a) discusses complex articulations (glottalization, palatalization) in a number of languages, including Hausa, Klamath, Coos, Yurok, Chiricahua, Maidu and Russian, and he finds that segments with secondary articulation are significantly less frequent than plain sounds. Long versus short vowels in Icelandic, Sanskrit, Czech, Hungarian, Finnish, Karok and Chiricahua follow the same statistical tendency, and so do nasal vowels, as opposed to non-nasals.

As to occurrence in inventories, there is a similar statistical tendency for unmarked structure to occur in more individual inventories than marked material. The table in (38), compiled by Clements (2004) on the basis of the UPSID database (Maddieson 1984, Maddieson and Precoda 1989) illustrates this behavior for consonant features:

(38) Table 9 Unmarked versus marked consonant features

<i>all languages have:</i>	<i>some languages lack:</i>	<i>marked feature</i> ²¹
obstruent consonants	sonorant consonants	[+sonorant]
coronal consonants	labial, dorsal, pharyngeal or laryngeal consonants	[labial], [dorsal], [pharyngeal] etc.
oral consonants	nasal consonants	[+nasal]
stop consonants	continuant consonants	[+continuant]
unaspirated stops	aspirated consonants	[spread glottis]
non-glottalized stops	glottalized stops	[constricted glottis]
anterior coronal stops	posterior coronal stops	[+posterior]
non-strident coronals	strident coronals	[+strident]
simple consonants	consonants with secondary articulations	features of secondary articulation

With respect to the presence/absence of certain items, the categories which some languages lack in (38) might be for just a particular counterpart of an element in the categories that they have. For instance a language might have [g] but lack a velar nasal, and at the same time show stop/nasal pairs at bilabial and alveolar points of articulation.

²¹ I am not necessarily committed to this particular version of features. The ‘marked feature’ column serves nevertheless our demonstration purposes.

Of course, a statistical approach *per se* does not explain why some segments are more frequent than others, but has the empirical advantage of relating markedness to observable parameters, such as frequency distributions.

It should also be noted that frequency of occurrence in phonological inventories does not necessarily coincide with the frequency of occurrence of the relevant phonological structures in individual languages. An example for this difference is provided by Arabic, where the coronal voiceless stop /t/, although relatively unmarked cross-linguistically and present in a large number of inventories, is found only in a small number of words (Pierrehumbert 2003)²².

Given the diversity of diagnostics proposed for phonological markedness, the task of correlating it with grammatical markedness is by no means an easy one. In the case studies presented in this thesis I discuss instances of phonological markedness that are uncontroversial: uneven moraic trochees in Old Saxon (Chapter 4), palatalized consonants in Romanian (Chapter 5) and intervocalic voiceless stops in Mayak (Chapter 6). In each of the cases the phonological markedness of the relevant structure is assessed and the two criteria for phonological markedness discussed in this chapter (complexity and occurrence in inventories) are discussed.

Since the theoretical framework assumed for the dissertation is Optimality Theory (Prince and Smolensky 1993/2004), a word is in place at this point about

²² This seems at odds with Greenberg's statistical observations. It should be noted, however, that Greenberg's correlations were established for phonological features (features of secondary articulation, length, nasality etc.), not necessarily for individual segments in inventories.

the way in which markedness is addressed in OT. Unlike approaches to markedness that capitalize upon phonetic or representational facts, in OT there is only one way to show that a structure is marked, namely to show that there exists a markedness constraint against that structure and that employing the markedness constraint leads to the right typological predictions (see McCarthy 2002 for a discussion of markedness in OT versus Prague School markedness). For example, (HL) uneven trochees are marked as there is a constraint *(HL) that prohibits them²³. I will return to the issue of markedness in OT in Chapter 3.

3.3 Summary: grammatical and phonological markedness

So far we have determined reviewed the most important diagnostics proposed for grammatical and phonological markedness. For grammatical markedness structural coding and frequency of occurrence in language corpora have emerged as the most reliable criteria, in the sense that marked categories are characterized by at least as much inflectional coding as the unmarked ones and have a lower frequency of occurrence than their unmarked counterparts.

Since we will be testing the Marked in the Marked generalization, which was stated for forms that have relative similar phonological expression of their inflectional markers, the frequency criterion turns out to be the essential trait of grammatical markedness. In general, for a grammatical category G with g_1 and g_2

²³ See Chapter 4 for a discussion of uneven trochees as marked phonological structure. Constraints against uneven trochees have been proposed by Prince (1990), Prince and Smolensky (1993/2004) and Kager (1993, 1995).

as its members, if g_1 and g_2 are expressed by similar phonological markers and g_2 has a lower frequency of occurrence than g_1 , g_2 is more marked than g_1 . For instance, in Romanian masculine and neuter nominals the expression of Number is represented by a high vowel suffix (/u/ in the Singular and /i/ in the Plural), although the Singular affix is not always expressed in outputs. Plural forms are less frequent in point of occurrence (along the lines of Greenberg 1966a)²⁴, which makes the Plural (g_2) more marked than the Singular (g_1). For the purpose of the MIM hypothesis, grammatical (inflectional) markedness is essentially reducible to a variable of language use represented by frequency of occurrence of expressions.

For the purpose of this dissertation, the main criteria for phonological markedness are complexity (in structural and articulatory terms, and correlated with perceptual difficulty) and relative frequency of occurrence in phonological inventories across languages.

For each of the phonological structures (M) involved in the illustration of MIM it will be shown that the structure in question meets these criteria. In addition to that, since the theoretical framework assumed in the thesis is Optimality Theory, OT markedness constraints against M (*M) will be defined. The criteria of complexity and occurrence in inventories represent a way in which *M constraints are grounded in structural, articulatory or language use factors.

So far, we have determined the basic content of the notions of grammatical and phonological markedness and we have seen what problems are raised by the

²⁴ See also our own text statistics in Chapter 5.

connection between them. We are now in a position to take a first step in testing the Marked in the Marked hypothesis. We have also seen (§2) that if there is a correlation between grammatical markedness and phonological properties, the correlation is not necessarily one of phonological size. Since frequency of occurrence has been shown to be the most reliable correlate of grammatical markedness such that marked categories are also less frequent tokenwise, we can paraphrase MIM as the ‘Marked in the Infrequent’. In the following section I will discuss possible phonological correlates of frequency in open versus closed class categories and affixes versus roots.

4. Frequency of occurrence and phonological markedness

4.1. Open versus closed class categories

A fertile ground for testing the correlation between phonological markedness and frequency of occurrence in actual speech is provided by the behavior of open and closed class word categories. It is well known that open class categories (also known as ‘lexical’ or ‘substantive’: nouns, verbs, adjectives etc.) have a lower frequency of occurrence than closed class categories (‘grammatical’ or ‘functional’: pronouns, determiners, auxiliaries, certain prepositions etc.)²⁵. In many languages, low-frequency, open-class categories are more prone to contain marked phonological material than high-frequency, closed class categories.

²⁵ See Kučera and Francis (1967) for a comprehensive study of word frequency in contemporary American English.

Observations of this sort have been made in the literature in the last several decades. As regards segmental markedness, Swadesh (1971) remarks that in languages having clicks²⁶ as part of their phonological inventory, these sounds are part of ordinary verbs, nouns, and adjectives (lexical, open-class items), but not of demonstratives, pronouns, and particles (functional, closed-class items).

A more articulate account of the presence of marked segments in functional categories is provided by Willerman (1994), who compared phonological profiles of pronouns in 32 typologically different languages. She found that segments that are cross-linguistically marked, such as clicks, affricates, uvulars, ejectives and consonants with secondary articulation occurred with less than predicted frequency in the pronominal paradigms. At the same time, segments that are less marked phonologically (bilabials, glottals, nasals and approximants) occurred with greater than predicted frequency in pronouns. Working with an independently developed scale of articulatory simplicity/complexity, Willerman found that the infrequently occurring segments were those that are relatively more complex, and they were present with relatively lower frequency in pronouns. Conversely, segments that are overrepresented in pronominal paradigms are typically the phonologically unmarked ones, at least from an articulatory standpoint.

Prosodic markedness has also been noted to correlate with membership in open versus closed class categories. A statistical study conducted by Shi, Morgan and Allopena (1998) on onset complexity shows that (less frequent) open-class

²⁶ For the status of clicks as phonologically marked segments in relation to their articulatory complexity, see Sagey (1986/1990).

words are more likely to have complex syllable onsets than (more frequent) closed-class words.

Another area of morphology where we can see differences in phonological markedness between categories that occur with different frequency is the root-affix distinction.

4.2. *Roots vs. affixes*

The comparative phonological properties of the morphological domains ‘root’ and ‘affix’ have been extensively discussed in the literature in the last decade (Steriade 1993, McCarthy and Prince 1994, 1995, Selkirk 1995, Pulleyblank 1996, Benua 1997/2000, Beckman 1998/1999, Alderete 1999/2001, Baković 2000, Walker 2000ab, Urbanczyk 1996/2001, Ussishkin and Wedel 2002, Tessier 2004 and many others).

The phonological reflex of the root-affix distinction has often been considered to derive from the phonetic or psycholinguistic prominence of roots as compared to affixes (see Beckman 1998/1999 and the references therein), which confers roots special faithfulness properties as compared to affixes. In optimality-theoretic terms, this property translates in the universally assumed fixed ranking labeled the Root-Affix Faithfulness Metaconstraint (McCarthy and Prince 1995), according to which faithfulness to root-sponsored phonological material outranks faithfulness to phonological material in affixes.

Less attention has been paid to the specific issue of occurrence of marked/unmarked phonological structure in roots versus affixes. However, a recent paper

by Ussishkin and Wedel (2002) lists a number of situations where affixes are attested to host unmarked phonological material, while roots can contain both marked and unmarked material.

In English, affix consonants are predominantly coronal, a relatively common, unmarked place of articulation (the situation is largely similar in other Indo-European languages). In Salish, glottalized consonants occur only in roots and lexical suffixes, never in grammatical affixes. The relatively marked mid, rounded vowels occur in Turkish only in roots, rarely in affixes. Discrepancies between the distribution of vowels are also attested in Frisian and Dutch, where affixes can contain only an unmarked subset of the vowel inventory (see also Dyck 1995 on asymmetries in vowel inventories occurring in stems versus affixes such that affixes show smaller inventories). In prosody, roots are different from affixes in Sanskrit, in that only the former allow for complex onsets²⁷.

The asymmetric behavior of roots and affixes parallels that of lexical (open-class) and functional (closed-class) items. From an ontological perspective, this is not unexpected, since roots, which are more likely to contain marked phonological structure, are open-class lexical elements, while affixes are closed-class functional elements²⁸. The frequency effects noted in the previous section for open versus closed-class items are expected to hold for roots and affixes; the former occur with less token frequency than the latter (see Segalowitz and Lane

²⁷ For references, see Ussishkin and Wedel (2002) and the citations therein.

²⁸ The generalization regarding the phonological markedness of roots and affixes can be extended to reduplication structures. The reduplicant, a morphological formative with an affix-like, functional status, is usually less marked than the base (a lexical element). The property is known as the Emergence of the Unmarked (McCarthy and Prince 1994).

2000 and the references therein for frequency data). The picture is reminiscent of ‘marked in the less frequent’ effects.

Such an account has positive consequences for explaining certain apparently unexpected reversals in the phonological properties of roots and affixes. Hebrew (Ussishkin 2000, Ussishkin and Wedel 2002) represents a system where affix faithfulness outranks all other instances of faithfulness, including root faithfulness, which contradicts the prediction of the Root-Affix Faithfulness Metaconstraint. In the templatic morphology of Hebrew, verbs are restricted to two syllables and are formed through the concatenation of a bisyllabic base with a bivocalic affix. The undominated bisyllabicity constraint on inflected forms can only be satisfied by deleting material from the base:

(39) The verbal paradigm for *gadal*, ‘to grow’ (Ussishkin and Wedel 2002)

<i>Base form</i>	<i>+affix</i>	<i>Derived form</i>	<i>Gloss</i>
gadal			‘he grew’
	i e	gidel	‘he raised’
	u a	gudal	‘he was raised’
	hi i	higdil	‘he enlarged’
	hu a	hugdal	‘he was enlarged’

As can be seen in (39), faithfulness to affix material outranks faithfulness to root (base) material, thus contradicting the Root-Affix Faithfulness

Metaconstraint. Ussishkin and Wedel note that in Hebrew, a language with a five-vowel inventory where verbal affixes consist of two vowels, these morphemes are near neighbors of one another. Unlike in other languages, the high frequency of a Hebrew verbal affix cannot compensate for low phonemic contrast, so affix faithfulness ranking higher than root faithfulness is a mechanism by which contrast between affixes is maintained. Ussishkin and Wedel suggest that the apparent root/affix faithfulness reversal effect in Hebrew is functionally grounded in frequency and neighborhood density for roots and affixes (a property that the authors label ‘effective contrast’). The recourse to language use factors offers an elegant, straightforward account for the reversal, in a manner akin to the solution proposed by Tiersma (1982) for dealing with markedness reversals in morphological linguistic typology (§1.2.3).

5. The functional grounding of Marked in the Marked effects

One of the central ideas advocated in this dissertation is that the connection between grammatical markedness and phonological markedness (expressed by the Marked in the Marked generalization) is functionally grounded.

A first step in this direction was taken in §1.2, where grammatical markedness was shown to closely correlate with a usage factor such as frequency of occurrence. In Chapter 3, where the optimality-theoretic framework assumed for the analysis is introduced, we will see that many OT constraints can be shown to have a functional grounding and we will introduce a licensing constraint

LICENSE(M,g). The licensor of marked phonological structure M in the marked member g of grammatical category G is represented by the morpho-syntactic features of g, which are marked by virtue of their low frequency of occurrence.

The picture sketched so far suggests that the MIM generalization is rooted in language use. In this section I investigate in more depth the functional underpinnings of MIM by looking at two conflicting forces that are at work in language use and processing.

First, there are principles of economy that tend to keep linguistic expression to a minimum (like the Principle of Least Effort formulated by Zipf 1949), whose effect becomes clear when we consider phenomena of reduction affecting mainly high frequency items, as shown, among others, by Bybee 1994, 2001, Fidelholtz 1975, Hooper 1976, Mańczak 1980, Phillips 1980, Fenk-Oczlon 2001 etc.

Minimization of expression in speech production, a speaker-oriented principle, is the second economy force at work. It is inherently in conflict with the listener-oriented principle of sufficient contrast which demands that there be enough expression to facilitate perception and decoding of information.

To see how these principles work, consider two simple examples from diachrony that we owe to Haspelmath (2002). In Old High German, the Genitive Plural marker was *-ono*, while in Modern German it is reduced to *-en*, as in *zungono - Zungen* ('tongues' - tongue-genitive plural'). From the speaker's point of view, this sort of form reduction represents an instance of economy. On the

other hand, there are cases where the amount of structure increases in time. In Old English, a noun like *dohtor* ('daughter') has null marking both in the Singular and the Plural, whereas in Modern English the Plural is characterized by the presence of a suffix ('daughter-s'). The particular evolution in English illustrates a principle of clarity in communication whereby comprehension of distinct meanings is aided by formal differences that may run counter to economy.

With regard to economy in production (the speaker-oriented principle) I discuss the advantages marked in the marked phenomena can have in language use in §5.1. Such advantages are indirect, in that less marked phonological material in more frequent forms favor effort minimization in production. In §5.2 I focus on some positive consequences of MIM from a hearer-oriented perspective, and I address the issues of perception, retrieval and language acquisition.

5.1 Production: MIM and form minimization

As Hawkins (1983, 1990, 1992ab, 2003, 2004) notes, grammatical markedness hierarchies are in fact performance frequency rankings encoded in the grammar or instances of 'performance shaping grammars'. The ultimate cause of frequency effects resides largely in pragmatic and/or cognitive and semantic factors that have to do with the way language users perceive and express entities in the real world. According to this assumption, groupings of two objects (Dual) can be less frequent than groupings of more than two objects (Plural), and groupings in general involve a higher level of abstractness that makes the Singular potentially more readily

available and necessary than the Plural, the Plural more available than the Dual and so on. The empirical adequacy of this take on grammatical markedness is supported by its ability to account for apparent markedness reversals, already discussed in §1.2.3.

In phonology, a number of researchers have claimed that functional grounding is internal to the grammar (Vennemann 1974, Hooper 1976, Stampe 1973, Donegan 1978, Donegan and Stampe 1979, Archangeli and Pulleyblank 1994 etc.)²⁹. Moreover, the particular behavior of phonetically or psycholinguistically prominent positions (Smith 2002/2005) or the mechanism of inductive grounding (Hayes 1999) offer insights into the functional grounding of phonological processes, although neither Smith nor Hayes makes explicit assumptions as to grammars being directly determined by functional factors.

Given this picture, the next question to ask is, of course, how functional factors correlate with formal complexity that can in turn translate into phonological markedness. An indirect answer to this question is provided by the Minimize Forms (MiF) principle proposed by Hawkins (2004):

(40) Minimize Forms (MiF)

The human processor prefers to minimize the formal complexity of each linguistic form F (its phoneme, morpheme, word, or phrasal units) and the number of forms with unique conventionalized property assignments, thereby assigning more properties to fewer forms. These minimizations

²⁹ It should be noted that not all researchers agree that the grammar is functionally grounded. See Smith (2004a) for a review and references on functional grounding in phonology.

apply in proportion to the ease with which a given property P can be assigned in processing to a given F. (Hawkins 2004:38)

In general, the MiF principle prefers structures with less material to those with more. This is possible if structures with less material are more predictable (and consequently, also more frequent in occurrence than structures with more material), which constitutes the expression of economy in communication along the lines of the Principle of Least Effort (Zipf 1949)³⁰.

In syntax and morphology, the workings of MiF can be easily seen. Consider, for illustration, grammatical roles and case marking. If the grammatical role (subject, object etc.) of a certain NP can be reliably associated with its syntactic position within the sentence, the grammar can dispense with the presence of specific case markers. For example, in a language where there is a canonical position for the subject, the Nominative case need not be overtly expressed, while the object is usually case-marked³¹.

The explanatory power of MiF also manifests itself if we consider the grammatical markedness – phonological markedness relation that this dissertation investigates. In §2 we noted the tendency of grammatically marked forms to have greater phonological size (in terms of segments, syllables etc.) than their unmarked counterparts. Although this correlation is not without exceptions, it is

³⁰ MiF is reminiscent in its effects of other principles of economy in production, like the Economy Principle (Haiman 1983) or principles of pragmatic efficiency, like Grice's (1975) second Quantity Maxim or Levinson's (2000) Minimization Principle.

³¹ See also Drellishak (2005) for a discussion of other syntactic phenomena that illustrate MiF, in particular, coordination.

uncontroversial that less phonological bulk in the unmarked, frequent category constitutes an advantage in production in terms of economy.

A similar advantage is noted in the cases of grammatical markedness – phonological markedness correlations where the latter kind of markedness is not simply a matter of size, but rather of phonological complexity (articulatory or structural, as discussed in §3.1). Indeed, given the criteria we have adopted for phonological markedness, marked phonological material is more complex articulatorily and is more likely to involve the presence of more numerous and/or complex articulatory gestures than unmarked material. It follows that circumscribing the marked phonological material to the less frequent, more marked categories, is bound to place less articulatory burden on the language user. For example, restricting consonants with secondary articulation to the more marked grammatical category³² creates an advantage in production in the sense that articulatorily complex structures are confined to a relatively smaller number of forms, and the overall articulatory effort is kept to a minimum.

Note that the activity of MiF is in effect one of optimization of form and properties that can be assigned to those forms. While forms with a high frequency of use are likely to be characterized by minimal formal marking, less frequently used forms are in a sense more conservative in that they overtly mark their corresponding properties such as grammatical category (this idea is expressed in Hawkins's (2004) principle of Morphologization).

³² For an illustration of the phenomenon, see the analysis of Standard Romanian in Chapter 5.

The first to study the behavior of lexical competitors in relation to frequency in production were Landauer and Streeter (1973). Since then, numerous studies have been devoted to this issue.

With regard to the problem of errors in production, low frequency forms have been shown to be generally more vulnerable to speech errors than high frequency forms (Marquardt et al. 1979, Stemberger and MacWhinney 1986, Vitevitch 1997); the fact that low frequency forms can host articulatorily difficult, marked phonological material could make them even more prone to errors, which seems to put such forms to a disadvantage in production³³.

On the other hand, the question arises whether there is some other processing advantage other than economy in production that may favor the occurrence of marked phonological structure in marked, less frequent grammatical categories that nevertheless express some relevant and necessary property P. This question will be addressed in the following section.

5.2 Perception, retrieval and acquisition

If assigning phonological complexity to grammatical categories in relation to their place on a grammatical markedness hierarchy has obvious advantages in production, where effort is minimized on the speaker's side, it is less clear what, if any, the advantages of such behavior could be in perception and retrieval. On the

³³ Of course, one may wonder why marked phonotactic structure does not then occur in more frequently used forms, where errors are less likely to occur. The fact that we are not seeing such 'transfers' seems to indicate that the overall cost of such a hypothetical 'transfer' would be too high on the speaker's part.

contrary, it could be claimed that the unmarked category, with its relatively unmarked phonological structure, should be easier to perceive and retrieve given its high frequency of occurrence.

This is what psycholinguistic studies generally show (e.g. Gordon 1983, Glanzer and Eisenreich, 1979). Work by Marslen-Wilson (1990) brings evidence to bear on higher frequency words being generally faster and easier to access than lower frequency words, even when they are balanced on other features, like phonological size. For example, a frequent English word like ‘pen’ is accessed and recognized faster than the less frequent word ‘pun’, the two lexical items having the same segment count and similar phonological makeup. Another advantage of high frequency of occurrence has been studied by Balota and Chumbley (1985), who showed that the word frequency effect could be at least partially attributed to articulatory processes. Such a view implies that articulatory programs for high-frequency words may be compiled (and also executed) faster than those for low-frequency words.

Nevertheless, high frequency of occurrence *per se* is not an inherent advantage in processing. A number of studies have shown that the effect of frequency on word intelligibility is mediated by the number of competitors for a given word, and can be eliminated if the number of lexical neighbors is controlled (Havens and Foote 1963, Pisoni et al. 1985, Luce 1986).

The question that is relevant for the phenomena approached in this dissertation is, of course, whether Marked in the Marked effects in lower

frequency items present certain advantages in perception and retrieval. Without offering a direct answer to this question, there are studies suggesting that such advantages do exist.

In particular, Monaghan et al. (2005) have shown distributional information to be more useful for categorizing higher frequency words, while phonological cues provide more valid data for lower frequency words. Using corpus analyses, they found that distributional information was a highly reliable cue for high frequency words, but that reliability reduced for lower frequency words. In addition, the reliability of phonological information was highest for the low frequency words. In an artificial language experiment, Monaghan et al. (2005) found that phonological information provided most assistance to categorizing words that occurred with low frequency in the language.

The presence of marked phonological structure in the low frequency category can in principle provide exactly the desirable phonological cues and thus ease the process of decoding morphological forms. As a caveat, one should distinguish between perceptual difficulty of individual sounds or phonological structures and the perception of the output words in which they occur, although the presence of rich cues in phonological constituents can aid the overall perception of the word.

A second argument for a possible advantage of marked phonological structure in perception comes from salience effects. Perceptual salience has been long recognized to play an important role in shaping phonological inventories

(Liljencrants and Lindblom 1972, Ohala 1983, 1990, Lindblom 1986, Lindblom and Maddieson 1988 etc.) and in phonological processes (Kohler 1990, 1991, Lindblom 1990a). In particular, it has been noted that coronals and laryngeals are less perceptually salient than labials and velars, which are also more marked (Jun 1995, 2004; Hamilton 1996, Hume et al. 1999). In the case of the coronal place of articulation, the relative unmarkedness of coronals as compared to labials and dorsals (testable by higher susceptibility to place assimilation, epenthesis, occurrence in inventories) was shown to follow from poorer acoustic cues in coda position (Byrd 1992). A similar argument can be made for vowel length. Long vowels are more salient than short vowels, at least when used as a perceptual cue for word-final stop voicing (Wang and Wu 2001). As Keren Rice (p.c.) points out, acoustic cues correlate with confusability, in that the likelihood of mishearing a labial consonant, for instance, is less than for an (unmarked) coronal one. Now if the marked structure is associated with the marked, less frequent grammatical category, whose overall salience is relatively low due to low frequency of occurrence, this particular distribution can in principle have a beneficial effect for the perception of the output inflected for the relevant morpho-syntactic category.

It should be noted, however, that the relation between frequency of occurrence and perceptual salience is not yet fully understood. Although high token frequency of grammatical categories is generally assumed to correlate with higher perceptual salience, Kerswill and Williams (2002) report that some of the less well represented forms used by adolescents in a dialect study project were

nevertheless salient for them without necessarily involving particular phonological structure. Also, Hoffman (2004) maintains that low frequency complex prepositions can be both cognitively salient and involved in language change, in particular in processes of grammaticalization. This suggests that the impact of the relative infrequency of syntactic forms on their salience and susceptibility to language change requires further investigation.

As suggested by Todd Haskell (p.c.), another dimension of perception for which frequency and phonological markedness effects can be relevant is segmentation of the speech stream into words. Several researchers have looked at the potential role of transitional probabilities in helping children segment the speech stream into words (e.g. Harris 1955, Hayes and Clark 1970, Motley and Baars 1975, Morton and Long 1976, Goodsitt et al. 1993, Saffran et al. 1996, 1997, Aslin et al. 1998 etc.).

In general, for any two phonemes A and B that occur consecutively in the speech stream, transitional probability is the likelihood that, when having heard A, the next phoneme will be B. The idea is that this probability will be higher within words than between words. Naturally, this probability will also depend on the frequency of occurrence of the B phoneme. All other things being equal, a B phoneme of lower frequency will mean a lower transitional probability. If the B phoneme (or, more generally, phonological structure B) is marked, it will most likely have a lower frequency. So the occurrence of a marked phoneme could serve as some sort of indicator for a good place to try to divide the speech stream

up into morphemes. In general, the intuitive idea is that the more a child hears something and the more frequently a given phonological structure occurs in the same place, the more likely the child will be to correctly segment the material and subsequently produce it. High frequency forms with more entrenched structure do therefore present a relative advantage over less frequent forms with more marked, less predictable structure. On the other hand, due to the fact that most inflectional processes are affixal in nature and affect word edges, transitional probability may be beneficial in singling out low frequency inflected words belonging to marked grammatical categories and thus compensate for their lower frequency of occurrence.

Word frequency and age of acquisition effects in recognition and recall have also been investigated. Using the so-called ‘remember-know’ procedure developed by Gardiner (1988), Dewhurst et al. (1998) found that recognition performance was higher for low-frequency words than for high-frequency words and higher for late-acquired words than for early-acquired words in ‘remember’ responses. Advantages for both low and high frequency words were found when the items were presented in mixed lists. The authors attribute the findings to the more distinctive encoding of low-frequency and late-acquired words. One can hypothesize that when marked phonological material is associated to low

frequency rather than high frequency words, the distinctiveness of low frequency words is enhanced³⁴.

To sum up, in §5 I examined possible mechanisms of functional grounding for MIM effects. It appears that from the perspective of speech production confining marked phonological structure to less frequent, grammatically marked forms represents an advantage, since it leads to minimization of overall articulatory effort on the speaker's part. A connection was made with Hawkins's (2003, 2004) principle of form minimization (MiF), which opens the door to considering MIM effects as language use effects encoded in the grammar.

If from the point of view of production there is an obvious advantage of assigning less marked structure to more frequent categories, things are less clear if we consider the other side of the coin, namely perception, and also aspects of retrieval. The review of the psycholinguistic literature undertaken in this chapter seems to suggest, nevertheless, that there may be advantages to having MIM effects in natural languages. The same remark can be made to some extent with respect to language acquisition, where the phonological cues provided by marked structure have been shown to aid segmentation and increase distinguishability.

³⁴ To complicate the matter even more, it should be mentioned that word frequency should be understood in relation to phonological neighborhood effects. For example, Metsala (1997) found that school-age children were better able to recognize low frequency words with large neighborhoods than low frequency words with small neighborhoods in a gated recognition task. See also Ussishkin and Wedel (2002), cited in §4.2, for an application of neighborhood density as a functional factor in root-affix asymmetries.

5.3. The locus and emergence of MIM effects

If it is true that functional factors can shape grammars, there are two essential issues to be addressed in relation to the way in which this influence is exerted. First, there is the issue of the exact locus where functional forces operate. Second, and equally important, is the issue of how patterns become grammaticalized, in other words, with direct application to the effects discussed in this dissertation, how MIM patterns emerge. In this section I approach the two issues mentioned above.

With respect to the locus where functional factors (specifically, frequency of occurrence of inflected forms) operate, there are, in principle, two possibilities. Starting from the general assumption made in Optimality Theory that individual grammars are particular rankings constructed from constraints in CON, one way in which functional factors influence grammars is via the constraints as such; for example, only those constraints which are functionally grounded are allowed to be part of CON. In this dissertation I propose a class of formal licensing constraints LICENSE(M,g) which license marked phonological structure M in outputs inflected for a marked member g of grammatical category G (see Chapter 3 §4 for the definition of the constraint). While I do not assume that all OT constraints are functionally grounded, I claim that the licensing constraint LICENSE(M,g), which is part of the MIM Schema, is subject to functional grounding³⁵. This is seen clearly

³⁵ For a general discussion of functional grounding of OT constraints, see Chapter 3 §1.1. For the functional grounding of the licensing constraint LICENSE(M,g), see §4 of the same chapter. The MIM Schema and its factorial typology are discussed in §5.

in the filtering mechanism which is assumed to allow only those licensing constraints as part of CON for which, for a given marked phonological structure M, g is a marked of grammatical category G. It is the same filtering mechanism proposed by Smith (2002/2005) and discussed in Chapter 3 §4, but this time the functional factor which is active in determining the range of possible constraints is frequency of occurrence. Licensing constraints in which the value of the grammatical category is an unmarked one are excluded from CON. As we shall see in §5 of Chapter 3 and also from the illustrations in Chapter 5, the factorial typology constructed on the basis of LICENSE(M,g) makes the right empirical predictions. The essential prediction is that under general phonological similarity of morphological marking the unmarked member g' of G cannot license marked phonological structure M which the marked member g does not. Had a licensing constraint for an unmarked member g' of G been allowed as part of CON, the factorial typology would have predicted languages in which M occurs in g', but not in g. Such systems do not seem to exist, at least if we take into account the similarity condition between g and g' with respect to the way in which the two are expressed phonologically.

A second conceivable possibility is that functional factors manifest themselves by determining constraint rankings proper, for instance, as universally fixed rankings between (some of) the constraints involved. The linguistic data available for this thesis do not lend empirical support to such a mechanism. As shown in Chapter 3 §5, the following patterns are predicted to exist: (a) Marked in

the Marked (M in g, but not in the unmarked category), (b) Full contrast (M both inside and outside g) and (c) Lack of variation (M prohibited, irrespective of grammatical category value). Given this diversity of linguistic patterns, among which MIM is just one particular case, there is no evidence that points in the direction of a universally fixed ranking driven by functional factors. In sum, I claim that with respect to MIM effects grammars are ‘shaped’ by functional factors in an indirect way, as a result of a substantive condition on CON, i.e. via the inventory of constraints universally available, rather than via fixed rankings between constraints.

Having addressed the issue of the locus of the activity of functional factors which determine MIM phenomena, we can now turn our attention to the problem of how such patterns become grammaticalized. There are two aspects to be taken into consideration when examining the emergence of a grammatical pattern, including MIM: language change and acquisition. The rest of this section is devoted to some considerations on the diachronic and synchronic dimensions of MIM patterns.

Within an optimality-theoretic approach to diachrony, it is commonly assumed that language change involves constraint reranking (for work on language change in Optimality Theory see, among others, Jacobs 1995, Bermúdez-Otero 1996, Cho 1998, Green 2001, Oh 2002). As for what constraints undergo promotion or demotion in the reranking process, there is no agreement among specialists. For example, while some researchers claim that language change

involves promotion of markedness constraints³⁶ and creates unmarked structure, (Billerey 2000, Gess 2001, Green 2001, Kiparsky 2004 etc.), other researchers highlight the role of markedness demotion in diachronic change, resulting in the emergence of marked structure (Albright 2004, Deo and Sharma 2005, Morin 2005).

What is the contribution the study of MIM effects can make to the understanding of the reranking processes in language change? In Chapter 5 we shall see how Romanian, one of the case studies presented in this dissertation, allows us to shed light on the relation between constraint reranking and the diachronic emergence of MIM patterns, at least for the linguistic system in question.

An interesting question surrounding the diachronic emergence of MIM patterns is whether there are factors which can be said to favor this pattern of linguistic change. While a definitive answer to this question cannot be provided on the basis of the cases considered in this dissertation, one can entertain the possibility that such favoring factors exist. For example, considerations of economy in production favor the confinement of marked phonological structure to output words inflected for a marked grammatical category, under general phonological similarity, as we have already seen in §5.1. Another possible favoring factor is represented by a general tendency in language change noted by

³⁶ In this respect, language change would represent the opposite of language acquisition, a process which has been claimed to involve demotion of markedness constraints (Tesar and Smolensky 1993, 1996, 1998, Gnanadesikan 1996, Hayes 2004 etc.)

Andersen (2001). Andersen formulates a principle (dubbed Markedness Agreement) according to which as a change spreads and becomes generalized in a language, “the innovated element is favored first of all in marked environments, if the innovated element is marked, but in unmarked environments if it is unmarked” (Andersen 2001:31). Although in its original statement Markedness Agreement refers to the markedness of syntactic environments as favoring the marked item, one can note the similarity with the Marked in the Marked generalization discussed in this thesis. More precisely, both of them have the effect of establishing a connection between two instances of markedness which converge in an output which is the result of linguistic change. For the Markedness Agreement principle, the two instances of markedness are represented by the marked structure of the output and the marked character of the environment in which it occurs, while in the case of MIM we are dealing with marked phonological structure in an output inflected for a marked grammatical category.

The recurring question in this section has been what mechanism allows patterns favored by language use to become grammaticalized. As shown by Kirby (1994), two kinds of explanations can be given in principle for how language use influences grammaticalization. The first type of explanation is essentially nativist: it may be the case that the language faculty (Chomsky 1988), a property of the human mind to acquire a language of a specific type, has properties that permit the acquisition and grammaticalization of certain structures, possibly those structures which are also favored by use.

The second type of explanation rests on the assumption that a language use (performance) mechanism can account for the structure of the language it processes. As Kirby points out, the nativist explanation has the drawback of being unable to account for issues of distribution of patterns across languages and, as argued by Hoekstra and Kooij (1988), is primarily devised to explain the ability of the language learner to infer grammar starting from an abundance of unstructured linguistic data (Plato's Problem).

Returning to MIM effects, we are left with the hypothesis according to which they arise from processing preferences that become grammaticalized rather than being innate. Having already explored the emergence of MIM patterns in diachrony, I will conclude this section with a few considerations on first language acquisition. As we have seen in §5.2, there is evidence which can be used to support the idea that the presence of marked phonological structure in outputs inflected for marked grammatical categories may represent an advantage in acquisition. Such arguments include ease of segmentation of the speech stream by L1 learners and an enhanced distinctiveness of low frequency forms. It is for future research to gather further evidence for potential advantages in the acquisition of MIM patterns. From an optimality-theoretic perspective, first language acquisition presupposes an initial state in which markedness dominates faithfulness and it is through successive demotion of markedness constraints that adult language is achieved (Tesar and Smolensky 1993, 1996, 1998, Gnanadesikan 1996, Hayes 2004 etc.)

MIM patterns pose an interesting problem to the markedness demotion approach to acquisition. The MIM Schema involves LICENSE(M,g) as a top-ranked markedness constraint. Two acquisition scenarios can be envisioned for such a situation. First, it may be the case that the licensing constraint never gets demoted in languages where MIM effects exist, to the effect that the occurrence of marked phonological structure M outside marked category g is subject to the same restrictions in the L1 learner and the adult. Second, it may be the case that the licensing constraint is in fact promoted in acquisition. According to Fikkert and Levelt (to appear), such a situation may require a refinement of the notion of ‘markedness constraint’ in the sense that two kinds of markedness constraints should be distinguished, universal and emergent. Of these constraints, emergent ones may get promoted in acquisition, and it may be the case that LICENSE(M,g) is such a markedness constraint. An argument in favor of this behavior may be provided by the sensitivity of emergent constraints to frequency patterns, as shown by Fikkert and Levelt, and we have already seen that licensing constraints of the type described in this dissertation are grounded in frequency effects. This issue, together with the acquisition side of MIM patterns in general, merits further investigation.

The correlations made in this chapter do not constitute a full account of the functional grounding of MIM phenomena. Nevertheless, their ultimate causes rest in functional factors and the ability of language use to shape grammars.

6. Conclusion

In this chapter I introduced and reviewed the notions of grammatical (inflectional) and phonological markedness. With respect to grammatical markedness, frequency of usage was shown to constitute main criterion for this kind of markedness. The frequentist approach to grammatical markedness allows for a successful account of so-called markedness reversal phenomena and, as I claim in this dissertation, for the correlation between grammatical and phonological markedness that I label *Marked in the Marked* effects.

In phonology, a review of properties associated with markedness shows that its most reliable correlates are complexity (structural and articulatory, and its correlate, perceptual difficulty) and occurrence in phonological inventories. Such criteria form the basis for optimality-theoretic markedness constraints *M that militate against marked phonological structures M.

With respect to the connection between the two kinds of markedness, the *Marked in the Marked* (MIM) hypothesis was introduced, according to which under similar inflectional coding, marked grammatical categories are more (or equally) prone to sponsor marked phonological structure than unmarked categories. Since grammatical markedness is largely equated with token frequency of outputs, the hypothesis was successfully tested on linguistic objects known for their asymmetric usage frequencies, such as open versus closed class items and roots versus affixes, respectively.

Finally, I discussed the issue of functional grounding of MIM phenomena. As regards the side of language production, MIM effects represent an advantage in minimizing the speaker's articulatory effort while assuring the distinctiveness of linguistic forms. From the point of view of speech perception, retrieval and acquisition, the picture is less clear, but there is indication that at least in some respects MIM phenomena can have a beneficial effect in facilitating word recognition and aiding speech stream segmentation.

In the following chapter I will discuss how the hypothesized correlation instantiated by MIM is implemented in Optimality Theory (Prince and Smolensky 1993/2004), which is the theoretical framework assumed for the present dissertation.

CHAPTER 3

MODELING MARKEDNESS IN OPTIMALITY THEORY

0. Introduction

In the preceding chapter we discussed the content and manifestations of grammatical and phonological markedness and we advanced the claim that there is a correlation between the two, instantiated by the Marked in the Marked (MIM) generalization. In accordance with MIM, as we have seen, inflectional or grammatical markedness corresponds to a higher or equal degree of phonological markedness.

As inflectional markedness is shaped by usage such as economy and frequency, MIM is *per se* a statement of the connection between language use (performance) and (phonological) grammars. The correlation is ultimately a matter of optimization in that actual linguistic systems tend to maximize economy in communication by allowing, other things equal, marked phonological structure in forms that are relatively infrequent (i.e. grammatically marked).

Optimality Theory (OT, Prince and Smolensky 1993/2004), where grammars emerge as a consequence of rankable, violable constraints, is superior to rule-based models in the analysis of MIM effects. It is the factorial typology orientation of the OT approach and the ‘homogeneity of target/heterogeneity of process’ (McCarthy 2002) feature that confer the superiority of OT to rule-based approaches to MIM (see §5.2 for a discussion of the factorial typology). This

second chapter of the dissertation is devoted to the optimality-theoretic modeling of MIM phenomena.

§1 discusses the content of the notion ‘markedness’ in OT and addresses the concept of functional grounding of constraints. §2 reviews licensing mechanisms represented by Positional Faithfulness and Positional Markedness. In §3 I discuss positive licensing in privileged positions and in §4 I propose a family of constraints that license marked phonological structure in outputs inflected for marked grammatical categories. §5 introduces the Marked in the Marked schema and the associated factorial typology. §6 is intended as a brief summary of the chapter.

1. Grammatical markedness and Optimality Theory

OT (Prince and Smolensky 1993/2004) distinguishes two types of constraints, dubbed faithfulness and markedness. Faithfulness constraints militate for the preservation and identity of input structures and relations in outputs and penalize input-output discrepancies. In contrast, markedness constraints are blind to input structure and “assign violation-marks to a candidate based solely on its output structure, without regard to its similarity to the input” (McCarthy 2002:14)³⁷.

As already hinted in Chapter 2 (§3.2), in OT the only way to show that a structure is marked is to show that there exists a markedness constraint against that structure. In addition to that, the markedness constraint should lead to the right

³⁷ See also Moreton’s (2004) formal definition of markedness constraints, where the same idea is emphasized, that markedness constraints look only at the output and ignore the input.

typological predictions. Although not decisive, functional considerations may help explain why Universal Grammar has a certain markedness constraint and, say, not its opposite. It is at this point that functional grounding assumes a role in the formulation of OT constraints. Although, as Hayes (1999) notes, the fact that an OT constraint is based on a functional principle does not make the constraint inviolable, the functional grounding of (certain) constraints increases the explanatory power of the theory. As the licensing constraint I propose in this thesis is grounded in functional factors such as frequency of occurrence of inflected forms, I will start with a discussion of the functional grounding of OT constraints.

1.1 Functional grounding of OT constraints

Due to the way it is defined, the notion of ‘markedness’ is used in a technical sense in OT. The legitimate question arises as to the extent to which there is a connection between OT markedness constraints in phonology and other types of markedness that exist outside of phonology, in syntax or morphology. As Haspelmath (2003) puts it, cross-linguistic processes stem from processing preferences (minimization of the coding/uncoding effort) and conceptual-pragmatic preferences like predictability or familiarity in use. In short, there is at least a tendency, if not a universal property, of OT constraints to be functionally grounded, and the connection between OT markedness constraints and other kinds of markedness can be expressed in functional terms. As we are going to see, this

applies not only to phonological OT, but also to constraints in optimality-theoretic morpho-syntax.

In its early statements, phonological OT does not make explicit assumptions as to the functional grounding of constraints. Expressed as phonological generalizations, constraints are assumed to be universal and languages differ with respect to the rankings of constraints. In short, a constraint is considered to be adequate to the extent to which its action is attested by cross-linguistic evidence³⁸.

Subsequent research has shown that many OT constraints are functionally grounded or rooted in the articulatory and perceptual systems (the idea is explicitly stated by Kager 1999). This is the position advocated, among others, by Flemming (1995), Steriade (1997, 2001), Beckman (1998/1999), Boersma (1998), Kirchner (1998), Haspelmath (1999), Hayes (1999), Côté (2000), Pierrehumbert (2000), Bye (2001)³⁹, Smith (2002/2005), Curtin (2002), Padgett (2003ab) and Walker (2005) or by the contributions in Hayes, Kirchner and Steriade (2004). For an important pre-OT contribution to the issue of functional grounding of phonological constraints, see Archangeli and Pulleyblank (1994) and the references therein.

To see how functional grounding works, consider, by way of example, a constraint like NOCODA (Prince and Smolensky 1993/2004), which enforces a ban on closed syllables:

³⁸ Apart from this kind of descriptive adequacy, constraints were also thought to be to a large extent characterized by innateness (Prince and Smolensky 1993/2004, Tesar and Smolensky 1993, 1996).

³⁹ Bye (2001) calls the position according to which all OT constraints are functionally grounded ‘the strong enactionist hypothesis’.

(41) NOCODA (or *C]_σ) ‘Syllables are open.’

The constraint in (41) can be said to be functionally grounded in the perceptual system, as coda consonants, which are unreleased, tend to lack the perceptual cues present in onset consonants (Ohala 1990, Steriade 1995c). NOCODA contributes to the understanding of an important typological universal on syllable inventories, namely the fact that open (CV) syllables are allowed in all languages, whereas closed (CVC) syllables are allowed only in a subset of the languages of the world. Moreover, assuming a constraint like NOCODA contributes to the understanding of processes of syllabification that disfavor closed syllables, even in languages with syllable codas.

In contrast, positing a constraint with a complementary activity (CODA), which requires syllables to be closed, would not only lack empirical adequacy (there are no languages where codas are required in all syllables), but would also fail to meet the grounding conditions of NOCODA. A similar argument can be made for other prosodic markedness constraints like ONSET (Itô 1989, Prince and Smolensky 1993/2004), which requires the presence of syllable onsets.

Functional grounding of markedness constraints in phonology is advocated by Smith’s (2002/2005) theory of augmentation in prominent positions. Smith notes that a number of phonological properties (like resistance to neutralization or prominence enhancement) can be accounted for if we consider markedness constraints that hold for prominent positions (M/str, labeled ‘augmentation

constraints') rather than faithfulness to weak positions (F/wk). One of the key insights in Smith's proposal is that not every logically possible M/str constraint can be assumed to be part of the constraint repository CON. Building on earlier work by Hayes (1999), she proposes a model of CON in which only a subset of imaginable M/str constraints are part of CON, namely those that are functionally (phonetically or psycholinguistically) grounded. This is achieved by imposing constraint filters, an issue which will be addressed in more detail in §4.

In general, many of the individual constraints or constraint families that have been acknowledged in phonological Optimality Theory are functionally grounded. For example, considerations of economy in output expression form the underpinnings of constraints of the *STRUC family (Prince and Smolensky 1993/2004, Zoll 1993, 1996), according to which various (and qualitatively different) amounts of phonological structure (features, segments, syllables etc.) are not allowed in outputs. Economy considerations underlie other markedness constraints as well. Another example in point is provided by LAZY (Kirchner 1997, 1998), which militates for minimization of articulatory effort. Faithfulness constraints associated with phonetically or psycholinguistically privileged positions as instances of functionally grounded constraints are discussed in more detail in §2.1.

In OT syntax, economy is enforced by STAY (Grimshaw 1993, 1997), a constraint that prohibits movement operations. Also, conceptual-pragmatic processing preferences have been claimed to find an expression in negative

markedness constraints of the *STRUC family in syntax, such as *DATIVE, *ACCUSATIVE, *NOMINATIVE or *OBJECT (Aissen 1999/2001, 2003; Woolford 2001).

In this dissertation I propose that the inventory of grounded constraints be enriched by a class of licensing constraints for which the licensors are the morpho-syntactic features of marked members of grammatical categories (defined as in Chapter 2). This brings further evidence to bear on the functional grounding of OT constraints and contributes to accounting for phonological asymmetries between categories on a grammatical markedness hierarchy. I claim that low(er) frequency of morpho-syntactic features correlates with a higher capacity of outputs inflected for those features to license marked phonological structure. This issue is discussed in detail in the following section, where the respective type of licensing constraint is introduced as part of the universal constraint repository CON (Prince and Smolensky 1993/2004) and arguments are put forth for the necessity of considering licensing constraints functionally grounded in usage frequency.

2. Licensing

In Chapter 2 I introduced the notion of grammatical and phonological markedness. I subscribed to the idea that frequency is the most reliable criterion for grammatical markedness⁴⁰, while phonological markedness is best described as

⁴⁰ The frequency of occurrence of forms reflects pragmatic, conceptual and cognitive preferences encoded in language use.

articulatory and structural complexity and capacity to occur in phonological inventories.

Asymmetries between the general behavior of phonological material and the particular behavior of the same in particular contexts describable in terms of language use or performance⁴¹ have been long documented. In particular, it has been shown that positions that are perceptually salient (like word-initial position, released consonants, root-initial syllables, onsets or stressed vowels) are privileged in that they play an important role in terms of psycholinguistic processes (perception, access, retrieval, storage) and resist neutralization to a larger extent than their unprivileged counterparts. For earlier work on the ability of privileged positions to preserve contrasts see Nootboom (1981), Hawkins and Cutler (1988), Ohala (1990), Ohala and Kawasaki (1984) etc.

Manifestations of the asymmetry between privileged and non-privileged positions have been shown to be pervasive in the phonology of individual languages (see Beckman 1997, 1998/1999 for a variety of examples). For instance, in Shona (Beckman 1997, 1998/1999) vowel height is fully contrastive in root-initial syllables, but subject to restrictions in non-initial syllables. Similarly, in a large number of languages, vowel reduction, a process that potentially leads to contrast minimization, does not affect vowels in stressed syllables (Crosswhite 2001). With respect to onsets, Lombardi (1999) argues for faithfulness constraints relativized to those positions in the distribution of laryngeal features across

⁴¹ See Chapter 2 §1.2.2 for a discussion of the concept of performance.

languages. Privileged positions have been also shown to act as triggers of phonological processes such as vowel harmony, place assimilation, laryngeal feature assimilation, and dissimilation (Majors 1998, Beckman 1998/1999 and the references therein, Walker 2001a).

With the advent of Optimality Theory, the asymmetry between privileged and non-privileged positions as a function of their phonetic underpinnings was recognized as a factor encoded in phonological grammars (Steriade 1995c, Flemming 1995, Jun 1995, Kirchner 1996, 1997, Zoll 1996, Beckman 1997, 1998/1999, Lombardi 2001 and many others).

The particular behavior of privileged positions has been implemented as licensing. The concept of licensing in phonology predates Optimality Theory (see, for instance, Itô 1986/1988). Building on the notion of prosodic licensing that requires all segments to be members of higher level prosodic units (syllable constituents, syllables, feet), Goldsmith (1990) defines autosegmental licensing as a property of certain units of description (syllables, codas, word-final morphemes) to license certain autosegmental features.

Within the optimality-theoretic framework, two approaches to licensing have emerged, positional faithfulness and positional markedness. These approaches will be discussed in the following sections.

2.1 Positional faithfulness

Licensing of phonological structure in privileged positions (α) has been claimed to assume the form of specific positional faithfulness by a number of researchers (Alderete 1995/2001, Steriade 1995b, Beckman 1997, 1998/1999, Casali 1997, Lombardi 1999, Walker 2001a etc.). While the specific privileged position α for which positional faithfulness is implemented may differ, advocates of positional faithfulness propose that faithfulness constraints be relativized to privileged positions α , assuming the general form FAITH $_{\alpha}$. Positional faithfulness constraints participate in schemas like the one in (42) below:

(42) Positional Faithfulness schema

FAITH $_{\alpha}$ » M » FAITH

What the Positional Faithfulness schema (42) shows is that faithfulness to input specifications can be over-ridden in the general case by well-formedness requirements enforced by the markedness constraint M, except in the privileged position α . A simple example is due to Zoll (1998), who considers the hypothetical case of a language where identity to a labial place of assimilation is observed only in (privileged) onset position. In (43) the Positional Faithfulness schema is instantiated for $\alpha = \text{onset}$:

(43) Table 10 IDENT[onset seg] » *LABIAL » IDENT[seg]

/pumsa/	IDENT[onset seg]	*LABIAL	IDENT[seg]
a. pum.sa		**!(p,m)	
b. \leftarrow pun.sa		*(p)	*(n)
c. tun.sa	*!(t)		**!(t,n)

When enforced, the Positional Faithfulness schema for the privileged position ‘onset’ predicts that preservation of input specifications for syllable onsets is more imperative than satisfaction of well-formedness conditions and preservation of input specifications for segments in general. The schema in (42) successfully accounts for the faithful parse of the labial onset of the winner (43b.), although in coda position the place specification for an underlying labial can change, as in (43b.) and (43c.).

Although positional faithfulness has been used successfully in accounting for an important number of language facts, its adequacy and applicability have not remained unquestioned (see, for example, Zoll 1998). As an alternative, positional markedness has emerged as a second approach to licensing in privileged positions⁴².

2.2 Positional markedness

The second approach to licensing in prominent positions is represented by Positional Markedness (Itô and Mester 1996, Majors 1998, Zoll 1996, 1998,

⁴² It should be noted, however, that the two kinds of licensing, positional faithfulness and positional markedness, do not necessarily stand in conflict and may be both needed (Walker 2001ab).

Steriade 1997, Ringen and Vago 1998, Crosswhite 2001, de Lacy 2001, 2002, Lombardi 2001, Walker 2001b, 2005, Smith 2002/2005 etc.).

There are three kinds of positional markedness constraints that have been proposed in the literature: (a) constraints that prohibit a certain phonological structure (M) in non-privileged positions (*M/non-privileged, as in Crosswhite 2001), (b) constraints that imply the overlapping or containment of M within privileged position X (Zoll 1998, Walker 2005) and (c) constraints where a privileged position X implies the presence of M in that position (the ‘augmentation constraints’ of Smith 2002/2005).

Assuming a hypothetical privileged position α , positional markedness can be implemented as a markedness constraints relativized to α (M_α). By analogy to Positional Faithfulness, we can define Positional Markedness schemas, shown in a general form in (44):

(44) Positional Markedness Schema

$M_\alpha \gg \text{FAITH} \gg M$

To understand how Positional Markedness works, consider again the hypothetical example discussed in (43). The privileged position is ‘onset’, and the structure against which markedness militates is the labial place of articulation. The category-neutral markedness constraint is *LABIAL and the positional markedness constraint (M_α) is *LABIAL(CODA), violated in outputs that have segments with a

labial place of articulation and in a coda⁴³. Note that *LABIAL(CODA) has the effect of prohibiting labial segments from occurring in the non-privileged position ‘coda’. An analysis along these lines works well for the hypothetical case (43). This is shown in (45):

(45) Table 11 *LABIAL(CODA) » IDENT[seg] » *LABIAL

/pumsa/	*LABIAL(CODA)	IDENT[seg]	*LABIAL
a. pum.sa	*!(m)		** (m, p)
b. ☞ pun.sa		*(n)	*(p)
c. tun.sa		**!(t, n)	

As (45) shows, candidate (45a.) incurs a fatal violation of *LABIAL(CODA), because it has a coda with a labial place of articulation, and loses early in the game. Candidate (45c.) loses due to excessive violations of IDENT[seg]. This allows candidate (45b.), in which the only violation of faithfulness is incurred by the coda of the first syllable, to emerge as the actual output.

It looks like both Positional Faithfulness and Positional Markedness can be used to achieve the same result. Nevertheless, as Zoll (1998) points out, not all instances of phonological asymmetries associated with privileged positions can receive a satisfactory account within a theory that relies on Positional Faithfulness. She shows that Positional Faithfulness is too limited in its scope and is primarily devised to deal with instances of reduction of (underlying) marked structure.

⁴³ As Zoll (1998) points out, this version of Positional Markedness constraint involves constraint conjunction. *LABIAL(CODA) is violated in outputs that simultaneously violate *LABIAL and NoCODA.

Situations in which marked structure arises via addition of phonological material are not predicted by the theory. Positional Faithfulness can also make erroneous predictions, such as the one according to which marked structure resulting from augmentation would be necessarily attracted to non-privileged (or weak) positions (see the arguments in Zoll 1998 as well as the analysis she proposes for Guugu Yimidhurr). A similar position is expressed by Jun (2001), who states the advantages a Positional Markedness analysis has over a Positional Faithfulness one in rounding phenomena in some Altaic languages. The necessity for Positional Markedness is also discussed in Walker (2001b, 2005).

The situation illustrated in (45) above represents an instance of Positional Markedness where a well-formedness condition is imposed on a non-privileged position. It should be noted that there are other formulations of Positional Markedness in which marked phonological structure M is required in a privileged position (α). This is the case of the ‘positive’ Positional Markedness constraints like $\text{COINCIDE}(x,y)$ introduced by Zoll (1996, 1998) or positional augmentation constraints (Smith 2002/2005).

Returning to the MIM effects investigated in this dissertation, they represent instances of phonological asymmetry which manifest themselves between outputs inflected for marked versus unmarked grammatical categories. I claim that a word carrying the morpho-syntactic features of the marked grammatical category in its Morphological Structure represents a kind of ‘privileged position’ akin to the privileged positions described in phonology. To

account for the fact that marked phonological material (M) can occur in those positions I propose a class of positive Positional Markedness constraints LICENSE(M,g) that license M in the relevant outputs, inflected for the marked member g of grammatical category G.

In the literature, positive licensing as a context-specific markedness constraint has been proposed for capturing situations where features or phonological material are affiliated to strong or privileged positions (Zoll 1998, Crosswhite 2000, 2001, Walker 2001b, 2004, 2005). Before I lay out the specifics of my proposal, I discuss the issue of positive licensing in privileged positions in the following section.

3. Positive licensing in privileged positions

If positional faithfulness and markedness are both largely speaking licensing constraints in the respective positions, licensing constraints proper are positional markedness constraints that express positive well-formedness conditions to the effect that marked phonological structures are licit in licensed positions (and/or disallowed in the complementary set of positions). Zoll (1996, 1998) posits a family of positive licensing constraints that she labels COINCIDE(x,y), defined in (46)⁴⁴:

⁴⁴ Without developing a theory of positive licensing, Crosswhite (2001) implements a family of LIC-Q/ β constraints that achieve the realization of the pertinent phonological property Q in the context β .

(46) COINCIDE (x,y)

(i) $\forall x (x = \text{marked structure}) \rightarrow \exists y (y = \text{strong constituent} \wedge \text{Coincide}(x,y))$

(ii) Assess one mark for each value of x for which (i) is false.

For example, if x is a mid vowel (a marked phonological structure) and y, a stressed syllable (a ‘strong’ or privileged position), the constraint COINCIDE(MidV, σ) is violated whenever mid vowels are not in stressed syllables, and satisfied in all situations in which mid vowels appear in stressed syllables. The interest of COINCIDE constraints for a theory of the relation between grammatical and phonological markedness lies in the fact that, apart from expressing licensing conditions, the constraints encapsulate a domain membership, rather than an identity relation (x is contained in the domain defined by y). Finally, it should be noted (following Zoll 1998) that the licensing constraints typified in (46) involve constraint conjunction (Smolensky 1995).

A development of Zoll’s positive licensing mechanism is provided by Walker (2001b, 2004, 2005). In her formulation of licensing, Walker proposes a family of LIC(F, S-Pos) constraints that demand the association of particular feature specifications (F) with perceptually strong positions (S-Pos). The formal definition of LIC(F, S-Pos) is given below:

(47) LIC(F, S-Pos)

- Let
- i. f be an occurrence of feature specification [F] in an output O
 - ii. s be an occurrence of strong position S in O
 - iii. and $s\delta f$ mean that s dominates f
- Then $(\forall f)(\exists s)[s\delta f]$

In (47iii.), the domination relation δ between s and f need not be immediate. For example, a phonological feature like [high] can be licensed by a stressed syllable, although in a prosodic hierarchical representation [high] is not directly dominated by the syllable.

Building on the above work on positive licensing by Zoll (1996, 1997, 1998) and Walker (2001b, 2004, 2005), I propose a family of constraints that license marked phonological structure M in the marked grammatical category g (LICENSE(M,g)⁴⁵. The proposal is presented in §4.

⁴⁵ The licensing constraint LICENSE(M,g) could be formulated as follows, by analogy with the work of Walker (2001b, 2004, 2005):

- Let
- i. m be an occurrence of phonological structure M in an output O
 - ii. γ be an occurrence of the morpho-syntactic feature(s) for a value g of a grammatical category G
 - iii. and $m\mathfrak{A}\gamma$ mean that m is associated with γ
- Then $(\forall m)(\exists \gamma)[m\mathfrak{A}\gamma]$

Conditions on M and g as well as the precise nature of the ‘association’ relation (\mathfrak{A}) holding between m and γ are discussed in §4.

4. Licensing of marked phonological structure in marked categories

The Marked in the Marked (MIM) generalization introduced in Chapter 2 associates marked phonological material (M) with a marked member (g) of an inflectional category (G). In licensing terms, this is tantamount to saying that M in Phonological Structure is licensed by the presence of the morpho-syntactic features of g in the Morphological Structure of outputs. The consequence of such a move is the fact that the universal constraint set CON contains licensing constraints LICENSE(M,g). Given the way positive licensing is conceived of in the literature (§3 above), the pertinent question at this point is to what extent such a move is theoretically justified.

The issue that needs to be addressed is that not any constituent or category can act as a licenser. Specifically, we have seen that licensors of marked phonological structure M should qualify as privileged positions, which are phonetically or psycholinguistically strong (or prominent). The properties of such positions are grounded in language use. Such factors have to do with production, perception, retrieval etc. and help to determine which structures serve as licensors of phonological structure.

I propose that the array of factors capable of determining the licensors of phonological structure be enriched so as to include frequency of occurrence of linguistic expressions. As shown in Chapter 2, if g_1 and g_2 are members of the grammatical category G such that $g_2 > g_1$ on the grammatical markedness hierarchy (g_2 is grammatically more marked than g_1), the relation between their

frequency of occurrence (φ) is $\varphi(g_1) > \varphi(g_2)$. The lower frequency $\varphi(g_2)$ pinpoints member g_2 of grammatical category G as a potential licenser of marked phonological structure M . The marked phonological structure (M) is therefore licensed in output forms that carry the morpho-syntactic specifications for g_2 . It should be emphasized that not any category g_2 licenses every marked M , rather a constraint particular or language particular pairing occurs.

A terminological clarification is in place at this point. The fact that inflected outputs ‘carry’ or ‘are associated with’ the morpho-syntactic specification for a grammatical category G should be understood as the presence of the functional node (and syntactic projection) for that category in the Morphological Structure of that output (see Chapter 5 §1.2.2 for more on the notion ‘Morphological Structure’). For example, if an output O carries the morpho-syntactic specification ‘Plural’, there is a Number projection in the Morphological Structure of that output and the head of that projection has the ‘plural’ syntactic feature. The syntactic feature percolates and lends the whole output the plurality property from a morpho-syntactic and semantic perspective⁴⁶. This gives us an answer to the question ‘what counts as a grammatical category?’ A grammatical category represents a set of syntactic features that express meanings from the same conceptual domain (Bybee 1985, Crystal 1985, Hopper 1992). The fact that an output word is inflected for a particular category is represented by the presence of the morpho-syntactic features on the head of the

⁴⁶ See Chapter 5 §1.2.2 for more details and an illustration of Phonological Structure (PS), Morphological Structure (MS) and phonological exponence.

relevant syntactic projection in the Morphological Structure of the output. The working definition for ‘grammatical category’ can be easily applied for categories which have a precise semantic content, like Number, Gender, Tense etc.

In other situations, as for instance the category of Case, the definition of grammatical categories has to take into account more abstract conceptual and formal relations. According to Blake (2001), Case is a category which marks dependent nominals in relation to their heads (verbs, adjectives, prepositions). Once the category defined in this relational fashion, its individual members (Nominative, Accusative, Genitive etc.) can have more or less unitary semantic properties.

Determining the exact inventory of categories and syntactic projections is sometimes an empirical matter and it can sometimes be the case that syncretism phenomena exist. In Old Saxon⁴⁷, for instance, the Nominative and Accusative on the one hand and the Dative and the Instrumental on the other hand pattern together to a large extent with respect to their morpho-syntactic behavior. The Nominative and Accusative are both ‘structural cases’, generally not associated with particular thematic roles in their semantic behavior. Syntactically, they meet similar requirements for case assignment on inflected nominals. Similarly, the Dative and Instrumental pattern together – they are ‘lexical cases’ associated with specific thematic roles and are require similar case assignment configurations. This parallel behavior underlies the traditional grouping into two case forms, ‘Direct’

⁴⁷ The Old Saxon data are discussed in Chapter 4, where inflectional paradigms are presented.

(Nominative-Accusative) and ‘Oblique’ (Dative-Instrumental). Without going into details of case assignment mechanisms, the similar behavior of the Nominative and Accusative allows us to assume the presence of a unified morpho-syntactic feature ‘direct’ in the Morphological Structure of words inflected for these two cases, and, by analogy, of a morpho-syntactic feature ‘oblique’ for the Dative and Instrumental. In conclusion, lumping together the Nominative and Accusative and the Dative and Instrumental, respectively, is not simply an assumption made purely for expository convenience, but a consequence of the properties of these cases⁴⁸.

Also, it is often the case that an output is inflected for two or several morpho-syntactic categories at the same time. The fact that in Morphological Structure morpho-syntactic categories have separate projections (and heads) allows for their individual treatment. For instance, one can compare nominal outputs simultaneously inflected for Case and Number by keeping one dimension constant and looking into the other dimension of morphological variation.

To return to the issue of licensing, for a member g of a given grammatical category G that occurs with frequency φ , the licensing constraint for a given marked structure M is $\text{LICENSE}(M,g)$, defined informally in (48):

⁴⁸ As we shall see (Chapter 4 §4.2.1), the grouping of cases in Old Saxon on the basis of the criteria shown here is not only possible and motivated, but also necessary in order to make the licensing analysis work.

(48) LICENSE(M,g) ‘The phonological structure M is licensed in the
grammatical category g.’

The licensing constraint (48) is subject to the condition that g is the (relatively) grammatically marked member of grammatical category G. To illustrate the proposal on a simple case, if category G is ‘number’ and its members (g_i), Singular and Plural, LICENSE(M,g) assumes the form LICENSE(M, PLURAL), as the Plural is more marked grammatically (and less frequent) than the Singular.

Let us turn to the formal statement of the licensing constraint (48). This definition is given along the lines of Walker (2001b, 2004, 2005) and has already been previewed in its essential lines in footnote 45 above. Recall that in that definition there was an ‘association’ relation (\mathfrak{R}) holding between an occurrence (m) of a phonological structure (M) and an occurrence (γ) of the morpho-syntactic features of a member (g) of a grammatical category (G). The definition in footnote 45 left the association relation unexplained. Also, we still have to clarify the status of M and g. All these issues are discussed in the remainder of this section, in relation with the formal definition proposed for LICENSE(M,g) in (49):

(49) LICENSE(M,g)

Let

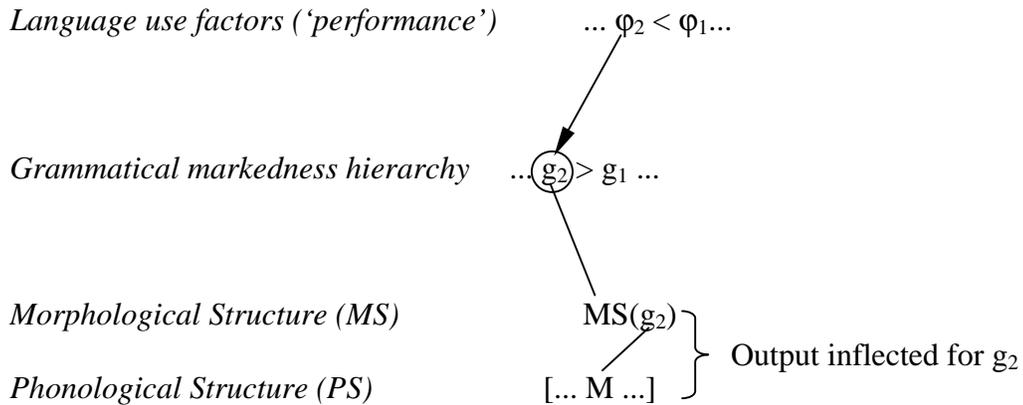
- i. m be an occurrence of phonological structure M in an output O
- ii. γ be an occurrence of the morpho-syntactic feature(s) for a value g of a grammatical category G

Then m in the Phonological Structure (PS) of an output O implies γ in the Morphological Structure (MS) of same output O.

The licensing constraint in (49) is subject to filter conditions such that M is a marked phonological structure and g a marked member of a grammatical category G (for example, in a two-way Singular-Plural Number system, g is Plural). As regards the relation between m and γ (so far vaguely referred to as ‘association’ (\mathfrak{R}) in footnote 45), it is one of material implication. This can be seen from the evaluation of the licensing constraint, which is violated only for instances (m) of the marked phonological material M in the Phonological Structure of an outputs (O) which are not inflected for the marked grammatical member g of G in their Morphological Structure. The filter conditions and the implication are discussed later in this chapter.

To sum up the discussion so far, consider the schematic illustration in (50) below, repeated from Chapter 1:

(50) Figure 4 Licensing of marked phonological material in the marked category



The top tier of schema (50) relates a factor of language use (frequency of occurrence (ϕ)) and the grammatical markedness hierarchy. For a given grammatical category G , the frequency of occurrence of inflected outputs determines the place of the members (g_1 and g_2) of a morpho-syntactic category G on the grammatical markedness hierarchy. The bottom part of the schema represents the licensing of marked phonological structure (M) in output words that are inflected for the marked grammatical category (g_2). The Morphological Structure ($MS(g_2)$) of those words contains the morpho-syntactic node that carries the specifications for g_2 . If we consider the Phonological Structure (PS) of an output inflected for G , a marked phonological structure within PS is said to be licensed by the marked member g_2 of G if the Morphological Structure (MS) of that word has the morpho-syntactic specifications for g_2 ($MS(g_2)$)⁴⁹. As already mentioned, the formal licensing relation that exists between the occurrence m of

⁴⁹ $MS(g_2)$ is a shorthand notation for the presence of a syntactic node carrying the features of g_2 (the marked category) in the Morphological Structure of the output.

the marked phonological structure M in an output and the occurrence (γ) of the features of the marked grammatical category is one of material implication in the sense that ‘ m implies γ ’⁵⁰. In other words, the presence of an instance m of marked phonological structure M in Phonological Structure implies the presence of the morpho-syntactic features for the marked grammatical category g in Morphological Structure, a relation symbolized as ‘ $M \supset g$ ’.

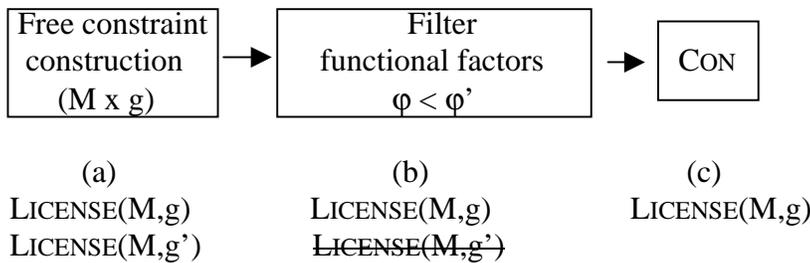
Let us return to the issue of filters on possible licensing constraints. As shown in (50), a functional factor (frequency of use) determines the grammatical category whose morpho-syntactic features can license the presence of marked phonological structure in inflected outputs. The essential remark here is that not any member of a given grammatical category (G) can, via its morpho-syntactic features, license marked phonological material (M) in outputs inflected for that category. In fact, the constraint $LICENSE(M,g)$ is defined only if M is a kind of marked phonological structure and g , a marked member of G (for simplicity, if g_1 and g_2 are members of G such that g_2 is more marked than g_1 , the licensing constraint is defined for g_2). This raises the issue of imposing limitations or filters in the range of potential constraints that can be contained in the constraint repository CON which is part of the architecture of Optimality Theory.

⁵⁰ For consistency of exposition, G represents a grammatical category. If G has n particular values or members, individual members are represented as g_i ($i = 1, 2, \dots, n$). For example, if G is the category of Gender in a three-way Gender system (Masculine, Feminine, Neuter), its members are symbolized as g_1, g_2 and g_3 ($i = 1, 2, 3$). When used without a subscript, g is a marked member of G . γ is the particular occurrence of the morpho-syntactic features of a member of G . m is an occurrence of marked phonological structure M in an output O .

In this dissertation I propose a filter on licensing constraints $LICENSE(M,g)$ which represents an application of the Schema/Filter Model of CON proposed by Smith (2002/2005). Smith discusses the issue of filters on constraints in relation to her ‘augmentation’ constraints (M/str). M/str constraints are markedness constraints that make specific reference to strong positions. According to Smith, not all logically possible augmentation constraints in strong positions (M/str) are part of CON. For example, M/str markedness constraints exist only if the markedness constraints (M) from which they are constructed refer to perceptually prominent properties. As an illustration, a constraint like $ONSET/\sigma_1$, which requires that initial syllables have onsets, is a legitimate M/str constraint in CON because the ONSET markedness constraint from which it is constructed enforces the presence of an onset, which is perceptually prominent. In contrast, following the same logic, a constraint like $*MIDV/\acute{\sigma}$, which bans mid vowels in stressed syllables, is not part of CON, due to the fact that mid vowels are not perceptually prominent. In Smith’s model, illicit M/str constraints (M/str constraints for which M does not refer to a perceptually prominent property) are not allowed to be part of the constraint inventory due to the activity of substantive filters that block them.

The model proposed in this thesis applies the filter mechanism to $LICENSE(M,g)$ constraints such that only those licensing constraints are allowed in CON for which g is a marked member of a grammatical category G. The filter mechanism is shown in (51), which represents an application of Smith’s Schema/Filter Model of CON:

(51) Figure 5 The Schema/Filter Model of CON applied to licensing



In the schematic illustration in (51), box (a) represents the potential range of licensing constraints for marked phonological structure (M) for two members of grammatical category G, a marked member (g) and an unmarked one (g'). The range of potential licensing constraints is subject to a filter (box (b)) represented by a functional factor such as frequency of occurrence (ϕ). The filter eliminates the licensing constraint defined for g', whose frequency of occurrence is higher than that of g⁵¹. As the outcome of the activity of the filter, only the licensing constraint LICENSE(M,g) emerges as part of CON (box (c)).

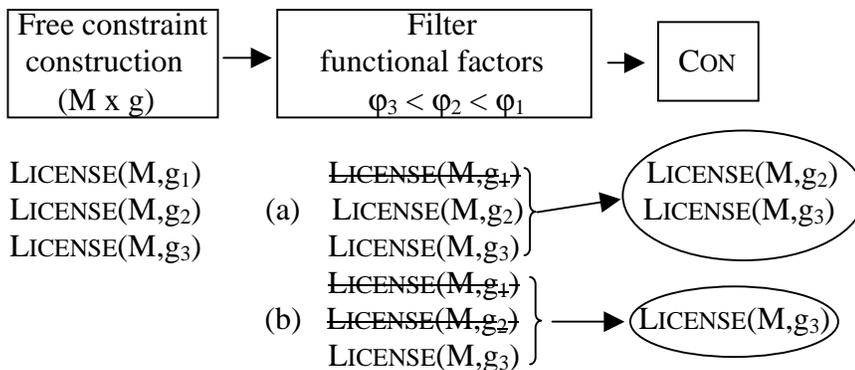
(51) represents the application of the filter on licensing constraints in the case of a category G with two members, g and g', of which g is the marked one. A legitimate question surrounding the constraint filter is how it can deal with grammatical categories consisting of more than two members. Let us examine a more complex situation represented by a three-way grammatical category G

⁵¹ Recall that according to the frequency criterion for grammatical markedness, lower frequency of occurrence determines the marked character of g as compared to g'.

represented by members g_1 , g_2 and g_3 such that $g_1 < g_2 < g_3$ with respect to grammatical markedness.

In such a case, it is in principle possible to make two cuts along the grammatical markedness dimension, one between g_3 and g_2 and one between g_2 and g_1 . This leaves us with two possibilities of filtering out licensing constraints. First, it is possible that the filter rules out the licensing constraint for the least marked category (g_1), but allows the licensing constraints for the more marked members (g_2 and g_3) to be part of CON. Second, it is possible that both licensing constraints for g_1 and g_2 are excluded from CON, and only the top-ranked g_3 is allowed to have a licensing constraint. These two situations are presented in (52):

(52) Figure 6 Schema/Filter Model variants for a three-way category



If the activity of the filter is the one in (52a.), CON will contain both $LICENSE(M, g_2)$ and $LICENSE(M, g_3)$ (and not $LICENSE(M, g_1)$), but if the filter has the activity in (52b.), only $LICENSE(M, g_3)$ will be part of CON. The two versions of the filter lead to different predictions. Indeed, if the filter assumes the shape in

(52a.), marked phonological structure M may occur only in the Phonological Structure of g_2 and g_3 and not in g_1 , or in all of them, or in none of the categories⁵². If the activity of the filter is as in (52b.), M will occur only in g_3 , or in all categories or in none of them. The case studies discussed in this dissertation do not allow us to determine which of the two scenarios of the filter is the correct one, so this issue is left for further research. There is also the possibility, illustrated in Chapter 4, to group together values of a grammatical category, thus reducing the inventory of possible licensing constraints, and then define licensing constraints for the newly defined ‘lumped up’ categories. It is to be noted, however, that no matter which version of the filter we adopt, no situations are predicted in which marked phonological structure M is licensed in the least marked member (g_1) of G, but not in g_2 or g_3 . As we shall see, this is consistent with the factorial typology discussed on cases with two-member categories.

In sum, the functional factor represented by frequency of occurrence of inflected forms plays the role of a substantive filter on licensing constraints by allowing only those LICENSE(M,g) constraints to be part of CON for which g is a marked (and less frequent in usage) member of grammatical category G.

Furthermore, there are at least two important similarities between the MIM phenomena investigated in this dissertation and the augmentation in prominent positions discussed by Smith. In both cases the influence of functional factors on phonological grammars is indirect and manifests itself as a force that affects the

⁵² See §5.2 for the factorial typology of the MIM schema.

inventory of actual constraints rather than, say, the ranking of constraints on a hierarchy. Also, both models inevitably have to deal with the issue of gradient functional forces that have categorical effects in the phonology. For instance, in the case of augmentation in prominent positions, the initial syllable is phonologically ‘stronger’ in categorical terms than the rest of the word, although with respect to the functional, psycholinguistic aspect, strength can be said to decrease gradually as one moves farther away in the word. A similar situation is encountered with MIM effects, where a gradient parameter like frequency of occurrence has a categorical effect on the phonological grammar. Such facts justify the application of the Schema/Filter to MIM phenomena. Also, they call for an investigation of how MIM effects emerge in natural languages and how exactly phonological grammars can be shaped by functional factors like frequency of occurrence. These issues have been dealt with in §5 of Chapter 2.

What is the ontological status of the substantive constraint filters on licensing constraints discussed above? In particular, it is worth asking whether they are part of Universal Grammar and how they are acquired. These questions are part of a broader research agenda, which has to do with the status of constraint schemas and their constraint construction, and will be left open at this point. It should be noted, however, that grammatical markedness hierarchies are in all likelihood learned (see Dressler et al. 2002, Dressler 2003) rather than innate. It may well be the case that the constraint filters are also ‘learned’ in the sense that their outcome is a CON where only licensing constraints are allowed for higher-

ranked categories on the grammatical markedness hierarchy. Smith (2002/2005) favors an answer along similar lines (schemas, arguments and filters being acquired rather than innate) for her account of augmentation in prominent positions.

It should also be noted that as regards the relation between grammatical markedness and frequency (φ), categories g_i on a grammatical markedness hierarchy are members of the same morpho-syntactic category. This means that cross-category markedness relations (like Case-Number or Tense-Voice) are not considered in this thesis. For example, no claims are made, based on relative frequency, that a verbal category is more marked than a nominal category, although the agenda for future research is open to exploring such relations.

Returning to definition (49), what it stipulates is a material implication of the type $M \supset g$. That is, the constraint is satisfied only when the marked phonological structure m occurs in the grammatical category g that is the marked member of G . The material implication relation which holds between M and g is not one of direct or indirect domination (as in Walker 2001b, 2004, 2005), but rather one of property assignment in the sense that the presence of M in the Phonological Structure of an output O entails that O carries in its Morphological Structure the morpho-syntactic features for the marked member g of category G . It should also be emphasized that the output O is a word constituent, rather than a phrase or inflectional morpheme; marked phonological structure need not be associated with a particular affix. A good example for this property is the case of

marked metrical structure. For instance, in Old Saxon (Chapter 4), phonologically marked uneven trochees (HL) are licensed in words inflected for the marked Oblique case. Although one may assume that morpho-syntactic features percolate from the syntactic head to the word, it is the whole inflected output word that ends up carrying the morpho-syntactic feature 'oblique' in MS that licenses the marked metrical structure (HL) in PS.

In the definition of licensing of marked structure in the marked category, the material implication is asymmetric (if 'm implies γ ' is true, the reverse, ' γ implies m', is not necessarily so). What (49) requires is not that all outputs inflected for g (i.e. outputs that have instances γ of the features for g in their Morphological Structure) contain instances m of phonological structure M, but that all instances of M be part of the Phonological Structure of outputs inflected for g in their Morphological Structure.

LICENSE(M,g) is satisfied whenever particular instances m of M occur in outputs carrying the morpho-syntactic features of the marked member g of G in their MS, and violated if m occurs in an output inflected for some other member of G that is less marked than g (and more frequent in usage) or it occurs in an output not inflected for G or in an uninflected output. Also, the statement of morphological exponence in relation with the percolation of morpho-syntactic features from syntactic heads to the word level has consequences for the way the licensing constraint is evaluated, specifically, for the domain within which the evaluation is done.

To see in more detail how these aspects play out in the assessment of LICENSE(M,g), consider the Plural Definite of certain Italian nouns that start in a vowel (Saltarelli and Calvano 1979). The feminine Italian Definite determiner has the form *la* in the Singular, and when attached to a vowel-initial noun the final vocalic segment of the determiner is deleted, in avoidance of hiatus (53a.). In the Plural, the determiner is *le*, but its final vowel is retained (53b.):

(53)

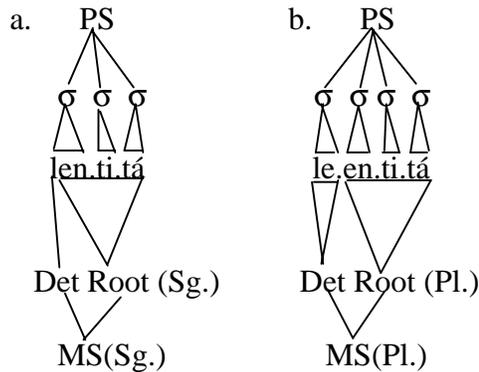
a. /la_{Def.+entita}/ → [len.ti.tá]_{Sg. Def.} ‘the entity’

b. /le_{Def.+entita}/ → [le.en.ti.tá]_{Pl. Def.} ‘the entities’

Setting aside the fact that the Plural of such nouns is expressed only in the determiner, we can note that in both situations the determiner and the noun form a word. The relevant marked grammatical category (g) is ‘Plural’ and the marked phonological structure (M) is ‘hiatus’⁵³. If we examine the Phonological and Morphological Structure of the Singular and Plural definite output forms in (53), it can be seen that the Phonological Structure (PS) of the Plural word contains a sequence of two vowels (VV), while hiatus is resolved in the Singular by deleting the determiner vowel from PS. The relevant representations of Phonological Structure (PS) and Morphological Structure (MS) of the two output words representing the definites in (53) are shown below:

⁵³ For ample discussion of hiatus as a marked structure and means of resolving hiatus see Casali (1997, 1998) and the references therein.

(54) Figure 7 Morphological and Phonological Structure of Italian definite outputs



The relevant licensing constraint is LICENSE(VV, PLURAL). An examination of the representations in (54) shows that the Plural word (54b.) satisfies the licensing constraint due to the fact that the marked phonological configuration (hiatus) in PS entails the presence of the morpho-syntactic feature ‘plural’ of the marked grammatical category in the MS of the output word. Had hiatus been present in the PS of an output with the unmarked ‘singular’ features in MS, the constraint would have been violated.

So far we have seen the relevance of Phonological Structure (PS) in the definition and evaluation of LICENSE(M,g). However, we still need to define more precisely the phonological domain for which the PS in question is relevant. Failure to circumscribe PS to a well-defined domain would predict that marked phonological structure (M) may occur as licensed by morpho-syntactic features in MS which are not relevant. For example, if PS is understood, respectively, as a

phonological/intonational utterance, phonological phrase or clitic group etc.⁵⁴, the hiatus structure discussed above would potentially be licensed anywhere within the domain, even in for segments with no affiliation to the Plural, leading to odd typological predictions. This is why a restriction is necessary on PS. I propose that for the purpose of the phenomena discussed in this dissertation PS be defined as the smallest prosodic unit (including segments as prosodic units) which contains all of the surface segments whose underlying correspondents belong to the smallest morpho-syntactic unit properly containing some morpho-syntactic marker⁵⁵. As an application of the definition to the Italian case considered above, the smallest morpho-syntactic unit containing the ‘plural’ morpho-syntactic specification is /le+Plural/, but the smallest morpho-syntactic unit properly containing it is the DP (consisting by a determiner followed by an NP). The identification of the domain is straightforward: in the underlying representation, it is composed of all the segments belonging to the DP; in surface, it consists of all the correspondents of those segments. Now in the prosodic structure of the output, the minimal unit containing all the segments is the prosodic word (PrWd), so we can say that in Italian Plurals hiatus is licensed in the PrWd. This is a general procedure which works in other cases as well, as we shall see below.

To take a further example of licensing constraint evaluation, consider the hypothetical case of a language where the category of Number has two values,

⁵⁴ See Nespor and Vogel (1986) for categories in Prosodic Phonology.

⁵⁵ In this thesis the relevant unit considered is the segment. It should be noted, however, that sometimes it may be necessary case to consider sub-segmental units, as the case is for the autosegment approach to Italian and Romance Plural formation briefly discussed in Chapter 5 §3.

Singular and Plural, and palatalized consonants C^j (cross-linguistically, a type of marked phonological structure) are attested only in the grammatically marked Plural⁵⁶. The distribution of plain and palatalized consonants is shown in (55):

(55) Table 12 Plain and palatalized consonants in Romanian Number

	<i>Singular</i>	<i>Plural</i>
C^j	No	Yes
C	Yes	Yes

The instantiation of the licensing constraint in the case under examination is LICENSE(C^j , PLURAL). The constraint is violated by output forms containing palatalized consonants that carry the morpho-syntactic feature ‘singular’ (C^j /SINGULAR). Outputs that contain only the unmarked phonological structure represented by plain consonants (C) do not fall under the scope of licensing. The evaluation of outputs on LICENSE(C^j , PLURAL) is given in (56):

(56) Table 13 Assessment of LICENSE(C^j , PLURAL)

	LICENSE(C^j , PLURAL)
C^j /SG.	*
C^j /PL.	✓
C/SG.	N/A
C/PL.	N/A

⁵⁶ The hypothetical example represents a simplification, for expositional purposes, of the situation encountered in Standard Romanian, where the distribution of plain and palatalized consonants in Singulars and Plurals is essentially the one considered here. A detailed analysis of the Romanian data is provided in Chapter 5.

Returning to the locality issue in the assessment of LICENSE(M,g) already discussed for Italian, we note that this time the smallest morpho-syntactic unit properly containing the ‘plural’ specification is the NP (or, if Number projections are considered, NumP, as in Chapter 5, (100)). As for Phonological Structure, the smallest unit containing all the segments affiliated to the NP is again the prosodic word.

The assessment in (56) shows the benefit of using LICENSE(M,g) in instances of marked phonological structure occurring in a grammatically marked category. While prohibiting marked structure (C^j) outside the marked category, the constraint does not penalize the presence of unmarked material (C) in that category, which is a desirable result both empirically and theoretically. Indeed, if the directionality of the material implication relation in definition (49) were ‘ γ implies m’, this would mean that LICENSE(M,g) is violated by outputs containing unmarked phonological material in the marked category, which is, in point of phonological typology, an odd result. In this regard, a short comparison with the FIAT-STRUC constraint family proposed by MacBride (2004) suggests itself.

Working within an output-oriented version of Optimality Theory where morphological generalizations are encoded by constraints (along the lines of Russell (1999))⁵⁷, MacBride introduces a SYN:PHON schema, according to which an output with syntactic property SYN displays the phonological property PHON. For instance, in a language where the Past Tense is the vocalic suffix *-i*, the

⁵⁷ Hammond (1995) makes a similar proposal by questioning the relevance of the input level in Optimality Theory.

relevant FIAT-STRUC constraint is PAST:]_{stem}i and demands that all Past Tense forms consist of a stem plus the suffix *-i*. It appears that the SYN:PHON schema not only leads to an considerable proliferation of parochial constraints but is also less well equipped to deal with phonological asymmetries related to grammatical marking. Setting aside the theoretical implications of OT models where the burden of expressing morphological constituents is placed exclusively on constraints and the role of lexical representations is reduced to a minimum, the SYN:PHON schema can at best instantiate the ‘ γ implies m’ relation and require the presence of a particular phonological structure in a grammatical category, a requirement that is not empirically supported. The licensing schema adopted in this dissertation does not demand that the marked phonological structure be present in the marked grammatical category, which would be too strong a statement. It allows for the presence of both marked and unmarked phonological structure in that category while forbidding marked phonological structure in the unmarked category, a result to which the language cases examined in Chapters 4-6 lend empirical support.

In this section I introduced a positive licensing constraint LICENSE(M,g) for marked phonological structure in grammatically marked categories as an essential ingredient of the Marked in the Marked (MIM) generalization. In the remainder of the chapter I will present the MIM constraint schema and the associated factorial typology.

5. The Marked in the Marked Schema

5.1 The emergence of the Marked in the Marked Schema

To see how the phonological asymmetry emerges between categories different with respect to their grammatical markedness status, let us discuss the interaction of LICENSE(M,g) with (context-free) faithfulness and markedness.

Several logical possibilities suggest themselves. First, undominated LICENSE(M,g) precludes the occurrence of marked phonological material M in the unmarked category⁵⁸. For example, let us imagine a scenario where M is attested only in the grammatically marked category Plural, and banned in every other category that is not Plural (in particular in the unmarked Singular or in items not inflected for Number), where only unmarked phonological structure occurs. The Plural-Singular asymmetry manifests itself in that the former category can contain both marked (M) and unmarked material, whereas the Singular does not contain M.

In terms of constraints, this result is achieved by the constraint hierarchy in (57), which I label Marked in the Marked (MIM) Schema:

(57) The Marked in the Marked Schema

LICENSE(M,g) » FAITH » *M

⁵⁸ Undominated licensing is a necessary but not sufficient condition for the MIM effect. If context-free markedness dominates faithfulness, the outcome is lack of variation (§5.2)

According to (57), M cannot occur outside g (Plural), but there may be instances of outputs inflected for G that sponsor unmarked material. This does not preclude the existence of unmarked phonological structure in g, for instance due to the presence of such structure in the input.

The activity of the MIM Schema will be exemplified by the case studies in Chapters 4-6. For practical purposes, the types of marked phonological structure M are classified into metrical (foot structure, 58a.), segmental (segment makeup and complexity, 58b.) and phonotactic (segment sequences, 58c.) as follows:

(58) Table 14 Applications of the MIM Schema

<i>Marked structure (M)</i>	<i>Marked category (g)</i>	<i>LICENSE(M,g)</i>	<i>Language</i>
a. <u>Metrical</u> Uneven trochee (HL) ⁵⁹	Case: Obl. (> Dir.)	LIC(HL, OBL.)	Old Saxon
b. <u>Segmental</u> Consonant with secondary articulation (C ^{SEC.})	Number: Pl. (> Sg.)	LIC(C ^{SEC.} , PL.)	Romanian
c. <u>Phonotactic</u> Intervocalic stop (VTV)	Voice: Pass. (> Act.)	LIC(VTV,PASS.)	Mayak

The classification of marked structure into metrical (58a.), segmental (58b.) and phonotactic (58c.) does not have an independent theoretical status and represents an expositional means of illustrating the applications of the MIM Schema at various levels of representation. As we discuss the individual cases, we will see that the MIM schema is part of the grammar of the respective languages

⁵⁹ The abbreviations in Table (58) are as follows: H = heavy syllable, L = light syllable, Obl. = Oblique case, Dir. = Direct case, Sg. = Singular, Pl. = plural, Act. = Active voice, Pass. = Passive voice. Marked members of grammatical categories are given in bold type.

and interacts with other OT constraints. Considerable complexity may arise when the schema interacts with phonotactic requirements (as in Romanian, Chapter 5) or allophonic variation (as in Mayak, Chapter 6), but the picture is essentially the same, marked in the marked phenomena.

Before we spell out the factorial typology associated with the MIM schema and the typological predictions it makes, it is worth considering an alternative approach to MIM phenomena. If for the grammatical category G the marked phonological pattern M occurs only in the Phonological Structure of outputs inflected for the marked member g_2 of G and not in outputs inflected for the unmarked member g_1 ($g_2 > g_1$ in point of grammatical markedness and $\varphi_1 > \varphi_2$ in point of frequency), one could entertain the solution of replacing LICENSE (M, g) by (negative) markedness constraints of the type $*M/g_1$ ⁶⁰. For ease of exposition, consider the case where G is the category of Number and g_1 and g_2 are Singular and Plural, respectively. The relevant $*M/g_1$ constraint is $*M/Sg.$ and is violated for each occurrence of M in the Phonological Structure of outputs inflected for the Singular. The main advantage of such an approach, which is essentially along the lines of Smith (2004b), would rest in the fact that contextual markedness constraints can be constructed in a straightforward fashion from instances of $*M$

⁶⁰ Thanks to Elliott Moreton for bringing this line of analysis to my attention.

and there is no need to demonstrate the markedness of the phonological structure involved⁶¹.

If undominated, *M/Sg. (in interaction with faithfulness and category-neutral *M) leads to grammars in which M is prohibited in the (unmarked) Singular, but allowed in the (marked) Plural and also possibly in other grammatical categories or in uninflected words⁶². Also, the alternative approach in question would still require a filter mechanism that legitimizes only *M/Sg. (and not *M/Pl.) as part of CON.

Finally, as already noted, the *M/g approach potentially predicts situations where M is prohibited in the unmarked member of G, but allowed in the marked one and also possibly in other grammatical categories or in uninflected words, for example, languages in which M is not allowed in the Singular, but allowed in the Plural and, say, in adverbs or uninflected adjectives. The positive licensing approach proposed in this dissertation is more constrained in the sense that it predicts languages where M occurs in the marked member of G, but not in the unmarked member of G or, say, uninflected forms. Such are the cases discussed in Chapters 4-6 as illustrations of MIM phenomena. This is not to say that cases like the ones which can be predicted by the *M/g model do not exist, but rather that there is no data at this point to document them. What needs to be emphasized is the

⁶¹ However, recall that in OT structure M counts as marked if it can be shown that there exists a markedness constraint against it, so the relativized markedness approach hinted at here would still require a demonstration of the adequacy of the *M constraints employed.

⁶² See §5.2 for detailed discussion of the factorial typology associated with MIM effects.

fact that the two approaches make slightly different predictions as to the occurrence of marked phonological material M in (un)inflected outputs.

Having discussed the formulation of the licensing constraints and the MIM schema, we can now turn to the predictions that follow from the factorial typology associated with it.

5.2 Factorial typology

The benefits of an optimality-theoretic approach to marked in the marked phenomena become apparent visible if we consider the factorial typology associated with the MIM Schema, which is a particular constraint configuration, not a fixed ranking. The three constraints that are part of the MIM Schema give rise to a factorial typology. The logically possible situations are presented below.

First, there is full contrast⁶³ (marked structure M can occur both inside and outside marked category g, as long as it is underlying). Full contrast is seen in grammars where general faithfulness dominates both licensing and context-free markedness (*M):

(59) Full contrast

FAITH » *M, LICENSE(M,g)

⁶³ For the concepts of full contrast and lack of variation, see Kager (1999, to appear).

A second possibility is represented by lack of variation, a situation in which marked structure *M* never occurs in a language, irrespective of the grammatical category for whose morpho-syntactic features outputs specified in Morphological Structure. Lack of variation ensues when context-free markedness (**M*) dominates faithfulness (**M* » FAITH). Lack of variation patterns emerge by freely ranking LICENSE(*M,g*) within the **M* » FAITH hierarchy:

(60) Lack of variation

(LICENSE(*M,g*)) » **M* » (LICENSE(*M,g*)) » FAITH » (LICENSE(*M,g*))

If context-free markedness (**M*) is ranked over FAITH as in the constraint hierarchy (60), the occurrence of marked phonological structure (*M*) is banned across the board, regardless of grammatical category. Undominated LICENSE(*M,g*) has the effect that *M* is excluded from the unmarked category, but the fact that **M* dominates general faithfulness will not allow *M* to surface in other situations either.

A third conceivable situation is represented by the MIM Schema proper, repeated in (61):

(61) The Marked in the Marked Schema

LICENSE(*M,g*) » FAITH » **M*

To summarize, the MIM Schema and the associated factorial typology make the right predictions regarding the range of phonological structures that occur, under relatively similar conditions, in grammatical categories on a markedness scale. The following range of phenomena is predicted:

(62) Patterns predicted by the factorial typology of the MIM schema

- (a) Marked in the Marked (M in g, but not in the unmarked category)
- (b) Full contrast (M both inside and outside g)
- (c) Lack of variation (M prohibited, irrespective of category)

What we do not see are situations where marked structure M occurs solely in the unmarked counterpart of g. For example, we do not expect, under general similarity of phonological factors, to see a language where the Singular can sponsor marked material M that the Plural does not. It is at this point that the benefit of assuming Optimality Theory as the theoretical framework for analyzing MIM effects becomes apparent. The grammars that can be constructed on the basis of the three constraints (*M, FAITH and LICENSE(M,g)) make the right typological predictions, thus justifying the line of analysis (see Chapter 5 §3 for an illustration of the factorial typology on the category of Number in Romance). In contrast, a rule-based approach does not yield this result in the same unitary fashion as factorial typology, which is intrinsic to Optimality Theory. Furthermore, optimality-theoretic analyses such as the ones proposed in this dissertation for

instances of MIM illustrate the principle labeled ‘homogeneity of target/heterogeneity of process’ (McCarthy 2002). According to this principle, there is a variety of processes that may occur in order to meet the requirements of a single output target, as expressed by a markedness constraint. The way in which the markedness constraint is satisfied hinges upon the ranking of faithfulness constraints and the structural conditions in the output under evaluation. Specifically, configurations in which marked phonological material M occurs in outputs inflected for a marked grammatical category can emerge via diverse processes. For example, they can be created by foot construction processes (uneven trochees in the Old Saxon Oblique case, Chapter 4) or by faithful parsing of underlying segmental material (intervocalic voiceless stops in the Mayak Passive Voice, Chapter 6). The outcome of such processes is nevertheless unitary in that they yield ‘marked in the marked’ output forms. The success of the optimality-theoretic MIM Schema approach to such diverse cases stems exactly from the ability of OT tools to handle a variety of patterns that can be subsumed to one general property (‘marked in the marked’). In contrast, a rule-based approach would require a different rule apparatus for each situation and would be unable to capture the unifying factor behind the MIM property.

6. Summary

In this chapter I introduced the theoretical apparatus employed in the dissertation to investigate the phonological correlate of grammatical markedness. In particular, I discussed aspects of Optimality Theory, the theoretical framework assumed in

this work, that have to do with the functional grounding of constraints. This was necessary in light of the fact that the claim defended in the dissertation rests on performance-related phenomena.

Two approaches to licensing of phonological material in prominent positions were discussed, Positional Faithfulness and Positional Markedness. As for the specific mechanism responsible for the occurrence, other things equal, of marked phonological structure in marked grammatical categories, I proposed a positional markedness schema labeled 'Marked in the Marked (MIM)'. As part of the schema, I introduced a family of functionally grounded positive licensing constraints LICENSE(M,G). The predictions of the MIM Schema were laid out by discussing the factorial typology associated with it.

CHAPTER 4

MARKED METRICAL STRUCTURE IN OLD SAXON

0. Introduction

According to the hypothesis advanced in the preceding chapters, marked grammatical categories have the ability to license marked phonological structure to an extent that is higher or equal than unmarked grammatical categories. I claim that a word carrying the morpho-syntactic features of the marked grammatical category in its Morphological Structure represents a kind of ‘privileged position’ akin to the privileged positions described in phonology. These claims form the underpinnings of the Marked in the Marked (MIM) generalization stated in Chapter 3.

MIM phenomena can be illustrated by the ability of marked categories to allow marked metrical structure. In this chapter I bring evidence from the Old Saxon Case system to bear on the claim that the inflected word that carries the morpho-syntactic features of the marked case (Dative-Instrumental or Oblique case) has the privilege to license uneven trochees as a particular type of marked metrical structure. In contrast, the grammatically unmarked case (Nominative-Accusative or Direct case) prohibits the occurrence of the uneven trochee in the Phonological Structure of the respective output word. Crucially, the inflectional markers in the Nominative and Oblique are both represented by the high vowel /u/.

The general mechanism assumed to drive the phonological asymmetry between categories on a grammatical markedness hierarchy is positive licensing.

Specifically, uneven (HL) trochees are licensed in the Oblique case. In §1 I introduce the Old Saxon data and state the relevant descriptive generalizations on the language's metrical system and inflectional paradigms. §2 discusses the status of the uneven trochee as a type of marked phonological structure. In §3 I define the positional licensing constraint for uneven trochees in Oblique forms and I lay out an optimality-theoretic analysis of the data. §4 deals with an apparent exception to the occurrence of uneven trochees in a grammatically unmarked category and discusses the applicability of the alternative Positional Faithfulness schema. Finally, §5 states the conclusions of the chapter.

1. Data and descriptive generalizations

Old Saxon (Old Low German) is an extinct West Germanic language for which records are attested between 750 and 1050 AD. The data used for the illustration of the phenomena are drawn from traditional Old Saxon grammars (Holthausen 1921, Gallée 1910, Cathey 2000). Indirect evidence comes from West Germanic languages to which Old Saxon has a close resemblance, most importantly Old English.

Like other languages that belong to the West Germanic branch (Old English in particular), Old Saxon has a weight-sensitive, moraic trochee system (Dresher and Lahiri 1991, Hayes 1995, Bermúdez-Otero 1999, 2001, McCartney 2002 etc.). Cross-linguistically as well as in Old Saxon, moraic trochees are either left-headed bimoraic units consisting of two light syllables (LL) or units composed

of one heavy syllable (H) (Hayes 1995). These metrical patterns are illustrated in (63):

(63) Standard moraic feet in Old Saxon

a. (hé.ru)	‘sword’	(LL) ⁶⁴
b. (fí.ri)na	‘iniquity’	(LL) L
c. (hé.ri)(tò.go)	‘duke’	(LL) (LL)
d. (bó:g)	‘bow’	(H)
(wáld)	‘forest’	

As shown in (63a.) and (63d.), bisyllabic and monosyllabic words are parsed exhaustively into (LL) or (H) moraic trochees. (63c.) illustrates words with an even number of light syllables with exhaustive and iterative parsing. (63b.) represents a word with an odd number of light syllables that displays final syllable extrametricality.

As expected in a moraic trochee language, there is a word minimum condition on substantive words, which are necessarily bimoraic. Following a convention widely adopted in the historical linguistics of Germanic languages, Old Saxon stems, which are often monosyllabic, are classified into two types, ‘light’ and ‘heavy’. The classification into ‘light’ and ‘heavy’ syllables is based on the phonological behavior of high vowels following the stem. After a ‘light’ syllable,

⁶⁴ The syllable carrying primary stress is given in bold type.

the high vowel is retained, but it is deleted following a ‘heavy’ syllable⁶⁵. ‘Light’ stems are of the CV or CVC type and ‘heavy’ stems are CV: or CVCC. This classification implicitly refers to the underlying form of the stems and has no bearing on the weight of the outputs.

Considerations of word minimality indicate that in Old Saxon the inventory of heavy syllables includes CV: and CVC(C), all of which are bimoraic. For convenience, I will label the ‘light’ CV and CVC stem type ‘l’ and the ‘heavy’ CV: and CVCC stem type, ‘h’. Note that these are descriptive labels, with no theoretical import and that there is no necessary connection between the syllable weight of an output form and membership in the ‘l’ or ‘h’ type. For example, a word like the Past Tense form *sat* (‘I sat’) is bimoraic (heavy syllable), but is traditionally classified as an ‘l’ stem.

The canonical morphological structure of Old Saxon words consists of a stem/root normally followed by an inflectional affix that merges the expression of Number and Case in nominals. For example, the citation form of a noun like *heru* (‘sword’) consists of an ‘l’ stem (*her*) followed by the singular nominative affix (-u), whereas the base form of a noun like *bo:g* (‘bow’) instantiates a bare nominative ‘h’ stem (null nominal marking)⁶⁶.

⁶⁵ The behavior of ‘light’ and ‘heavy’ syllables is expressed by the descriptive rule of High Vowel Deletion (see (64) below).

⁶⁶ The nominals represent output forms. Bare nominals are underlyingly vowel-final, but the vocalic affix deletes as a consequence of High Vowel Deletion after an ‘h’ syllable.

Old Saxon has a relatively rich inflectional system, which distinguishes as many as five cases: Nominative-Accusative ('Direct Case'), Genitive and Dative-Instrumental ('Oblique'). The Nominative and Accusative endings are merged, and so are the Dative-Instrumental endings in certain inflectional paradigms ('declensions'). The identity of grammatical markers for Dative and Instrumental and the syncretism of those forms in inflectional paradigms allows for the grouping of the two cases under the label 'Oblique'⁶⁷, and likewise for the Nominative-Accusative ('Direct').

In Old Saxon, like in other Indo-European languages, nominal stems select their inflectional endings based on membership in a lexical inflectional paradigm. In this dissertation I focus on two such paradigms, traditionally known as 'u-stems' and 'o-stems'. In these paradigms, Case expression is leveled to a large extent, so the Nominative-Accusative and the Dative-Instrumental (Oblique) have similar markers. The fact that the Nominative and the Accusative ('Direct Case'), on the one hand, and the Dative and the Instrumental ('Oblique Case'), on the other hand, are lumped together based on their inflectional and syncretic properties is not expected to have significant consequences on frequency counts as compared to the counts of individual categories (like 'Nominative' or 'Dative').

There is indirect evidence that this is really the case in general in languages with a similar Case system and where syncretism phenomena manifest themselves.

⁶⁷ The Dative-Instrumental syncretism is not uncommon in Indo-European. For example, in Ancient Greek the Dative, Locative and Instrumental are syncretized into one case form. See also Chapter 3 §4 for arguments for grouping together the Dative and Instrumental and the Nominative and Accusative, respectively.

For example, Greenberg (1966a:32)⁶⁸ used a similar grouping for three other Indo-European languages, Sanskrit, Latin and Russian, based on Case syncretism in those languages. The frequency count ratios of ‘Direct’ over ‘Oblique’ cases range from 1.87 (Russian) to 2.62 (Sanskrit).

As in other languages that belong to the West Germanic group, a property of the Old Saxon phonological system is that underlying high vowel suffixes /u, i/ are generally deleted whenever their presence in outputs would lead to uneven (HL) trochees. The process, known as ‘high vowel deletion’ (HVD) is well documented in West Germanic (for a similar phenomenon in Old English, whose morpho-phonology is very close to that of Old Saxon, see Peinovich 1979 and Hogg 1997, 2000). The descriptive generalization, which I owe to Campbell (1959), is the following: “High vowels are deleted in unstressed word-final syllables when preceded by a heavy stressed syllable or a light stressed syllable plus another syllable.” (Campbell 1959: §345-6). In a rule-based format HVD of *-u* is stated in (64):

(64) HVD (Peinovich 1979)

$$\left(\begin{array}{l} -\text{Cons} \\ +\text{High} \\ +\text{Back} \end{array} \right) \rightarrow \emptyset / \text{CV} \left\{ \begin{array}{l} \text{V} \\ \text{C} \\ \text{CV} \end{array} \right\} \text{C}_1 _ \#$$

⁶⁸ See Chapter 2 §1.2.2 for Greenberg’s frequency counts.

In the morphology of Old Saxon nominals, HVD is relevant in the inflectional paradigm of u- and o-stem nouns. The Nominative-Accusative and Dative-Instrumental (Oblique) case forms are exemplified in (65). In both paradigms, the case markers for the case forms are underlyingly homophonous (-u). After ‘h’ stems, -u is deleted in the Nominative-Accusative, but retained in the Oblique (65a.). After ‘l’ stems, -u is always retained (65b.)

(65) Table 15 Case marking in u-stem nouns (Singular)⁶⁹

<i>Nominative-Accusative</i>			<i>Dative-Instrumental</i>		<i>Gloss</i>		
a.	(lúft) (H)	/luft-u/	*luftu *(HL)	(lúf.tu) (HL)	/luft-u _O /	‘air’	} ‘h’
	(bó:g) (H)	/bo:g-u _{NA} /	*bo:gu *(HL)	(bó:.gu) (HL)	/bo:g-u _O /	‘bow’	
b.	(sú.nu) (LL)	/sun-u _{NA} /		(sú.nu) (LL)	/sun-u _O /	‘son’	} ‘l’
	(hé.ru) (LL)	/her-u _{NA} /		(hé.ru) (LL)	/her-u _O /	‘sword’	

It appears that while in the Nominative-Accusative only even (LL or H) trochees are allowed, the Dative-Instrumental allows for one more trochee type, the metrically marked (HL) trochee, which is a relatively unusual behavior in light of the universal foot inventory (Hayes 1985, 1995). As Hayes points out, trochaic feet (* .) do not exhibit durational contrasts and their head and tail tend to have even duration, hence a (putatively universal) dispreference for uneven trochees (I return to the issue of uneven trochees as a type of marked phonological structure in §2).

⁶⁹ NA = Nominative-Accusative, O = Oblique (Dative-Instrumental)

There is one more area of Old Saxon morphology where the high vowel *-u* is an inflectional suffix. This is the conjugation of ‘strong’ verbs, whose first person Singular present form has the ending *-u*. Interestingly, the verbal suffix is retained in outputs irrespective of the phonological structure of the stem. Uneven trochees are attested in the first person Singular Old Saxon ‘strong’ verbs:

- (66) The first person singular present of ‘strong’ verbs
- a. ‘l’ stem bir-u ‘I carry’ (LL)
 - b. ‘h’ stem wirð-u ‘I become’ (HL)

Although I will not discuss verbal forms, it appears that similar processes are active in nouns and verbs that license marked metrical structure (HL trochees) in the two lexical categories. Both in nouns and verbs the marked metrical structure is allowed in grammatically marked categories, Oblique Case in nouns and first person in verbs. The MIM generalization is testable, however, only in nouns, because in the verbal domain the affix of the third person (*-id, -od*) and second person (*-is, -os*) are different from the affix of the first person (*-u*).

Returning to the nominal domain, in feminine o-stem nouns the Nominative-Accusative singular suffix is *-a* (or, sometimes, *-e*). Historically, the Nominative affix is a former Accusative marker that was generalized to the Nominative (Cathey 2000). However, among the o-stems there are a number of nouns that do not take the Nominative suffix and surface as bare ‘h’ stems, on a

par with bare u-stems. The occurrence of such forms can be accounted for if we take into account the fact that they reflect an older stage in which the Nominative ending was *-u*, which underwent HVD when affixed to ‘h’ stems:

(67) Bare o-nouns

θarf ‘demand’ *θarfu_{N(A)}

no:n ‘noon’ *no:nu_{N(A)}

Before concluding the section on Old Saxon data, a remark is in place as to the assumptions that underlie the analysis that will be proposed. In particular, one may wonder whether the high vowel *-u* in the Nominative-Accusative of u-stem forms is indeed a case ending or just an epenthetic segment inserted for reasons of foot well-formedness with ‘l’ stems, but not with ‘h’ stems, where there is enough phonological material to form an (even) trochee. A possible answer to this question lies in the paradigmatic coherence of the u-stem class, where both ‘h’ and ‘l’ stems take nominal endings. Also, cognate endings in the Nominative-Accusative are attested in closely related Germanic languages (Old English). Diachronically, the endings represent the outcome of the evolution of Proto-Germanic case affixes.

For completeness, full inflectional paradigms are given below for an ‘l’ stem (*heru*, ‘sword’) and an ‘h’ stem (*luft*, ‘air’).

(68) Table 16 Old Saxon u-stem paradigms

a. 'l' stem

<i>Singular</i>	<i>Plural</i>
N heru	heri
G heries	hero
D heru	herun
A heru	heri

b. 'h' stem

<i>Singular</i>	<i>Plural</i>
N luft-Ø	lufti
G lufties	lufto
D luftu	luftun
A luft-Ø	lufti

The overt absence of the high vowel endings in the Nominative-Accusative of 'h' stems can therefore be viewed as deletion of an expected *-u* ending, and the occurrence of *-u* in 'l' stems reflects an underlying segment rather than an epenthetic one. Also, the fact that CVC words are allowed in Old Saxon shows that epenthesis would be unmotivated, since CVC monosyllables contain enough phonological material to build an (H) trochee. Incidentally, 'l' stem nouns with expressed Nominative-Accusative ending are more numerous than bare h stems, and historically both stem types started out with overt inflection. Under such circumstances, it appears more plausible to analyze the Old Saxon data as displaying HVD in 'h' stems rather than high vowel epenthesis in 'l' stems. Processes in closely related languages (Old English, Hogg 1997, 2000) support this view.

2. Uneven trochees as marked prosodic structure

An important component of the account proposed for Old Saxon Case forms is represented by the type of phonological structure that is assumed to be licensed in the output words inflected for marked grammatical category Oblique. In Old Saxon, the relevant structure is the uneven trochee.

The claim I make is that marked metrical structure (HL) occurs in the Oblique due to a mechanism that licenses this kind of structure in the words carrying the ‘oblique’ morpho-syntactic feature. Due to its relatively low frequency of occurrence, the grammatically marked Oblique is claimed to be able to license marked metrical structure⁷⁰.

Research on stress systems (Prince 1990, Hayes 1985, 1995, Kager 1993, 1995 etc.) has shown that cross-linguistically there is a preference for even trochees over uneven ones (and the reverse for iambs)⁷¹. This is not to say that uneven trochees are unattested altogether in natural languages. In fact Mellander (2001, 2003) lists a number of languages in which the respective feet emerge as a result of phonological processes (Mohawk, Selayarese, Central Slovak, Gidabal etc.). McCall (1999) analyzes the Ancient Egyptian metrical system as accommodating uneven trochees and Revithiadou (2004) discusses phonological processes that lead to this type of foot in Chimalapa Zoque and dialects of Cypriot

⁷⁰ No frequency data were available for Old Saxon corpora. One can assume, however, similarity with statistical data in other Indo-European languages (Latin, Sanskrit), where the Oblique case was shown to occur with lower frequency than the Nominative-Accusative (see the illustrations in Chapter 2).

⁷¹ OT encodes the markedness of uneven trochees using constraints like RHHRM (‘rhythmic harmony’) in Prince (1990) and Prince and Smolensky (1993/2004).

Greek. The relative rarity of uneven trochees in metrical inventories across languages constitutes an indication that the said trochee type is a marked phonological structure.

The scarcity of metrical systems with uneven trochees has been assumed to be grounded in perception. It appears that in cases of intensity contrasts, hearers prefer groupings with the most prominent element first – trochees, and in cases of durational contrast, groupings with the most prominent element second – iambs. The formulation of the asymmetry was given by Hayes (1995) in the form of the Iambic/Trochaic Law.

Two processes are assumed to underlie the formation of (HL) trochees, trochaic lengthening and trochaic shortening, respectively:

(69) Processes that create HL trochees (Mellander 2003)

a. Trochaic Lengthening: /LL/ → (HL)

b. Trochaic Shortening: /HH/ → (HL)

Uneven trochees should, therefore, be included in the foot inventory available universally (a similar claim is made by Rice 1992). Thus the uneven trochee represents a marked metrical structure that can occur in certain languages alongside even trochees, but apparently there are no languages where the only type of trochee is uneven.

As a matter of processes that can create prosodic and metrical structure, let us refer to the mechanism available in Old Saxon for assigning segment weight. According to Morén (1997, 1999) there are two sources of weight, coercion and distinctiveness. As Morén notes, while coerced weight stems from restrictions on surface moraicity in certain phonological contexts (weight by position, foot binarity etc.) and is subject to distributional restrictions based on sonority, distinctive weight is essentially underlying moraicity that translates in a surface contrast. Based on the properties of the prosodic system of Old Saxon, I assume that weight in this language is an instance of distinctive weight, at least for vowels. Indeed, if we examine the segment inventory of Old Saxon, we find that length (which correlates with weight) is distinctive for vowels, as illustrated by the existence of minimal pairs (e.g. *wan* ('lacking') - *warn* ('hope'), *hof* ('house and yard') - *hof* ('hoof') or *budil* ('bailiff') - *budil* ('bag') etc.) (Cathey 2000).

The Old Saxon facts are particularly striking in that, unlike other cases described in the literature where uneven trochees arise, the possibility of occurrence of uneven trochees in this language is not purely phonologically conditioned, but it is also morphologically conditioned. Moreover, it is in the grammatically marked Oblique case that (HL) trochees can occur, and not in the unmarked Nominative-Accusative, where the particular metrical structure is avoided through high vowel apocope (deletion in word-final position). This serves as evidence for the licensing strategy assumed to be at work in the Oblique word,

which is considered to be a position privileged by language use factors in the sense that it is capable of inducing the positional markedness phenomenon.

The ontological status of the uneven trochee can be easily accommodated in Optimality Theory, where determining the trochee type(s) allowed in a language is a matter of constraint interaction rather than a universal property. In OT, The markedness of the uneven trochees is expressed by the existence of constraints on foot form such as RHRM ('rhythmic harmony') in Prince (1990) and Prince and Smolensky (1993/2004), which militates in favor of balanced trochees. Similar remarks have been made about properties of other metrical phenomena, such as weight sensitivity. For example, Alber (1997) maintains that weight sensitivity is better understood in terms of constraint interaction within the metrical system of the language rather than as a two-value parameter with language-specific setting. Also, as we shall see in the following section, a markedness constraint *(HL) exists against uneven trochees and including this constraint in the Marked in the Marked constraint schema leads to the right typological predictions.

3. Analysis

Consider first the phonological expression of Case in 'h' stems. As already shown, with such stems the high vowel case marker surfaces in the marked Dative-Instrumental (Oblique), even at the risk of generating an uneven (HL) trochee ending in *-u*. In contrast, the (homophonous) case ending undergoes HVD in the unmarked Nominative-Accusative.

This indicates that faithfulness to underlying segmental material (enforced by MAX-IO, McCarthy and Prince 1995) dominates the markedness constraint that militates against uneven trochees. The relevant constraints are given in (70) and (71):

(70) MAX-IO ‘Input segments have output correspondents.’

(71) *(HL) ‘No uneven (HL) trochees.’

Markedness constraints against uneven (HL) trochees have been shown to be active across languages. For example, Prince (1990) and Hayes (1995) employ a constraint dubbed EVEN-TROCHEE or Grouping Harmony, whose activity rules out uneven trochees. Prince and Smolensky (1993/2004) employ RHHARM and Gouskova (2003, 2004) uses *(HL) under the name of GRPHARM. Recently, Elías-Ulloa (2004) uses the Grouping Harmony constraint as *(HL).

The general affix retention in Oblique forms and the ranking of MAX-IO and *(HL) that drives it are exemplified shown in (72) for an ‘h’ stem inflected for the Oblique case:

(72) Table 17 MAX-IO » *(HL) (affix retention in Oblique forms)

/luft-u _o /	MAX-IO	*(HL)
a. [(lúft)] _o	*!	
b. [↻] [(lúf.tu)] _o		*

In (72) the fully faithful candidate (72b.) wins over the deletion candidate (72a.) due to a fatal violation of MAX-IO incurred by the latter. With regard to foot form, candidate (72a.) is well formed (H trochee), but candidate (72b.) instantiates a violation of the foot form condition because it consists of an uneven trochee (left-headed HL foot).

If we now turn to the unmarked Nominative-Accusative of ‘h’ stems, we can see that this time the Case ending does not surface. Recall that in this case the uneven trochee is not tolerated:

(73)	[(luft)] _{NA}	/luft-u _{NA} /	*[(luf.tu)] _{NA}	‘air’
	[(bo:g)] _{NA}	/bo:g-u _{NA} /	*[(bo:.gu)] _{NA}	‘bow’

I attribute the asymmetry between the Nominative and Oblique to the activity of an instance of the positive licensing constraint LICENSE(M,g) introduced in Chapter 3. The relevant constraint is defined in (74):

(74) LICENSE(HL, OBL.)

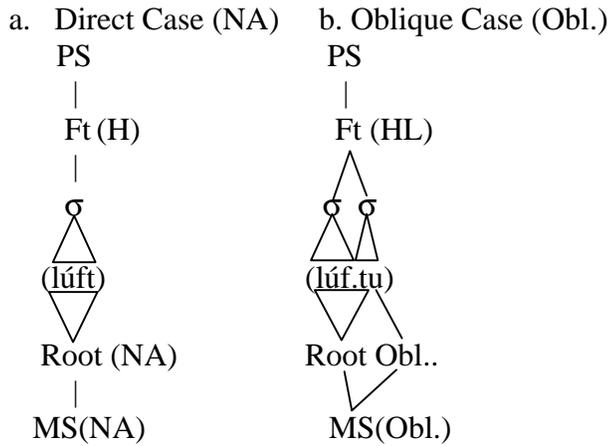
Let

- i. m be an occurrence of phonological structure (HL) in an output O
- ii. γ be an occurrence of the morpho-syntactic feature(s) for the value ‘oblique’ of the grammatical category of Case

Then m in the Phonological Structure (PS) of an output O implies γ in the Morphological Structure (MS) of same output O .

As shown in Chapter 3, due to the activity of the constraint filter on licensing constraints, the constraint in (74) is defined only for the marked member of the category of Case (Oblique). It allows uneven trochees to occur only in the marked Oblique case. In particular, it penalizes any inflected output containing uneven trochees that is not an Oblique case form. As an illustration of the Phonological and Morphological Structures involved in the evaluation of LICENSE(HL, OBL.), consider the representations below for the Oblique of an ‘h’ stem:

(75) Figure 8 Morphological and Phonological Structure



The inflected output in (75b.) satisfies the licensing constraint, since the presence of an uneven (HL) trochee in its Phonological Structure entails the

presence of the ‘oblique’ case feature in the Morphological Structure of the output. In terms of the constraint hierarchy, the fact that the uneven trochee is banned in the Direct Case (Nominative) is indicative of the domination of MAX-IO by LICENSE(HL,OBL.):

(76) Table 18 LICENSE (HL, OBL.) » MAX-IO (HL prohibited in the Nominative)

/luft-u _N /	LICENSE (HL, OBL.)	MAX-IO
a. \varnothing [(lúft)] _N		*
b. [(lúf.tu)] _N	*!	

This time the fully faithful candidate (76b.) loses, due to the fact that it contains an occurrence of an unbalanced (HL) trochee and is indexed for the morpho-syntactic feature ‘nominative’. Thus it violates the higher-ranking licensing constraint and is rendered sub-optimal, in spite of satisfying MAX-IO. The winner (76a.) fares well on the licensing constraint and thus emerges as the actual output in spite of its segmental unfaithfulness (violation of MAX-IO).

Putting together hierarchies (72) and (76) we obtain the constraint hierarchy in (77), which represents an instantiation of the Marked in the Marked (MIM) Schema introduced in Chapter 3 §5:

(77) LICENSE (HL, OBL.) » MAX-IO » *(HL)

The ranking in (77) is a positional markedness schema (comparable to $M_\alpha \gg \text{FAITH} \gg M$ discussed in Chapter 3). The constraint hierarchy is illustrated in Tableau (78) below for an ‘h’ stem form like *luftu* (‘air’) in the Nominative:

(78) Table 19 LICENSE (HL, OBL.) \gg MAX-IO \gg *(HL) (Nominative)

/luft-u _N /	LICENSE (HL, OBL.)	MAX-IO	*(HL)
a. φ [(lúft)] _N		*	
b. [(lúf.tu)] _N	*!		*

In the Oblique, the activity of the MIM schema is illustrated in (79):

(79) Table 20 LICENSE (HL, OBL.) \gg MAX-IO \gg *(HL) (Oblique)

/luft-u _O /	LICENSE (HL, OBL.)	MAX-IO	*(HL)
a. [(lúft)] _O		*!	
b. φ [(lúf.tu)] _O			*

Having discussed the behavior of ‘h’ stems in the Nominative and Oblique, the properties of ‘light’ stems can be shown to carry through under the same schema. Consider, for illustration, a light-stem word like *heru* (‘sword’), in which the case affix surfaces both in the Nominative and the Oblique.

The application of the MIM Schema in the Nominative case is shown in (80):

(80) Table 21 LICENSE (HL, OBL.) » MAX-IO » *(HL) (Nominative)

/her-u _N /	LICENSE (HL, OBL.)	MAX-IO	*(HL)
a. φ [(hé.ru)] _N			
b. [(hér)] _N		*!	

In (80) the licensing constraint is vacuously satisfied by both candidates. The winner is the fully faithful candidate (80a.) that wins over the output with HVD (80b.) due to a violation of MAX-IO incurred by the deletion candidate (80b.).

The remaining case is a ‘light’ stem in the Oblique, as in (81):

(81) Table 22 LICENSE (HL, OBL.) » MAX-IO » *(HL) (Oblique)

/her-u _O /	LICENSE (HL, OBL.)	MAX-IO	*(HL)
a. φ [(hé.ru)] _O			
b. [(hér)] _O		*!	

The situation illustrated in (81) is similar to a large extent to that in (79). The only difference is the potential applicability of LICENSE (HL, OBL.) to forms carrying morpho-syntactic case features. This time, both candidates considered are specified as ‘oblique’ and the licensing constraint is satisfied by both (81a.) and (81b.). The failure of the suboptimal candidate (81b.) is due to a fatal violation of MAX-IO, a situation that closely parallels the one in (79) above.

In sum, the phonological behavior of case forms in Old Saxon can be accounted for using the Marked in the Marked Schema instantiated for the

particular grammatical category and marked phonological structure, without resorting to additional constraints.

4. Discussion

4.1 An apparent counterexample: uneven trochees in the unmarked category

An apparent counterexample to the claim that uneven trochees are licensed in the grammatically marked category is provided by Galician (Kikuchi 2005). As Kikuchi notes, Galician Plural nouns contain exclusively even (LL or H) trochees, but the Singular allows for an uneven type of trochee (LH).

For example, according to Kikuchi, in Galician we find uneven trochees in Singular forms such as (*ú.til*) ('useful') or '*di(fí.θil)*' ('difficult'). The uneven trochee never occurs in the Plural, where the allomorph of the number affix is selected so as to avoid uneven trochees, as in *a.(θújs)*, not **a.(θú.les)* ('blue', singular form: *aθúl*).

If true, the observation on the metrical properties of Galician Number forms would be tantamount to saying that a grammatically unmarked category (Singular) allows for marked metrical structure that does not occur in the marked category (Plural).

However, Kikuchi's analysis crucially hinges on the assumption that Galician stress, which is trochaic, is unequivocally weight-sensitive and that CVC(C) syllables are bimoraic. This assumption is not necessarily true. Without attempting an analysis of the Galician data, a few remarks are appropriate that

question the empirical adequacy of the analysis. Against a moraic trochee account we can mention the fact that in Galician there is a general word minimality requirement according to which words should consist of at least two syllables, not two morae. Also, there is no contrastive vowel length in Galician and CVC syllables can act as ‘heavy’ or ‘light’ without a systematic correlation between the type of coda and moraic affiliation. These remarks suggest that the stress system of Galician may be, at least in part, weight-insensitive (syllabic trochees), so the Plural forms do not necessarily contain (marked) uneven trochees.

Also, even if Galician Singular nominals contained uneven trochees that were prohibited in the Plural, this would not constitute a counterexample to the MIM generalization, since the Singular and Plural inflections in Galician are not phonologically similar. Indeed, the Singular has a null marker, and the Plural is underlyingly /s/ (although allomorphs are available).

Having provided an analysis of the Old Saxon data and having discussed a potential counterexample to the MIM generalization, let us consider two alternative accounts of the phenomena.

4.2 Alternative accounts

4.2.1 MIM with licensing constraints for individual case values

The analysis provided for Old Saxon in terms of MIM rests on the assumption that cases pattern such that the Nominative and the Accusative on the one hand and the Dative and Instrumental on the other hand can be lumped together into ‘Direct’

and ‘Oblique’, respectively. This grouping is motivated by the commonalities between the case values in question (see the arguments brought in Chapter 3 §4 for the groupings in question). These commonalities allowed us to define a unique licensing constraint LICENSE (HL, OBLIQUE) covering the Oblique (Dative and Instrumental) cases. Also, this made possible the implicit assumption according to which a hypothetical licensing constraint LICENSE (HL, DIRECT), which licenses uneven trochees in the Nominative and Accusative (Direct cases) does not play an active part in Old Saxon and is possibly not even part of CON. This assumed behavior is also an implicit statement on the nature of the filter on licensing constraints discussed in Chapter 3 §4. With these stipulations, the account I offered for Old Saxon case was successful, as shown by the analysis in §3.

However, Old Saxon is a Case system with at least four values: Nominative, Accusative, Dative and Instrumental⁷². On the grammatical markedness hierarchy, these values are arranged in the decreasing order of their markedness as shown in (82) below, following Greenberg (1966a), Croft (1990) and Hawkins (2003):

- (82) Nominative (N) < Accusative (A) < Dative (D) < Other (including Instrumental (I))

⁷² The Genitive has been deliberately left out of the picture because the phonological expression of its marker is not similar to the one of the other four Case values.

This raises the problem of how many licensing constraints we can define for a given marked phonological structure M (in the particular case of Old Saxon, M is the uneven trochee). If we consider individual Case values, with no assumption as to their grouping, we can in principle distinguish as many as four licensing constraints: LICENSE (M,N), LICENSE (M,A), LICENSE (M,D) and LICENSE (M,I). Given the way licensing constraints were conceived of in Chapter 3, M is licensed in a marked member of the grammatical category, so we can assume that the constraint for the least marked member of the Case category (Nominative, LICENSE (M,N)) is filtered out from CON. We are then left with three licensing constraints (for A, D and I).

We can now assume that the licensing constraint for the next least marked member, the Accusative, is also excluded from CON. This assumption is made for the sake of the argument, but it may also be supported by further empirical evidence. For example, having a three-way licensing constraint set for licensing of M in Case makes the prediction that there may be languages where M is allowed in the Accusative, but not in the Dative and/or Instrumental. At this point there is no data to illustrate such a system, but it may well be the case that it does not exist.

We are left with a scenario in which we have individual licensing constraints for the Dative and Instrumental, the most marked values of Case. In what follows I will show that this scenario does not work for Old Saxon. The illustration will be done on the class 'h' stem nominals (*luft*, 'air').

Given the fact that uneven (HL) trochees are not allowed in the Nominative and Accusative, the two individual licensing constraints LICENSE (M,D) and LICENSE (M,I) have to be dominate MAX-IO in the constraint hierarchy. This prevents the realization of the high vowel affix in the Nominative and Accusative (which would lead to an uneven trochee) and makes possible its retention in the Dative and Oblique:

(83) LICENSE (M,D), LICENSE (M,I) » MAX-IO » *M

The MIM Schema in (83) accounts for the behavior of the Nominative and Accusative:

(84) Table 23 LICENSE (M,D), LICENSE (M,I) » MAX-IO » *M

/luft-u _{N/A} /	LICENSE (M,D)	LICENSE (M,I)	MAX-IO	*M
a. ☹ [(lúft)] _{N/A}			*	
b. [(lúf.tu)] _{N/A}	*(!)	*(!)		*

As expected, the fully faithful candidate (84b.) loses to the winner (84a.) because it violates both licensing constraints.

However, the schema no longer works for the Dative (85) or Instrumental (86), where the intended winners are indicated by the frowny face symbol:

(85) Table 24 LICENSE (M,D), LICENSE (M,I) » MAX-IO » *M (Dative)

/luft-u _D /	LICENSE (M,D)	LICENSE (M,I)	MAX-IO	*M
a. ☞ [(lúft)] _D			*	
b. ☹ [(lúf.tu)] _D		*!		*

(86) Table 25 LICENSE (M,D), LICENSE (M,I) » MAX-IO » *M (Instrumental)

/luft-u _I /	LICENSE (M,D)	LICENSE (M,I)	MAX-IO	*M
a. ☞ [(lúft)] _I			*	
b. ☹ [(lúf.tu)] _I	*!			*

The failure of the actual outputs (85b.) and (86b.) above is due to the fact that both of them violate one of the top-ranked individual licensing constraints, although satisfying MAX-IO. The analysis cannot be rescued by re-ranking, for instance, LICENSE (M,D) under MAX-IO, because in such a situation a null marking output (*luft*) would be predicted in the Dative. Also, allowing the filter to eliminate the licensing constraint for the next most marked Case value (LICENSE (M,D)) would have the same undesirable effect.

Grouping together the Dative and Instrumental as ‘Oblique’ does yield the right empirical result, as seen in §3. In conclusion, grouping together categories on the grammatical markedness hierarchy is not only motivated by the commonalities between them, but also necessary for the success of the analysis. This gives us an insight into the way the constraint filter operates in that it is not only the case that constraints for unmarked categories are eliminated, but also constraints for marked categories, in principle allowed in CON, have to be at least sometimes ‘lumped

together' into a single licensing constraint. The analysis along these lines offered for Old Saxon is thus not only possible, but also necessary.

4.2.2 Positional Faithfulness

Finally, let us consider an alternative to the licensing analysis, along the lines of positional faithfulness (Alderete 1995/2001, Jun 1995, Steriade 1995b, Beckman 1997, 1998/1999, Casali 1997, to mention only a few). The key observation that could lead to this kind of approach is that the Old Saxon Oblique represents a faithful segmental parse of the input, irrespective of stem type ('l' or 'h'). Recall that the Nominative-Accusative of 'h' stem deletes the case marker *-u* in avoidance of uneven trochees, as shown in (65), repeated for convenience in (87):

(87) Table 26 Case marking in u-stem nouns (Singular)

<i>Nominative-Accusative</i>			<i>Dative-Instrumental</i>		<i>Gloss</i>			
a.	(lúft) (H)	/luft-u/	*luftu *(HL)	(lúf.tu) (HL)	/luft-u _O /	'air'	}	'h'
	(bó:g) (H)	/bo:g-u _{NA} /	*bo:gu *(HL)	(bó:.gu) (HL)	/bo:g-u _O /	'bow'		
b.	(sú.nu) (LL)	/sun-u _{NA} /		(sú.nu) (LL)	/sun-u _O /	'son'	}	'l'
	(hé.ru) (LL)	/her-u _{NA} /		(hé.ru) (LL)	/her-u _O /	'sword'		

Given this situation, it may seem legitimate to relativize faithfulness, in particular MAX-IO, to grammatical categories. What we need is the faithfulness constraint indexed for the Oblique case:

- (88) MAX-IO_O ‘Input segments belonging to forms inflected for the Oblique case have output correspondents.’

Indexed for the Oblique, MAX-IO is never violated at least as regards the Case affix *-u*. It could conceivably replace top-ranked LICENSE(HL, OBL.) and apparently leads to the desired result, without recourse being made to positive licensing. Nevertheless, this option turns out to be less felicitous than the licensing approach due to the fact that there is more than one way to satisfy MAX-IO.

Other ingredients in the alternative analysis are markedness constraints that interact conflict with MAX-IO, notably *(HL) (already introduced in §3) and *PK/hi. *PK/hi militates against high vowel syllable peaks. It is a member of the *PK/x constraint family (Prince and Smolensky 1993/2004)⁷³:

- (89) *PK/hi ‘No high vowel syllable peaks.’

The fact that in general faithfulness is sacrificed to foot form (as attested in the Nominative-Accusative) indicates that *(HL) dominates MAX-IO:

⁷³ *PK/hi will be discussed in more detail in Chapter 5 in relation to the realization on Number suffixes in Romanian nominals.

(90) Table 27 *(HL) » MAX-IO (Nominative deletion)

/luft-u _{NA} /	*(HL)	MAX-IO
a. \varnothing [(lúft)] _{NA}		*
b. [(lúf.tu)] _{NA}	*!	

The retention of the high vowel in stems indicates that MAX-IO (or, at least, a version of that which is relativized as to stem-affix membership such as MAX-IO_{Stem}) dominates *PK/hi.

The constraint ranking that has emerged so far (*(HL) » MAX-IO » *PK/hi) cannot account for all the data, as apparently undominated trochee form *(HL) is in fact violated in ‘heavy’ stem Obliques. The need for relativized faithfulness becomes obvious; moreover, MAX-IO in the Oblique case (MAX-IO_O) has to dominate *(HL). The constraint ranking is therefore the one in (91):

(91) MAX-IO_O » *(HL) » MAX-IO » *PK/hi

Hierarchy (91) is an instance of Positional Faithfulness⁷⁴ analysis applied to Old Saxon. As Zoll (1998) notes, the principle problem with this kind of approach is that it is unable to account for derived marked structure, like marked foot form. Even if this point can be circumvented by regarding foot form as a bi-product of faithful preservation of underlying material in the Oblique, MAX-IO_O is satisfied not only when the case marker is realized as [-u], but also, among other

⁷⁴ See Chapter 3 §2.1.

things, when the segment is apparently ‘deleted’ and co-indexed with the final consonant of the stem:

(92) Table 28 MAX-IO_O » *(HL) » MAX-IO » *PK/hi

/luft ₁ -u ₂ o/	MAX-IO _O	*(HL)	MAX-IO	*PK/hi	
a. Ⓢ [(luft ₁ u ₂)] _O		*!		*	<i>segmentally faithful</i>
b. Ⓢ [(luft _{1,2})] _O					<i>coalescence</i>
c. [(luft ₁ ∅ ₂)] _O	*!		*		<i>deletion</i>

In (92), both the intended winner (92a.) and the coalescence candidate (92b.) fare well on Max-IO_O, but the actual output incurs a fatal violation of *(HL) and loses to (92b.), which satisfies all relevant constraints⁷⁵. The only candidate that is ruled out by MAX-IO_O is the deletion candidate (92c.).

Needless to say, there are many more hypothetical outputs that satisfy MAX-IO_O in various ways, through labialization of the final consonant of the stem, glide formation etc. To prevent all these candidates from winning one has to resort to a more complex constraint machinery. The licensing of marked metrical structure in the marked grammatical category position suggests itself as a more economical approach, which has at the same time the advantage of capturing the observed phenomena in a direct fashion by positive licensing.

Finally, it should be noted that Old Saxon represents a relatively simple case, where the implementation of Positional Faithfulness is possible, although it is less economical than the MIM schema. As we shall see, there are more complex

⁷⁵ It should be acknowledged, however, that candidate (92b.) violates the anti-coalescence constraint UNIFORMITY-IO.

cases, like the one of Mayak intervocalic lenition (Chapter 6), where Positional Faithfulness cannot be employed. This highlights the advantages of the MIM account advocated in this dissertation.

5. Summary

To summarize, in this chapter I have described and analyzed marked metrical structure as it emerges in the case system of Old Saxon in relation to grammatical markedness. Specifically, uneven trochees are allowed to occur in the grammatically marked Dative-Instrumental (Oblique), but are disallowed in the unmarked Nominative-Accusative, although the respective case markers are underlying the same.

The behavior of Case in Old Saxon is particularly interesting because it represents an application of the MIM Schema for a grammatical category (Case) with more than two values. I have shown that grouping Case members into two empirically motivated classes ('Direct' and 'Oblique') leads to an adequate analysis. More research is necessary on the behavior of n-way categories, which can offer insights into the nature of the constraint filter on licensing discussed in Chapter 3.

The Old Saxon phenomena represent a relatively simple application of the Marked in the Marked Schema, which presents itself as an economical, straightforward alternative to Positional Faithfulness, at least as far as marked structure that is not underlying is concerned. In the following two chapters two

other instances of marked phonological structure in grammatically marked categories will be investigated, namely segmental and phonotactic markedness.

CHAPTER 5 SEGMENTAL MARKEDNESS IN ROMANIAN

0. Introduction

Romanian nominal morphology can be used to illustrate the claim according to which a category that is more marked morphologically (Plural) allows for marked phonological material (consonants with secondary articulation) to an extent that is equal or greater than in the less marked category (Singular). The Romanian case illustrates the activity of the Marked in the Marked principle at the segmental level (segmental markedness).

Romanian nouns and adjectives display a relatively rich inflectional system in expressing the grammatical category of number. Unlike other Romance languages, Romanian distinguishes three grammatical genders (masculine, feminine, neuter), where neuters pattern with masculines in the singular and with feminines in the plural.

In most masculines and neuters, both the Singular and the Plural have underlying high vowel morphemic exponents, whose distribution is subject to similar restrictions in Standard Romanian. However, there is a phonological asymmetry between Singulars and Plurals in that only Plurals allow for consonants with secondary articulation, which occur as a result of number affixation, while Singulars allow only for plain consonants and in fact often have a null realization of the Number suffix:

- (93) a. No secondary articulation in the Singular
 /lup-u_{Sg}/ → [lup-Ø]_{Sg} ‘wolf’ *[lupu]_{Sg}, *[lup^w]_{Sg}.
- b. Secondary articulation in the Plural
 /lup-i_{Pl}/ → [lup^j]_{Pl} ‘wolves’ *[lup-Ø]_{Pl}, *[lupi]_{Pl}.

The data in (93) show a general property of Romanian high vowel affixes, namely the fact that high vowel syllable peaks are avoided, which results in deletion of the Singular morpheme, but in palatalization of the stem-final consonant in the Plural. In contrast, non-high vowel affixes are faithfully realized:

- (94) a. Deletion of Singular high vowel affix
 /lup-u_{Sg}/ → [lup-Ø]_{Sg} ‘wolf’ *[lupu]_{Sg}, *[lup^w]_{Sg}.
- b. Preservation of Singular non-high vowel affix
 /frat-e_{Sg}/ → [frate]_{Sg} ‘brother’ *[frat-Ø]_{Sg}.

As we shall see, the Romanian data are in fact even more complex and considerations of syllable well-formedness come into play in the realization of forms inflected for number. For example, whenever Number inflection would lead to a coda cluster rising in sonority (like a stop-sonorant sequence), the Number affix is retained in outputs as a vocalic segment, even if this creates high vowel syllable peaks:

- (95) a. Singular affix retained
 /akr-u_{Sg}/ → [akru]_{Sg}. ‘sour-Sg.’ *[akr-Ø]_{Sg}, *[akr^w]_{Sg}.
- b. Plural affix retained
 /akr-i_{Pl}/ → [akri]_{Pl}. ‘sour-Pl.’ *[akr-Ø]_{Pl}, *[akr^l]_{Pl}.

The asymmetries noted above between Singular and Plural forms cannot be explained in purely phonological terms, and morphology has to be taken into account. Specifically, I show that Marked in the Marked Schema can be used to account for the differential behavior of number forms in Romanian. Licensing of marked phonological structure (consonants with secondary articulation) in the grammatically marked Plural number will be shown to play an important role in shaping inflected forms, but in the spirit of Optimality Theory outputs will emerge from constraint interaction. This explains why we do not always see consonants with secondary articulation in the Plural, but also why we never see this kind of marked structure in the Singular, at least in Standard Romanian.

§1 of the chapter presents Number expression in Romanian nominal morphology and argues for the underlying presence of the theme vowel /u/ as the exponent of the Singular in masculines and neuters. The Singular - Plural asymmetry in Number marking is discussed and the MIM schema is applied to account for it. In §2 I extend the applicability of the MIM analysis to other dialects of Romanian and in §3 extensions to Romance are examined. §4 examines an alternative approach (Morpheme Realization). It is shown that the MIM schema is

simpler and empirically more adequate in capturing the typology of Number marking. §5 formulates the conclusions of the chapter.

1. Number expression in Romanian nominal morphology

Romanian nouns and adjectives have long been claimed to be vowel-final in their underlying representation (Augerot 1974, Steriade 1984, Chitoran 1996, 2002), although only feminines and some of the masculines display the final vowel in surface form. Along the same lines, previous researchers have assumed that all Romanian nominals have the underlying representation */[stem]-vocalic ending /* (Chitoran 1996, 2002).

However, most of the arguments put forth for this representation rely on diachrony and dwell upon the fact that the assumed vocalic ending represents a remnant of the nominal theme vowel in the mother language, Latin. Such an argument is hard to defend from the perspective of acquisition, as speakers cannot be assumed to have access to diachronic data. From the perspective of Optimality Theory (Prince and Smolensky 1993/2004), the presence or absence of the vocalic ending in nominal outputs can be shown to be the result of constraint interaction, under which assumption no recourse is necessary to the history of the language proper. Moreover, there are patterns in the data that point to the recoverability of vocalic suffixes or endings.

1.1 Data

In agreement with Chitoran (1996, 2002) I argue that all Romanian nominals have the underlying representation mentioned above and repeated in (96):

(96) / [stem]-vocalic ending /

Vocalic endings (also known as thematic vowels) vary according to inflectional class and function in contemporary Romanian as the exponent of the category of number (Singular in the citation form), so in the remainder of the chapter the terms ‘thematic vowel’ and ‘singular affix’ will be used interchangeably.

Romanian has a three-way gender system that distinguishes between masculines, feminines and neuters. In the citation form of feminines, thematic vowels are always realized. As for the masculines/ neuters, the picture is less straightforward, since a sizable number of outputs end in a consonant. In (97) below I summarize the Romanian nominal endings. The data are taken from Standard Romanian, the major dialect of the language, spoken north of the Danube. The proposal, which I share with Augerot (1974), Steriade (1984) and Chitoran (1996, 2002), among others, is that all masculines and neuters which end in a consonant or a glide at the output level (and thus have no overt morphological marking) have the underlying thematic vowel /u/⁷⁶.

⁷⁶ The vocalic ending *-u* is in actuality the exponent of the Singular in masculines and neuters.

(97) Romanian nominal endings (base form, singular indefinite)

a. Feminines

-ə: ká.s-ə 'house'

só.r-ə 'sister'

lí.te.r-ə 'letter'

-e: kár.t-e 'book'

vúl.p-e 'fox'

b. Masculines and neuters

-e: frá.t-e 'brother'

mún.t-e 'mountain'

-u

- not realized word-finally, after a single consonant or a licit coda:

lúp-Ø 'wolf'

ópt-Ø 'eight'

mórt-Ø 'dead'

- realized as [u]

al.bás.tr-u 'blue-masculine'

kú.pl-u 'couple'

- realized as [w]

ka.ró-w 'square'

The interesting case is represented by the masculines and neuters that are assumed to be underlying *u*-final. As shown in (97) above, sometimes the underlying vowel is faithfully realized in outputs as [u], sometimes as the glide [w] and sometimes deleted altogether. In what follows, I will add more flesh to the issue of the underlying theme vowel affix /u/ in masculines and neuters and show that this segment is indeed part of the phonological input and has morphological affiliation, even though one may suspect that it is epenthetic.

1.2 Evidence for underlying /u/ in masculines and neuters

1.2.1 Lexicon optimization

With respect to the thematic vowel /u/ as underlying, although this status has been long assumed in Romanian generative phonology, no substantial arguments have been adduced for its presence in the input as a reflex of synchronic morphology. Chitoran (2002) merely notes that /u/ surfaces as [u] in the singular definite form of masculines/ neuters or as [w] at the end of certain loanwords, most of which are borrowed from French, and concludes that “there is no independent evidence from the phonology of the language where [u] is an epenthetic vowel, or some kind of preferred default vowel” (Chitoran 2002:39).

Assuming the standard two-level system of representation of Optimality Theory, the success of the analysis essentially depends on the choice of representations, especially for underlying representations, which are not directly accessible and have to be deduced. Given the OT principle of Richness of the Base

(Prince and Smolensky 1993/2004), there are no restrictions on the inputs to the constraint hierarchy for a language.

On the other hand, in terms of learnability, there should be a way for speakers to infer the actual input that serves as the underlying form for a given output. It has been proposed that this is accomplished by Lexicon Optimization (Prince and Smolensky 1993/2004; Itô, Mester and Padgett 1995), whereby learners, in the absence of other evidence, infer the input as being identical with the actual output.

In Romanian vowel-final nominals then, the underlying form will be chosen as identical with the phonetic realization, which includes the theme vowel. In consonant-final forms, the inference process is presumably more complex and involves evaluation of related, morphologically derived outputs, such as the forms where the high vowel [u] surfaces between the root and suffixed or clitic material, such as the definite article *-l*⁷⁷ or possessive affixes, as will be exemplified in the following subsection below. It can be hypothesized that as elements occupying argument positions in the syntax, definite nominal phrases (DPs) have a high frequency of occurrence, potentially higher than that of bare, indefinite nominals, so there is a consistent exposure of the speakers to forms in which /u/ surfaces faithfully⁷⁸. Although this algorithm looks reasonable, it should be supplemented by a more comprehensive argumentation for final /u/, in the absence of which one

⁷⁷ See also work by Inkelas (1994) on lexicon optimization in cases of alternation.

⁷⁸ Cross-linguistically, definites are more marked grammatically than indefinites. The relatively higher frequency of occurrence of definites that we see in certain languages may instantiate a 'markedness reversal' phenomenon that arises for pragmatic and syntactic reasons (arguments tend to be definite, reflecting the informational structure of language).

might have to consider the alternative of epenthetic [u], which would lead to a different analysis.

1.2.2 Morphological exponence in nominal inflection

What draws attention in the first place to the possible existence of an underlying vocalic ending /u/ in nominals that end superficially in a single consonant (like *lup* ('wolf')) or in a licit consonant cluster (like *opt* ('eight')) is the fact that in the Singular Definite form they systematically display the vowel [u] intervening between the root and the definite article *-l*, pronominal clitics or any suffixed inflectional material that begins with a consonant:

(98) Table 29 The vocalic ending [u] surfacing before consonantal suffixes

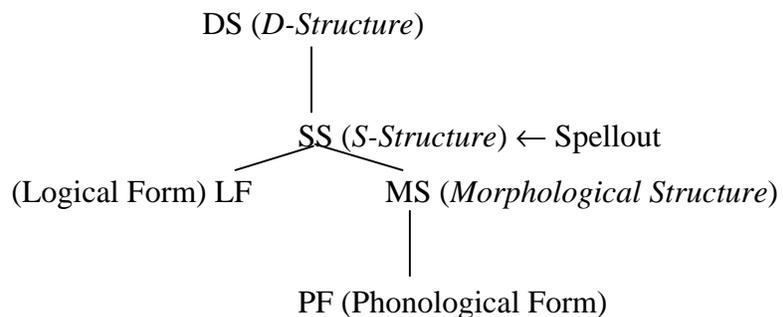
<i>lúp</i>	'wolf'	$[lú.p]_{Stem-u_{Sg.}-l_{Def.}}$	'the wolf'
<i>glás</i>	'voice'	$[glá.s]_{Stem-u_{Sg.}-l_{Def.}}$	'the voice'
$[glá.s]_{Stem-u_{Sg.}-m^{Clit.}}$	'my voice'		

In (98) above, [u] represents the morphological exponent of the Singular number. To understand the notion of morphological exponence, consider two facets of an output, Phonological Structure (PS) and Morphological Structure (MS)⁷⁹.

⁷⁹ See Walker (2000) and Walker and Feng (2004) for the correspondence relation between PS and MS.

The ontological status of Morphological Structure (MS) as a legitimate level of representation is acknowledged by Halle and Marantz (1993) in their seminal work on Distributed Morphology (DM). Starting from the basic organization of the grammar originally proposed by the Principles-and-Parameters model (Chomsky 1981), Halle and Marantz introduce (1993) MS as an independent level that is “a syntactic representation that nevertheless serves as part of the phonology” (Halle and Marantz 1993:114):

(99) Figure 9 Morphological Structure as a level of representation

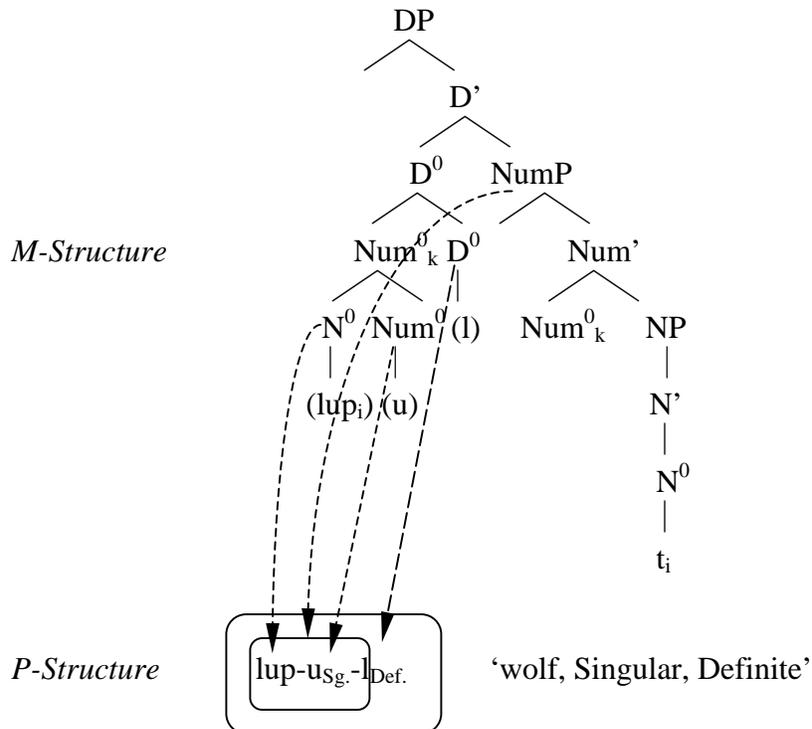


The task of MS is to serve as the interface between Syntax and Phonology. This process can be described as follows. The syntax deals in bundles of syntactic features, not phonological features. At MS, the feature bundles are matched up with morphemes from the Vocabulary (i.e. the list of lexical items); at this point, a phonological string is assigned to each feature bundle (if possible). Then PF performs phonological operations on the morphemes. What MS does is to impose a linear order among words and their constituents, given the fact that the Syntax only indicates hierarchical relations. Also, morphemes indicate whether they are

prefixes or suffixes and MS respects those indications. Finally, additional morphemes (agreement) may be added to meet certain well-formedness conditions.

To see how morphological exponence is assigned in Romanian outputs inflected for Number, let us return to the data in (97). If we consider the two facets of an output, Phonological Structure (PS) and Morphological Structure (MS), the segment [u_{Sg.}] in PS corresponds to the Number head in MS, that carries the ‘Singular’ specification, and the segment [l_{Def.}] in PS corresponds to the Determiner head specified as ‘definite’. (100) shows the assignment of morphological exponence for the Singular masculine noun *lupul* (‘wolf-definite’):

(100) Figure 10 Assigning morphological exponence



The segment [u_{sg.}] in the PS representation in (100) stands in a correspondence relation with the Number node in MS. Also, morpho-syntactic features like ‘singular’ or ‘definite’, originally present in MS as properties of the respective heads, can be said to percolate to structures that dominate them and ultimately to the word level⁸⁰. It is in this sense that the output word ‘carries’ or ‘is inflected for’ the morpho-syntactic features in question.

If we uphold the principle of Consistency of Exponence (Prince and Smolensky 1993/2004), epenthetic segments are not expected to have a morphological affiliation, but we can see that [u_{sg.}] does have one (Singular). This is, of course, an argument based on phonological and morphological representations, and will be corroborated by evidence coming from the phonotactics of Romanian in §1.2.3.

1.2.3 Phonotactic evidence for underlying /u/

From a phonotactic perspective, the vowel [u] that intervenes between the stem and the Definite or Possessive affixes in (98) apparently does the work of breaking a consonant cluster which is illicit in Romanian, like a syllable coda of the type Cl]_σ. Although complex codas are allowed in Romanian, there is a sonority sequencing principle that is never violated, namely that complex codas with increasing sonority are banned. This indicates that at least in codas the Sonority Sequencing Principle is obeyed (for earlier work on sonority sequencing see,

⁸⁰ For the notion of ‘percolation’ in morpho-syntax, see the seminal work of Lieber (1980) and Williams (1981).

among others, Sievers 1876, Vogel 1977, Kiparsky 1979, Selkirk 1984, Clements 1990). Benua (1997/2000) formulates a constraint dubbed SON-CON, which bans complex codas rising in sonority (101). In Romanian SON-CON is undominated.

(101) SONCON ‘No codas rising in sonority.’

In the citation form, [u] can be found in nominals whose stem ends in voiceless consonant followed by a liquid (traditionally labeled *muta cum liquida*), a sequence disallowed in codas by virtue of SON-CON, as in *al.bás.tr-u/ *al.bástr* (‘blue’), *kú.pl-u/ *kúpl* (‘couple’) *á.kr-u/ *ákr* (‘sour’) etc.⁸¹.

In Romanian SONCON is thus strictly enforced, and no rising sonority profiles are tolerated in codas. Although syllables of type C(C)V(C)C and CC(C) consonant clusters in general are licit in Romanian, vowel epenthesis is attested, albeit sporadically, to break consonant onset/ coda clusters, presumably for ease of articulation and/ or to maximize perception of otherwise unreleased stops. This kind of epenthesis occurs in casual speech or in the speech of uneducated speakers when they utter neologisms or borrowings which contain consonant clusters that are hard to articulate or perceive:

⁸¹ Forms ending in a voiceless fricative - nasal cluster are attested (as in *basm*, ‘fairy tale’), but in such cases the nasal is devoiced to [m̥], and the sonority of the voiceless nasal may be on a par with [s] (Vasiliu 1965).

(102) a.	ad- <u>i</u> -ministrator for ad.mi.ni.stra.tor	‘administrator’
	sil- <u>i</u> -vestru for sil.ves.tru	‘Sylvester’
	h- <u>i</u> -lizi for hli.zi	‘giggle’
b.	ʃ- <u>i</u> -kɔalə for ʃkɔa.lə	‘school’
	opt- <u>i</u> -sprezetʃe for opt.spre.ze.tʃe	‘eighteen’
	ʒun- <u>i</u> -kə for ʒun.kə	‘young cow’
	os- <u>i</u> -tʃor for os.tʃor	‘small bone’

If in the case of (102a.) one can detect the flavor of copy epenthesis (Kitto and de Lacy 1999), given the fact that the words contain other instances of the vowel [i], no such explanation is available for the rest of the forms (102b.). For those words, where all the vowels of the base form are different from [i], copy epenthesis cannot be invoked and the situation is typical of default epenthesis.

It seems therefore that Romanian has at least one unquestionably epenthetic vowel, so the question boils down to whether [u] in (98) can be a second epenthetic vowel in this language. At first blush, [u] appears to qualify as epenthetic, as there seems to be a fairly clear-cut division of labor between [i] and [u]: both of them serve the purpose of syllable well-formedness, and it could be hypothesized that [u] is inserted at morpheme boundary, separating the stem from inflectional material or clitics, whereas [i] is a kind of elsewhere case. It has been shown that in languages with two or more epenthetic segments, those segments

often occur in complementary distribution, in other words, they should not share one and the same context. For example, in Japanese (Nasu 2003), the epenthetic vowel is [u] as a rule, but [o] after coronal stops. It appears, however, that there is no way to predict the quality of the epenthetic vowel in Romanian ([i] or [u]) depending on the context of insertion.

Consider by way of example the compound numeral *optsprezetfe* ('eighteen', literally 'eight-to-ten'), which is often pronounced [*opt-i-sprezetfe*], with epenthetic [i], as illustrated in (102b.) above. This is nevertheless not the end of the story, since in casual speech a good deal of the speakers utter it as [*opt-u-sprezetfe*]. A similar case can be made for the noun *untdelemn*⁸² ('vegetable oil', literally 'butter-of-wood'), formerly a compound, for which the pronunciation *unt-u-delemn* is attested. Under these circumstances, the epenthetic status of [u] appears to be at least questionable, since the vowel shares the context of occurrence with the truly epenthetic [i]. I suggest that in such a case speakers adopt an alternative strategy of avoiding a complex consonant cluster and pronounce the underlying thematic vowel /u/ in *opt(u)* ('eight'). Likewise, I claim that this is what they do when they apparently 'insert' [u] in the outputs in (98). Also, [u] in place of [i] is not an available option in (102) where there is not a corresponding form with thematic *-u*.

It is known that epenthesis takes place at the expense of increasing phonological unfaithfulness, so if /u/ is available from the input there seems to be

⁸² The morpheme structure of *untdelemn* is *unt+de+lemn*.

no good reason to assume insertion. If /u/ were epenthetic, its occurrence in exactly the same context where a thematic vowel would occur would be accidental, missing an obvious parallel. In fact, Romanian does not seem to favor vowel epenthesis as a means of simplifying consonant clusters (the [i] epenthesis in (102), although documented, is infrequent and unsystematic). Instead, the preferred solution is consonant deletion at the expense of MAX-C, as attested in the following substandard pronunciations:

(103)	pormone <u>w</u> for port <u>m</u> one <u>w</u>	‘wallet’
	eskursi <u>j</u> e for e <u>k</u> skursi <u>j</u> e	‘excursion’
	istit <u>i</u> t for i <u>n</u> stitut	‘institute’
	ba <u>ʒ</u> okurə for ba <u>ʒ</u> okurə	‘mockery’

Having discussed evidence for underlying /u/ provided by Romanian phonotactics, let us turn to evidence that comes from the treatment of loanwords.

1.2.4 Evidence from loanwords

Another argument against epenthesis comes from the treatment of French loanwords. French borrowings originally ending in a stressed vowel like [é], [ó], [í], end in V + [w] in Romanian. Under the assumption that there are no phonemic glides in Romanian (see also Steriade 1984 and Chitoran 2002 on vowel/ glide alternations in Romanian), final [w] is the realization of underlying /u/. Let us,

however, suppose for the moment that [w] is the realization of epenthetic /u/, possibly modulo some phonological opacity, and that insertion is necessary for reasons of metrical structure⁸³. The behavior of French loans is illustrated in Table (104) below:

(104) Table 30 The realization of French loanwords in the indefinite form
(with [u] as epenthetic)

<i>French word</i>	<i>Possible Romanian input</i>	<i>Romanian output</i>
[paʁí] ‘wager’	/paʁi/	pa.rí-w
[kaʁó] ‘square’	/kaʁo/	ka.ró-w
[lisé] ‘high school’	/litʃe/	li.tʃé-w

Consider again the set of French loans originally ending in [í], [ó] and [é], all of which are neuters in Romanian, this time in their definite form:

(105) Table 31 The definite form of French loans

<i>French word</i>	<i>Romanian output (indefinite)</i>	<i>Romanian output (definite)</i>
[paʁí] ‘wager’	pa.rí-w	pa.rí-u-l *pa.rí-l
[kaʁó] ‘square’	ka.ró-w	ka.ró-u-l *ka.ró-l
[lisé] ‘high school’	li.tʃé-w	li.tʃé-u-l *li.tʃé-l

The definites in (105) are hard to account for in terms of epenthesis, since in the absence of [u] no ill-formedness would have arisen. In spite of that, definite forms like **pa.rí-l*, **ka.ró-l* or **li.tʃé-l* (the starred forms in (105)) are not attested.

⁸³ Note that final stressed vowels are severely restricted in Romanian.

In all these cases, the epenthesis of [u] seems unmotivated. A natural solution to the problem is to assume that /u/ has become a part of the underlying form, generalized by analogy with the rest of the members of the masculine-neuter class, and that it surfaces as the glide [w] word-finally to form a stressed CVw syllable, in avoidance of a vowel-final form with final stress⁸⁴ (the only nominals that end in a stress vowel (á) are a limited class of feminines. Before the definite article [-l], /u/ surfaces faithfully, to avoid the illicit coda $wl]_{\sigma}$.

Also, [u] is present in cliticized forms even if its epenthesis does not seem necessary, as in *glas-u-j* ('his voice'). Without providing a systematic analysis of Romanian glides here, it is worth noting that, if the possessive clitic [j] is underlying /i/, there seems to be no good reason to epenthesize [u], thereby increasing unfaithfulness to the input. The faithful realization [i] would suffice for syllable well-formedness, but we do not get forms like **glas-i*. In actuality, the assumed sequence /ui/ gets realized as [uj], in accordance with the principles that govern the status of Romanian vowel strings (see Chitoran 2002 for a detailed analysis).

To summarize the discussion so far, it has been shown that Singular masculines and neuters all have the underlying theme vowel /u/. Three kinds of evidence have been brought to bear on the issue:

⁸⁴ Hiatus is also disfavored in Romanian (see Chitoran 2002), which makes a form like **pa.rí.u* ungrammatical.

- lexicon optimization and morphological exponence
- phonotactic evidence
- the treatment of loanwords

I have shown that an analysis that assumes /u/ to be part of the underlying form captures the facts better than an epenthesis account. To conclude this section, Romanian nominals are all characterized by the presence of vocalic Singular affixes. While in feminines the affixes are always seen at the surface and the affix vowels are non-high, in masculines and neuters the Singular morpheme, underlyingly /u/, is realized in outputs only when its absence would lead to an illicit coda. The non-high affix /e/ is regularly retained. A question that requires an answer is why, if [u] is underlying and represents the Singular suffix, it does not always surface in the base form of the masculine-neuters, in other words, why is /-u/ deleted in a form like /lup-u/ → [lup] ('wolf, singular')? In the following section I take a step towards answering this question and introduce Romanian Plural morphology, with a focus on masculines and neuters. In these two types of nominals, both the Singular and the Plural affix are high vowels on which, as we shall see, Standard Romanian imposes occurrence restrictions in final position.

1.3 Romanian Plural morphology

1.3.1 Restrictions on the distribution of high vowels in Romanian

A closer examination of Romanian nominals shows that [u] is not the only (unstressed) vowel whose final occurrence is restricted word finally. The high,

central vowel [i] is banned from this position altogether in Romanian words, except in a relatively small class of verbs, in which this vowel serves as the Infinitive marker and carries primary stress. For convenience, a vowel chart for Romanian is provided below:

(106) Table 32 Romanian vowel chart

	Front	Central	Back
High	i	ɨ	u
Mid	e	ə	o
Low		a	

The third member of the set of Romanian high vowels, /i/, is particularly important to nominal inflectional morphology, as it represents the Plural affix for a good deal of masculines and some feminines. It also occurs as the underlying Plural marker of all masculine adjectives.

Unlike the singular morpheme /u/, which surfaces only when compelled by the phonotactics of the language, the high vowel plural marker /i/ is always realized in some way. It is realized as the full vowel [i] in words whose stem ends in an unsyllabifiable consonant cluster, or as palatalization on the preceding consonant [ʲ] in words whose stem form ends in a single consonant or a licit consonant cluster⁸⁵:

⁸⁵ The inflection of Romanian nominals also illustrates cases of more complex alternation, such as for example the alternation s/ʃ, as in *pas - paʃ* ('step - steps'). For simplicity of exposition, I do not discuss alternations of this sort, as their existence does not crucially affect the analysis (see Chitoran 2002 for details on more complex instances of palatalization).

(107) The realization of the plural marker /i/

pom-Ø _{Sg.}	‘fruit-tree’	pom ^{iPl.}	‘fruit-trees’	UR /pom+i _{Pl} /
akr-u _{Sg.}	‘sour’	akr-i _{Pl.}	‘sour-plural’	UR /akr+i _{Pl} /

So far we have seen that monosegmental number affixes in Romanian masculines and neuters are high vowels subject to similar distributional restrictions. Nevertheless, as already mentioned, Plural markers always find an expression in outputs, unlike Singular markers, which undergo full deletion when they do not serve syllabification purposes. In the following section I develop an optimality-theoretic analysis of these facts.

1.3.2 Analysis

1.3.2.1 The Sonority Hierarchy and the distribution of theme vowels

The Romanian data on nominal number morphology indicate that in this language final high vowels are generally disallowed, and masculines and neuters undergo high vowel apocope whenever possible. High vowel apocope is attested cross-linguistically in Kagoshima Japanese, Balto-Finnic (Kenstowicz, 1994), Gilbertese (Blevins 1997), Old English (Hogg, 2000) etc., under a wide variety of conditioning factors⁸⁶.

High vowels have been shown to be favorite targets for apocope (Howe and Pulleyblank 2001), possibly due to their low place on the sonority scale. With

⁸⁶ See also the behavior of Old Saxon high vowel affixes in Chapter 4.

respect to the dimension of sonority, given the Sonority Hierarchy (Selkirk 1984, Clements 1988), segments that rank higher in the hierarchy make better syllable peaks:

(108) Sonority Hierarchy

Low V > High V > Liquid > Nasal > Voiced Fric. > Voiceless Fric. >
> Voiced Stop > Voiceless Stop

The Sonority Hierarchy (108) can be expressed in terms of a hierarchy of constraints of the form *PK/x that prohibit the segment x as a syllable nucleus (peak). The lower the segment x is in the sonority hierarchy, the higher-ranked is the associated constraint, as shown in (109) below, following Prince and Smolensky (1993/2004):

(109) *PK/p,t,k » *PK/b,d,g » *PK/f,s » *PK/v,z » *PK/m,n » *PK/r,l » *PK/i,u,(i) »
» *PK/a,o,e,ə

I refer to *PK/i,u,(i) as *PK/[hi]. Notice that this constraint dominates *PK/[non-hi] (*PK/a,o,e,ə). This accounts for the possibility that non-high vowels may occur in contexts where high vowels do not, as the case is with the thematic vowels /e/ and /ə/. I propose that the ranking in (109), in interaction with other

constraints active in the language, correctly predicts the distribution of Romanian nominal theme vowels.

1.3.2.2 High vowel deletion in the Singular

Let us start by considering a simple case, deletion of the theme vowel /-u/ in masculines or neuters with roots that end in a single consonant or a syllabifiable consonant cluster like /moʃ+u_{sg}/ → [moʃ-Ø]_{sg}. ('old man'). As already shown, the underlying phonological exponent of the Singular number, /-u_{sg}/, does not surface in this case. This constitutes a ranking argument for *PK/hi and MAX-IO, defined below in (110) and (111):

(110) MAX-IO 'Input segments have output correspondents.'

(111) *PK/[hi] 'No high vowel syllable nuclei.'⁸⁷

I propose that /-u/ deletes under pressure of avoidance of syllable peaks with less sonority than a non-high vowel, as exemplified in (112):

⁸⁷ *PK/[hi] and MAX-IO were also employed in an alternative analysis of Old Saxon Case morphology (Chapter 4).

(112) Table 33 *PK/[hi] » MAX-IO (general deletion of high vowels)

/moʃ+u _{Sg.} /	*PK/[hi]	MAX-IO
a. φ moʃ-Ø _{Sg.}		*
b. moʃ-u _{Sg.}	*!	

In Tableau (112), candidate (112a.) wins over the fully faithful candidate (112b.) because it satisfies top-ranked *PK/[hi] and avoids a final high vowel through deletion.

In nouns whose stem ends in a consonant cluster with rising sonority, like *akr-u_{Sg.}* ('sour-masculine'), the singular affix surfaces as a last resort to rescue syllable well-formedness. The survival of the high vowel Singular affix is ensured by SONCON dominating *PK/[hi]:

(113) Table 34 SONCON » *PK/[hi] (high vowels retained avoiding illicit coda)

/akr+u _{Sg.} /	SONCON	*PK/[hi]
a. φ [akr-u] _{Sg.}		*
b. [akr-Ø] _{Sg.}	*!	

The success of the winning candidate (113a.) is ensured by satisfaction of SONCON, a constraints that penalizes the deletion candidate (113b.) because it has a coda rising in sonority. The fact that deletion of root segments does not occur shows that MAX-ROOT-IO (McCarthy and Prince 1994, 1995) is undominated, so outputs with root segment deletion like *ak* or *ak^w* are ruled out. Undominated MAX-ROOT-IO also prevents deletion of high vowels in roots.

So far, we have established the following constraint ranking:

(114) MAX-ROOT-IO » SONCON » *PK/[hi] » MAX-IO

The hierarchy in (114) captures the behavior of Singular masculines and neuters. It expresses the fact that high vowel syllable peaks are prohibited via deletion of the high vowel, except when deletion of that vowel would cause a syllable coda with rising sonority. However, if we examine the behavior of Plural inflected forms, we find that (114) is not enough for capturing the phenomena.

1.3.2.3 Secondary articulation in the Plural

Let us now turn to Plural forms. Here we note that while Singulars can display null marking (bare roots), plurals are always phonologically affixed in some way, either by the presence of a full vowel [i] suffix or by secondary articulation (palatalization) of the final consonant of the stem.

The picture sketched above seems to indicate that within the category of Number the Plural makes use of strategies that converge to realize the morpheme in question. The situation is reminiscent of cases where phonological realization of morphemes is enforced in outputs, so considering that to be the relevant constraint might seem to be a legitimate move. In §1.3.2.7 we will see, however, that an analysis in such terms fails to give a satisfactory account of the Romanian facts.

Consider first the plural of nominals whose root ends in licit coda clusters, like /moʃ+i_{Pl}/ → [moʃ^j]_{Pl}. ('old men'). The fact that palatalization occurs in the actual output as the phonological expression of plurality indicates that MAX-IO dominates the anti-coalescence constraint UNIFORMITY-IO (McCarthy and Prince 1995):

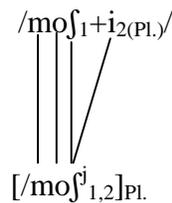
(115) UNIFORMITY-IO 'No segment in the output has multiple correspondents in the input'

(116) Table 35 MAX-IO » UNIFORMITY-IO (coalescence in the Plural)

/moʃ+i _{Pl} /	MAX-IO	UNIFORMITY-IO
a. ↵ [moʃ ^j] _{Pl} .		*
b. [moʃ-Ø] _{Pl} .	*!	

Candidate (116a.) is a multiple correspondence candidate that instantiates the mapping /moʃ₁+i₂/ → [moʃ^j_{1,2}] shown in more detail below:

(117) Multiple correspondence in Plural formation



Coalescence in the winning candidate (116a.) represents a way of satisfying MAX-IO, a constraint violated by the loser (116b.).

The hierarchies (114) and (116) can now be collapsed into (118):

(118) MAX-ROOT-IO » SONCON » *PK/[hi] » MAX-IO » UNIFORMITY-IO

While (118) accounts for the Plural data, it can be easily seen that it would favor coalescence in the Singular. This would lead to final labialized consonants, which is not what we see in Standard Romanian, if we assume symmetry with the Singular. Indeed, if we consider an output that expresses the Singular as secondary articulation (labialization) on the final root consonant, that output would be preferred to the deletion candidate and emerge as the illicit winner in (110):

(119) Table 36 MAX-IO » UNIFORMITY-IO (coalescence wrongly predicted in the Singular)

/moʃ+u _{Sg.} /	MAX-IO	UNIFORMITY-IO
a. ☞ [moʃ ^w] _{Sg.}		*
b. ☹ [moʃ-Ø] _{Sg.}	*!	

As anticipated, deletion of the high vowel affix in the winning candidate (119b.)⁸⁸ causes it to incur a fatal violation of MAX-IO (the fact that the intended winner does not emerge as the actual candidate is symbolized by ‘☹’). On the

⁸⁸ There are dialects of Romanian that allow final labialized consonants (see §2). I will return to this property in §3, where I discuss the factorial typology issue in number marking.

other hand, the ranking in (119) does work for the Plural, where palatalization occurs whenever SONCON is not violated. This means that we have to take into account other dimensions of morpho-phonological variation in Romanian number inflection, in particular secondary articulation, and the forces that drive it. As we shall see, we are dealing with a phonological process that shows morphological conditioning.

1.3.2.4 Licensing marked phonological structure in the Plural

As already noted, the main asymmetry between the Singular and the Plural in Standard Romanian masculines and neuters resides in the fact that the exponent of the latter category is never deleted in the actual output and can surface as palatalization on the final consonant of the stem. I interpret this property as driven by a licensing constraint that allows for consonants with secondary articulation in the grammatically marked category (Plural).

The relevant constraint is an instantiation of LICENSE(M,g) already introduced in Chapter 3, that allows marked phonological material M in the marked member (g) of grammatical category G, singled out by relatively lower frequency of occurrence (φ). In accordance with the properties of marked grammatical categories discussed in Chapter 2, the frequency of occurrence of nominals inflected for the Plural is generally lower than the frequency of occurrence of nominals inflected for the Singular. The relevant licensing constraint, where the marked structure M is a consonant with secondary

articulation ($C^{\text{Sec.}}$) and g is the Plural, is defined in (120), following the definition already introduced in Chapter 3 §4⁸⁹:

(120) LICENSE($C^{\text{Sec.}}$, PLURAL)

Let

- i. m be an occurrence of phonological structure $C^{\text{Sec.}}$ in an output O
- ii. γ be an occurrence of the morpho-syntactic feature(s) for a value ‘plural’ of the grammatical category of Number

Then m in the Phonological Structure (PS) of an output O implies γ in the Morphological Structure (MS) of same output O .

Informally, the licensing constraint in (120) states that for every occurrence of a consonant with secondary articulation $C^{\text{Sec.}}$ in an output, the respective output has the morpho-syntactic feature ‘plural’; in other words, consonants with secondary articulation occur only in Plural outputs. As we have seen in Chapter 3, the licensing factor is the presence of the morpho-syntactic feature ‘plural’; in turn, the category ‘Plural’ as the grammatically marked member of Number is determined by the lower frequency of occurrence of words inflected for the Plural.

As shown as early as in Greenberg (1966a.) for Latin, Sanskrit, French and Russian, Plurals, in accordance with their place on the markedness hierarchy, have a lower frequency of occurrence than Singular forms:

⁸⁹ In the following section I will discuss evidence for the markedness of $C^{\text{Sec.}}$.

(121) Table 37 Frequencies of occurrence of Number category values

<i>Language</i>	<i>Size of Sample</i>	<i>Singular</i>	<i>Plural</i>	<i>Dual</i>
Sanskrit	93,277	70.3	25.1	4.6
Latin (Terence)	8,342	85.2	14.8	N/A
Russian	8,194	77.7	22.3	N/A
French	1,000	74.3	25.7	N/A

No statistic data were available in the literature for Romanian nominal Plurals and Singulars, so I computed the frequency of occurrence of the relevant categories on a sample text consisting of about one third of the novel *Bunavestire* [Annunciation] by Nicolae Breban (2002). The text is a piece of contemporary Romanian prose, with balanced expository and dialogue parts. The text sample was analyzed using WordSmith Tools version 3.0, a lexical analysis program developed by Scott (1996) for Oxford University Press.

WordSmith Tools was used to generate the list of words used in the text together with the respective token frequencies. First, all words that did not qualify as nominals were removed from the list and only nouns and adjectives were retained. As many adjectives are homophonous with verbal past participles and serve for the formation of perfect tenses, I subsequently decided to remove them from the list as well. This procedure yielded a list of 7,089 items (Singular and Plural nouns). Out of those, 6,090 items were Singular forms, which corresponds to 85.1% Singulars and 14.9% Plurals. The results are comparable with those of Greenberg (1966a.) and show that Plural nominals occur with significantly less frequency as compared to their Singular counterparts.

Returning to LICENSE(C^{Sec.}, PLURAL), the constraint is relevant for outputs that contain consonants with secondary articulation. If those outputs are morphologically inflected for the Plural, the constraint is satisfied; if, on the other hand, the outputs are inflected for the Singular, the constraint is violated.

We can now reconsider the illicit winner [moʃ^w]_{Sg.} ('old man') in Tableau (119). The fact that for stems ending in a single consonant suffix vowel deletion is preferred to labialization indicates that LICENSE(C^{Sec.}, PLURAL) dominates MAX-IO, a ranking which blocks coalescence in the Singular:

(122) Table 38 LICENSE (C^{Sec.}, PL.) » MAX-IO (no coalescence in the Singular)

/moʃ+u _{Sg.} /	LICENSE (C ^{Sec.} , PL.)	MAX-IO
a. ↵ [moʃ-Ø] _{Sg.}		*
b. [moʃ ^w] _{Sg.}	*!	

An examination of (122) shows that LICENSE(C^{Sec.}, PLURAL) rules out outputs that contain consonants with secondary articulation that are not inflected for the (more marked) Plural. Accordingly, candidate (122b.), a Singular form with final labialization, violates the licensing constraint and loses in spite of satisfying low-ranking MAX-IO.

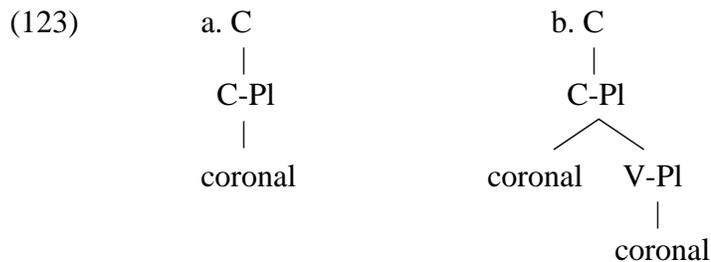
Before introducing other constraints relevant for the analysis and discussing their place in the constraint hierarchy, let us recall that one of the pivotal assumptions in the licensing mechanism proposed for Romanian is the fact that consonants with secondary articulation (in particular, palatalized consonants)

represent marked phonological material. I will address this issue in more detail in the following section.

1.3.2.5 Palatalized consonants as marked phonological structure

Cross-linguistically, palatalized consonants (C^j) are more marked than their plain counterparts (C). Various arguments can be brought to bear on this assertion.

From the point of view of complexity, consonants with secondary articulation are more complex with respect to autosegmental makeup, a criterion for structural markedness discussed by Rice and Avery (1995), who claim that segmental markedness increases with the amount of structure. If we consider the autosegmental representation in (123) according to Clements (1985), we can see that a palatalized consonant (123b.) has a secondary vocalic place of articulation that is missing from the representation of the plain segment (123a.). This is shown in (123):



Frequency of occurrence in phonological inventories across languages is also relevant in the sense that secondary articulations are relatively rare. The asymmetry, noted by Greenberg (1966a.), is substantiated by the data in the

UPSID database (Maddieson 1984), where only 21 out of 318 languages are noted to have distinctive palatalization.

Also, Padgett (2003a.) discusses the relative articulatory markedness of palatalized versus plain consonants, and Haspelmath (2005) mentions the fact that palatalized consonants are sometimes subject to distributional restrictions (for example, Russian palatalized consonants are prohibited before liquids). In parochial terms, individual palatalized consonants have been shown to be phonologically more marked than the corresponding sounds without secondary articulation (for an illustration, see the work of Zygis 2004 on palatalized rhotics in Slavic, where articulatory and aerodynamic characteristics as well distribution in sound inventories are brought to bear on the issue). In general, from an articulatory perspective, as already shown in Chapter 2, consonants with secondary articulation represent a type of marked phonological structure due to their complexity.

From the perspective of Optimality Theory, the general occurrence of consonants with secondary articulation as a marked structure is prohibited in outputs by constraints belonging to the *STRUC family (Prince and Smolensky 1993/2004, Zoll 1993). For the analysis of Romanian nominals I assume an instantiation of this constraint, which is stated in (124):

(124) *C^{Sec.} ‘No consonants with secondary articulation’

Although phonologically marked, secondary articulation is attested in morphological processes in a variety of languages. In particular, palatalization cases are represented by Polish (Padgett and Zygis 2003, Rubach 1984, 2002 etc.), Russian (Padgett 2001, 2003b, Padgett and Zygis 2003, Kochetov 2001/2002 etc.), Japanese (Mester and Itô 1989) and Celtic (Russell 1995), to mention only a few. As regards labialization as the phonological expression of a morphological marker, very well studied in the literature is labialization in Chaha/Inor (Johnson 1975, McCarthy 1983, Hendricks 1989, Rose 1994, Zoll 1996).

Having discussed the relative markedness of consonants with secondary articulation, let us pursue the analysis of Romanian nominal number.

1.3.2.6 The emergence of the Marked in the Marked Schema

We have seen that in the Singular high vowel deletion operates over inputs whenever the result is an output that has a licit syllable coda. Also, coalescence of the high vowel Number suffix is prohibited in the grammatically unmarked Singular, but allowed in the marked Plural. The phenomena analyzed thus far are summarized below:

(125) Table 39 Summary rankings for Romanian

<i>Process</i>	<i>Ranking</i>	<i>Tableau</i>
High vowel deletion	SONCON » *PK/[hi] » MAX-IO	(114)
No coalescence in the Singular	LICENSE (C ^{Sec.} , PL.) » MAX-IO	(122)
Coalescence in the Plural	MAX-IO » UNIFORMITY-IO	(116)

To make the picture complete, we note that in the Plural secondary articulation is preferred to deletion, as shown in (126):

(126) Table 40 MAX-IO » *C^{Sec.} (secondary articulation preferred to deletion)

/moʃ+i _{Pl.} /	MAX-IO	*C ^{Sec.}
a. $\text{[moʃ}^j\text{]}_{Pl.}$		*
b. $\text{[moʃ-}\emptyset\text{]}_{Pl.}$	*!	

Tableau (126) shows that the realization of the Plural affix is mandatory and can be achieved via coalescence of the high vowel of the Number morpheme with the final consonant of the stem. This occurs even though the result is a consonant with secondary articulation. It is therefore preferable to have an output with final palatalization (126a.), although it violates the constraint against secondary articulations, rather than delete the affix vowel altogether (126b.).

From the analysis laid out so far, it appears that palatalization is unavoidable in the Plural, except, of course, outputs where the process generates codas rising in sonority, as in the case of *akri* ('sour-plural'), where the output *akri*^j fatally violates undominated SONCON. It is also important to note that palatalization is minimal, that is, it never applies more than once. Consider, for the sake of the argument, a Plural input that has palatalization on the initial stem consonant, like /m^joʃ+i_{Pl.}/ ('old men'). The essential conflict that prevents excessive palatalization is the one between *C^{Sec.} and the feature correspondence constraint IDENT[hi], defined below:

(127) IDENT[hi] ‘Correspondent segments have identical feature specifications for the feature [high].’

To see how excessive palatalization is prevented in outputs, consider the input-output mappings in (128):

(128) Table 41 *C^{Sec.} » IDENT[hi] (minimal occurrence of secondary articulations)

/m ⁱ oʃ+iPl./	*C ^{Sec.}	IDENT[hi]
a. φ [moʃ ^j] _{Pl.}	*	**
b. [m ⁱ oʃ ^j] _{Pl.}	**!	*

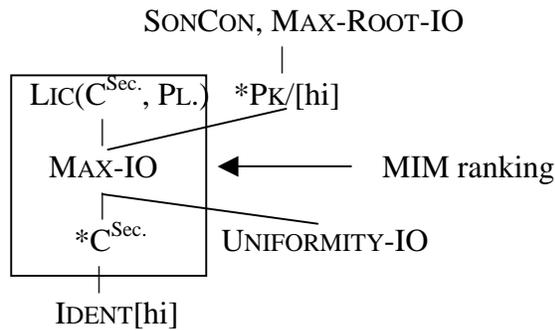
Neither of the candidates in (128) satisfies both relevant constraints. However, the winner (128a.) incurs only one violation of top-ranked *C^{Sec.}, although it violates IDENT[hi] twice (first, for not faithfully parsing the height feature on the first consonant of the root, and second by doing so on the affix vowel in the input). In contrast, the sub-optimal candidate (128b.) incurs too many violations of *C^{Sec.} and loses to the winner although it is more faithful with respect to the feature [high].

Before concluding the analysis, a word is in place as regards the locus of secondary articulation in the Number inflected word. In (128) we saw that a candidate with both initial and final palatalization is ruled out by excessive violations of *C^{Sec.}, what would prevent palatalization exclusively on the first consonant of the root? The answer to the question lies in the inflectional

morphology of Romanian, which is exclusively a suffixing language. We can therefore assume that affix alignment to the right edge of the prosodic word, a constraint that is undominated in the language, rules out candidates with non-final palatalization that $*C^{Sec}$ alone does not exclude, like $[m^i o_j]_{Pl.}$.

We can now spell out the final constraint lattice for Romanian number marking:

(129) Figure 11 Constraint lattice for Number marking in Romanian



Lattice (129) expresses the observed fact that in Romanian high vowel peaks are prohibited unless the outcome of deletion results in an illicit coda (penalized by SONCON). Also, high vowels coalesce with a consonant to form a secondary articulation, except when C^{Sec} is not in a Plural form, in which case the high vowel can delete, subject to the same condition on coda well-formedness.

The hierarchy in (129) also accounts for Marked in the Marked effects in Romanian nominal morphology. In the grammatically marked Plural, secondary articulation is preferred to high vowel deletion due to MAX-IO dominating $*C^{Sec}$.

Nevertheless, the coalescence process seen in the Plural is blocked in the unmarked Singular due to the activity of LICENSE (C^{Sec.}, PL.) that dominates MAX-IO.

In sum, the workings of the Marked in the Marked schema in Romanian, obscured with nominal roots ending in unsyllabifiable consonant clusters due to undominated SONCON, become visible in roots that can form licit codas via high vowel deletion or palatalization.

2. Number expression in dialects of Romanian

2.1 North-Western Transylvanian

The data considered so far are drawn from the standard dialect of Romanian spoken north of the Danube (the so-called ‘literary standard’). In this dialect, as we have seen, expressing the category of number by secondary articulation on the final consonant of the root is possible only in the Plural, where it is specifically licensed. No instances of contrastive palatalization exist unless they are the result of pluralization, so for example a word-internal consonant does not palatalize⁹⁰. Labialization is of course unavailable in all positions.

An examination of Romanian dialects reveals an interesting fact, namely that in some geographical varieties of Romanian final labialization in the Singular and final palatalization in the Plural are attested as long as the falling sonority

⁹⁰ We have seen that word-internal palatalization is not attested due to the suffixal nature of the Plural marker.

contour is observed in codas. The phenomenon in question manifests itself in certain dialects spoken in North-Western Transylvania (NWT), where Singular forms like the ones in (130) have been documented (Rusu 1983):

(130) Final labialized singulars in North-Western Transylvanian Romanian

unt ^w	/unt-u _{sg} /	‘butter’
moj ^w	/moʃ-u _{sg} /	‘old man’
kap ^w	/kap-u _{sg} /	‘head’

In the opinion of some researchers, the source of final labialization in the singular is controversial (see Rusu 1983 for a review). Historically, the Singular marker *-u* is the reflex of the Latin theme vowel of the second declension nouns such as *lup-u-s* (‘wolf’), which (Standard) Romanian inherits as *lup*, with (diachronic) high vowel apocope after the demise of the Latin nominative suffix *-s*. In §1.2.3 I argued, from a synchronic perspective, that although not always present in outputs in contemporary Standard Romanian, the marker *-u* is underlyingly present as the exponent of the Singular number. The arguments adduced for Standard Romanian are valid in NWT Romanian. The question is whether speakers of NWT Romanian preserve final /u/ as labialization as a vestige of the Latin theme vowel in a limited number of words, and the answer to it is negative, due to speakers’ lack of access to diachronic information.

Research by Rusu (1983) demonstrates that final labialization in NWT is an active process in contemporary NWT, as shown by the treatment of loanwords. For example, the noun *televizor^w* ('TV set') is pronounced with final labialization, which indicates not only that analogy has allowed speakers to reconstruct and generalize the underlying Singular affix, but also that the underlying Singular marker is retained. The phenomena in NWT can also be used to argue for the similarity of Romanian high vowel affixes [-i] and [-u], which pattern with respect to both apocope patterns and ability to coalesce with the final consonant of the stem, generating secondary articulations (C^j and C^w, respectively).

The situation in the NWT dialect of Romanian can be used to illustrate the factorial typology based on the Marked in the Marked Schema. As we have seen in §1.3.2.6, the constraint hierarchy LICENSE(C^{Sec.}, PL.) » FAITH » *C^{Sec.} (supplemented by constraints on the distribution of high vowels in Romanian like *PK/[hi]) accounts for the asymmetry in number marking in Standard Romanian.

As already shown in the discussion of the factorial typology associated with the MIM Schema (Chapter 3), we expect that if the relevant faithfulness constraint is ranked higher than both the markedness constraint *C^{Sec.} and the licensing constraint LICENSE(C^{Sec.}, PL.) both the Singular and the Plural will surface as final secondary articulations. Consider, by way of example, the North West Transylvanian forms *mof^w* ('old man') and *mof^j* ('old men'):

(131) Table 42 *PK/[hi], MAX-IO » *C^{Sec.}, LICENSE(C^{Sec.}, PL.)

/moʃ ₁ +u ₂ Sg./	*PK/[hi]	MAX-IO	*C ^{Sec.}	LICENSE(C ^{Sec.} , PL.)
a. ☞ [moʃ ^w _{1,2}]Sg.			*	*
b. [moʃ ₁ -Ø ₂]Sg.		*!		
c. [moʃ ₁ u ₂]Sg.	*!			

The relevant faithfulness constraint in (131) is MAX-IO, which is fatally violated by the deletion candidate (131b.). Candidate (131c.), which faithfully realizes the Singular marker as a high vowel, loses due to a violation of *PK/[hi]. Note that UNIFORMITY-IO has to be dominated by MAX-IO, as in Standard Romanian, in order to allow the coalescence candidate (131a.) to win.

The formation of the palatalized Plural of NWT nouns is illustrated in (132):

(132) Table 43 *PK/[hi], MAX-IO » *C^{Sec.}, LICENSE(C^{Sec.}, PL.)

/moʃ ₁ +i ₂ Pl./	*PK/[hi]	MAX-IO	*C ^{Sec.}	LICENSE(C ^{Sec.} , PL.)
a. ☞ [moʃ ^j _{1,2}]Pl.			*	
b. [moʃ ₁ -Ø ₂]Pl.		*!		
c. [moʃ ₁ i ₂]Pl.	*!			

Tableau (132) shows that in NWT the Plural patterns with the Singular with respect to the expression of Number. The actual output (132a.) satisfies both high-ranking constraints (*PK/[hi] and MAX-IO), while candidate (132b.) violates MAX-IO, and (132c.), *PK/[hi].

2.2 Aromanian

The survey of Romanian nominal morphology would be incomplete without mentioning the phonological treatment of number morphemes in Aromanian, a dialect of Romanian spoken south of the Danube, mainly in Greece and former Yugoslavia (Caragiu-Marioteanu 1968, 1975).

Like all dialects of Romanian, Aromanian enforces a strict ban on codas rising in sonority. Pluralization strategies are the same as in Standard Romanian and North-Western Transylvanian, namely final palatalization or preservation of the high vowel affix to prevent illicit codas. What distinguishes Aromanian from the other dialects is the faithful emergence of the singular suffix /u/, irrespective of the phonotactics of the stem:

(133) Aromanian Number morphology

- | | | | |
|----|------------------------|------------------------|---------------------------|
| a) | /moʃ-u _{Sg} / | → [moʃu] _{Sg} | ‘old man’ |
| | /moʃ-i _{Pl} / | → [moʃʲ] _{Pl} | ‘old men’ |
| b) | /akr-u _{Sg} / | → [akru] _{Sg} | ‘sour-masculine-singular’ |
| | /akr-i _{Pl} / | → [akri] _{Pl} | ‘sour-masculine-plural’ |

The data in (133) indicate that in the Aromanian dialect faithfulness (MAX-IO) dominates *PK/[hi], as the Singular affix has a full high vowel correspondent

in the output, and *PK/[hi] is dominated by LICENSE(C^{Sec.}, PL.), to prevent secondary articulations in the Singular:

(134) Table 44 MAX-IO, LICENSE(C^{Sec.}, PL.) » *PK/[hi], *C^{Sec.}

/moʃ ₁ +u ₂ Sg./	MAX-IO	LICENSE(C ^{Sec.} , PL.)	*PK/[hi]	*C ^{Sec.}
a. ☞ [moʃ ₁ u ₂]Sg.			*	
b. [moʃ ₁ -Ø ₂]Sg.	*!			
c. [moʃ _{1,2} ^w]Sg.		*!		*

The emergence of the full vowel Singular affix candidate as the actual output in (134) is ensured by undominated faithfulness and licensing of secondary articulation in the Plural. The deletion candidate (134b.) loses due to a violation of the relevant faithfulness constraint (MAX-IO), whereas the labialization candidate (134c.) incurs a fatal violation of the licensing constraint, which prohibits the respective structure outside the Plural.

The analysis of Plural forms offers us a ranking argument for *PK/[hi] and *C^{Sec.}:

(135) Table 45 MAX-IO, LICENSE(C^{Sec.}, PL.) » *PK/[hi] » *C^{Sec.}

/moʃ ₁ +i ₂ Pl./	MAX-IO	LICENSE(C ^{Sec.} , PL.)	*PK/[hi]	*C ^{Sec.}
a. ☞ [moʃ _{1,2} ^j]Pl.				*
b. [moʃ ₁ -Ø ₂]Pl.	*!			
c. [moʃ ₁ i ₂]Pl.			*!	

Failure to realize the Plural suffix penalizes candidate (135b.), while the presence of the full vowel Plural marker causes candidate (135c.) to lose to the winner, (135a.).

We can now flesh out a factorial typology of number marking in Romanian and extend the results to Romance.

3. Towards a factorial typology of Number marking in Romance

I start by summarizing the main features of Number marking in the dialects of Romanian considered in this chapter.

In the nominal morphology of Standard Romanian (SR), secondary articulation occurs only in the (marked) Plural, and is prohibited in the (unmarked) Singular. This is the consequence of the Marked in the Marked Schema (LICENSE(C^{Sec.}, PL.) » MAX-IO » C^{Sec.}). In North-Western Transylvanian Romanian (NWT), secondary articulations occur both in the Singular and in the Plural. Finally, in Aromanian (AR), secondary articulation is allowed in the Plural and prohibited in the Singular, where, unlike in SR, the high vowel affix /u_{sg}/ is always retained as a segment. The relevant constraint rankings for the three dialects are given in (136):

(136) Table 46 Constraint rankings for Romanian dialects

<i>Constraint ranking</i>	<i>Languages</i>	<i>Pattern</i>
(a) (*PK/[hi] ») LICENSE(C ^{Sec.} , PL.) » FAITH » *C ^{Sec.}	Standard Romanian	MIM
(b) FAITH, (*PK/[hi] ») LICENSE(C ^{Sec.} , PL.), *C ^{Sec.}	NWT Romanian	Full contrast
(c) FAITH, LICENSE(C ^{Sec.} , PL.) » (*PK/[hi] ») *C ^{Sec.}	Aromanian	MIM
(d) *C ^{Sec.} » FAITH, (LICENSE(C ^{Sec.} , PL.))	Not attested in Romanian	Lack of variation

If we disregard, for simplicity, the activity of *PK/[hi] in the constraint hierarchies, we note that SR (136a.) illustrates the Marked in the Marked Schema (the marked phonological structure occurs only in the marked category ‘Plural’). NWT (136b.) represents the case where the marked phonological structure occurs both inside and outside the marked grammatical category (the ‘full contrast’ case in the sense of Kager 1999, to appear)⁹¹. AR is essentially a sub-case of SR in that secondary articulation is attested only in the Plural, but differs from it with respect to the treatment of the high vowel suffix /-u_{sg}/, which is generalized across the whole nominal paradigm.

A fourth conceivable constraint ranking (136d.)⁹², the one where phonological markedness (*C^{Sec.}) dominates faithfulness (and possibly licensing), represents Kager’s ‘lack of variation’ pattern and is not attested among the dialects of Romanian under investigation.

⁹¹ Consonants with secondary articulation do not occur as part of the language’s phoneme inventory (due to the ranking *C^{Sec.} » IDENT[hi])

⁹² (129d.) represents the ‘lack of variation’ case (Kager 1999, to appear).

This is not to say that we are dealing with a real gap in the factorial typology. Rather we are faced with a particular situation in which the occurrence of a marked phonological structure (consonants with secondary articulation) is subject to restrictions that have to do with licensing in the marked grammatical category (Plural). Within the wider domain of Romance, it is worth noting that there are languages in which secondary articulation is not permitted as an expression of Number, and all Number affixes surface as full vowels.

The Italian data in (137) illustrate this type of Number morphology:

(137) Number marking in Italian

	<i>Thematic Vowel</i>	<i>Plural feature</i>	<i>Outputs(Sg./Pl.)</i>	
(a)	a	[coronal]	kás-a – kás-e	‘house(s)’
(b)	o	[coronal]	múr-o – múr-i	‘wall(s)’
(c)	e	[coronal]	kwór-e – kwór-i	‘heart(s)’

For Italian it has been proposed that the Plural marker is a floating [coronal] feature that docks onto the thematic vowel of the noun (Saltarelli 2001). Before we conclude this section, a note is in place regarding the possibility to extend the MIM account to situations in Romance where Number involves sub-segmental affixation, as illustrated in (137) above⁹³. Without attempting a detailed analysis of such situations, we can note that in Italian type languages both the

⁹³ For a recent discussion of the morpho-phonological phenomena surrounding Plural formation in Romance by means of [coronal] affixation, see also d’Hulst (2006).

Singular and Plural forms are thematic and the Plural marker is represented by a [coronal] feature that applies onto the theme vowel. In a sub-segmental approach to Romance Number, the formation of Plural is therefore asymmetric in the sense that the Plural is formed from the Singular base by feature affixation to the theme vowel. Given the way in which the MIM generalization was stated (Chapter 1, Chapter 2 §2), a certain degree of phonological similarity between grammatical category forms is assumed. For example, if g and g' are members of a grammatical category G such that $g > g'$ in point of markedness, the phonological makeup of g and g' is relatively similar (inflectional affixes are identical underlyingly or pattern with respect to phonological behavior). Under such circumstances, the asymmetry with respect to the presence of marked phonological structure M in output words inflected for g (but not in g') can be said to be functionally grounded in terms of frequency of occurrence and not simply due to phonological factors. As a consequence, instances of asymmetric sub-segmental affixation should not fall under the scope of the MIM generalization, at least in its strict formulation.

Nevertheless, as appears from (136), the factorial typology of the MIM schema does predict the existence of such 'asymmetric' Number systems. In Romance, for the relevant dimension considered (secondary articulation), they are instantiated by languages without secondary articulation in the Singular and the Plural and with sub-segmental affixation in the Plural. The hierarchy in (136d.), which accounts for such cases, corresponds to a 'lack of variation' case with respect to secondary articulation in the expression of Number; moreover, in such

languages secondary articulation does not occur, at least with respect to the phonological expression of Number. While important for the elucidation of the mechanism of Plural formation in Romance, the particular fact that the Plural formative is a sub-segment affixed to a Singular base bears relatively little relevance to MIM effects proper. To conclude, no matter what analysis we adopt for Italian and other Romance languages where there is no secondary articulation as Number inflection (full vowel Number affix or floating feature/sub-segment on the theme vowel), secondary articulations are not licensed as a means of expressing Number in those languages. They are closer to the pattern of (Classical) Latin, where no word-final palatalization occurred word-finally, and their behavior is captured by the hierarchy in (138), which repeats (136d.) (FAITH » PK/[hi]):

(138) *C^{Sec.} » FAITH (LICENSE(C^{Sec.}, PL.)

In the same context of number expression in Romance nominals, the applicability of the Marked in the Marked schema can be assessed in Romanian if we consider an alternative scenario. Recall that in §1.2 of this chapter evidence was brought to support the idea that masculine and neuter Romanian nominals all have the underlying theme vowel /u/ in the Singular, and that the high vowel marker deletes except when necessary for syllabification. However, there is an alternative scenario according to which non-alternating Singular forms in Romanian (like *mof*, ‘old man’) are not marked underlyingly with /u/. According

to such a view, the final vowel [u] in forms whose stem ends in an unsyllabifiable consonant cluster (like *akru*, ‘sour’) is epenthetic, and its insertion is necessary in order to satisfy the sonority sequencing requirement imposed by undominated SONCON. Considering such a scenario becomes necessary in the broader context of Romance morpho-phonology if we consider epenthesis accounts that have been proposed for Spanish (see Contreras 1977; Harris 1969, 1980 and Saltarelli 1970, 2001 for discussion surrounding Spanish epenthesis).

The question that needs to be addressed is whether the MIM schema proposed for Romanian can handle consonant-final masculines and neuters which are not vowel-final underlyingly. The answer to this question is in the affirmative and will be presented in its essential lines in the remainder of this section⁹⁴.

Consider first nominals ending in a single consonant or a syllabifiable consonant cluster (the *moʃ* type). These nominals fall under the scope of ranking (136a.) or the MIM Schema proper (LICENSE(C^{Sec.}, PL.) » FAITH » *C^{Sec.}), where FAITH covers both MAX-IO and DEP-IO. A relevant tableau is presented in (139):

(139) Table 47 *PK/[hi] » LICENSE(C^{Sec.}, PL.) » FAITH (MAX/DEP-IO) » *C^{Sec.}

/moʃ _{Sg.} /	LICENSE(C ^{Sec.} , PL.)	FAITH	*C ^{Sec.}
a. ☞ [moʃ] _{Sg.}			
b. [moʃu] _{Sg.}		*!	
c. [moʃ ^w] _{Sg.}	*	(*)	*

⁹⁴ Again, it should be noted that this is not an application of the MIM generalization in its strict sense, where there should be relative phonological similarity between Singular and Plural. However, as we will see in the remainder of this section, the MIM Schema can be used to account for the Standard Romanian facts under an ‘epenthesis’ scenario.

Although the vertical lines in (139) are solid, the tableau as such does not offer ranking arguments for the constraints in question – they have been provided by the analysis of nouns with underlying theme vowels. The actual output (139a.) satisfies all relevant constraints. The epenthesis candidate (139b.) violates faithfulness (DEP-IO), while the other sub-optimal candidate (139c.) violates both the licensing constraint and the markedness constraint against consonants with final labialization (depending on the scenario that leads to final labialization, this candidate may also violate faithfulness).

To account for ‘epenthesis’ forms such as *akru* (‘sour’), the relevant sub-hierarchy is MAX-ROOT-IO, SONCON » *PK/[hi] » FAITH extracted from the constraint lattice for number marking in Romanian (129):

(140) Table 48 MAX-ROOT-IO, SONCON » *PK/[hi] » FAITH (MAX/DEP-IO)

/akr _{Sg.} /	MAX-ROOT-IO	SONCON	*PK/[hi]	FAITH
a.  [akru] _{Sg.}			*	*
b. [akɾ] _{Sg.}		*!		
c. [ak] _{Sg.}	*!			*

It can be seen that MAX-ROOT-IO and SONCON are actually enough to yield the actual output (140a.) in Tableau (140). The fully faithful candidate (140b.) loses due to a fatal violation of SONCON, since it has a coda rising in sonority. Also, the deletion candidate (140c.) is eliminated due to the fact that it incurs a violation of undominated MAX-ROOT-IO.

It appears therefore that the analysis proposed for Standard Romanian under the assumption that Singular nominals are underlyingly marked with /-u/ carries over to the hypothetical scenario according to which Singular forms are underlyingly bare stems, and [-u], to the extent it appears in outputs, is epenthetic. This makes the analysis of Standard Romanian in principle applicable to epenthesis cases in Romance. As in the case of Romance sub-segmental affixation, this is an interesting result, because MIM was stated as a generalization made under phonological similarity in the sense that the Singular and the Plural have similar phonological exponents (high vowels).

The Marked in the Marked Schema in Number inflection is thus adequate to account for the observed facts in the dialects of Romanian under investigation as well as in other Romance languages where Number is expressed by means of vocalic affixes or asymmetric sub-segment affixation.

Having discussed the factorial typology of the MIM Schema in dialects of Romanian and its possible extensions to Romance, let us explore some historical implications. Within an optimality-theoretic approach to diachrony, it is commonly assumed that language change involves constraint reranking (for work on language change in Optimality Theory see, among others, Jacobs 1995, Bermúdez-Otero 1996, Cho 1998, Green 2001, Oh 2002). As for what constraints undergo promotion or demotion in the reranking process, there is no agreement among specialists. For example, while some researchers claim that language change

involves promotion of markedness constraints⁹⁵ and creates unmarked structure, (Billerey 2000, Gess 2001, Green 2001, Kiparsky 2004 etc.), other researchers highlight the role of markedness demotion in diachronic change, resulting in the emergence of marked structure (Albright 2004, Deo and Sharma 2005, Morin 2005).

What is the contribution the study of MIM effects can make to the understanding of the reranking processes in language change? Romanian, one of the case studies presented in this dissertation (Chapter 5) allows us to shed light on the relation between constraint reranking and the diachronic emergence of MIM patterns, at least for the linguistic system in question.

Recall that Standard Romanian enforces a ban on final high vowels, in particular on the affixes *-u* (Singular) and *-i* (Plural), so that whenever these vowels are not required for syllabification they are either deleted (Singular, (141a.)) or coalesced with the final consonant of the stem, yielding consonants with secondary articulation (Plural, (141b.)):

(141) Standard Romanian

/lup-u _{Sg.} /	→ [lup] _{Sg.}	*[lupu]	‘wolf’
/lup-i _{Pl.} /	→ [lup ^ɨ] _{Pl.}	*[lupi]	‘wolves’

⁹⁵ In this respect, language change would represent the opposite of language acquisition, a process which has been claimed to involve demotion of markedness constraints (Tesar and Smolensky 1993, 1996, 1998, Gnanadesikan 1996, Hayes 2004 etc.)

Earlier in this section I showed that that the Standard Romanian facts are essentially derivable from a MIM Schema represented, in a simplified form, as (*PK/[hi] ») *LICENSE(C^{Sec.}, PL.)* » *FAITH* » *C^{Sec.}⁹⁶. In Late Latin or in Common Romanian (a reconstructed stage in the development of Romanian prior to its breakup into dialects around the 10th century A.D.), Number affixes were always present in the output as full vowels, with no deletion or coalescence:

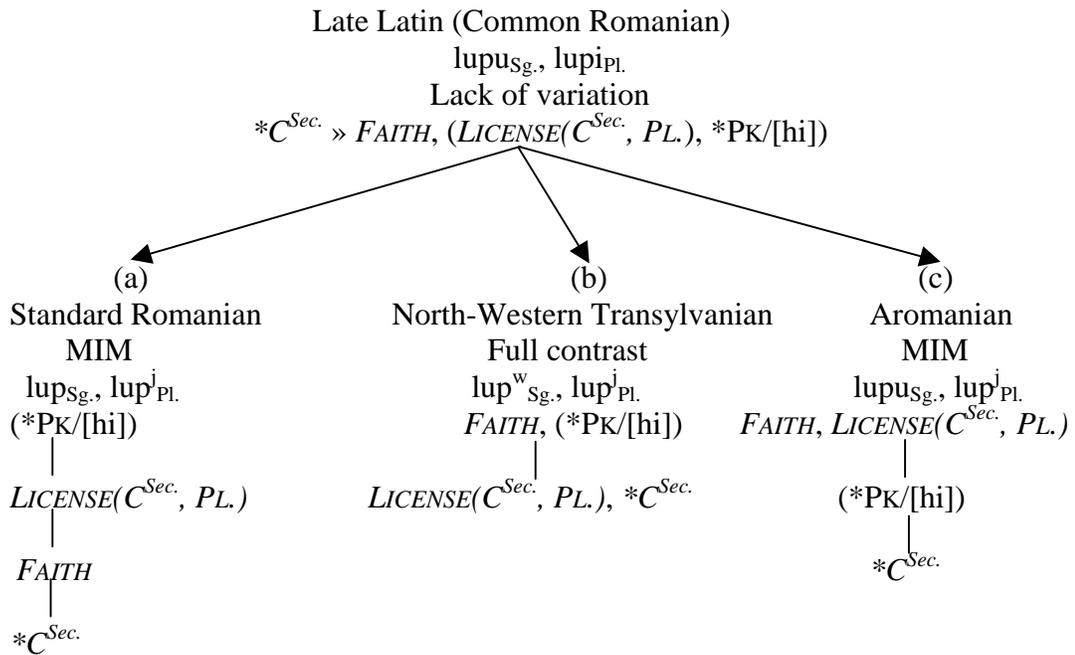
(142) Late Latin (Common Romanian)

<i>/lup-u_{Sg.}/</i> → [lupu] _{Sg.}	* <i>[lup]</i>	‘wolf’
<i>/lup-i_{Pl.}/</i> → [lupi] _{Pl.}	* <i>[lup^j]</i>	‘wolves’

The Late Latin (Common Romanian) pattern is represented by the ‘lack of variation’ hierarchy presented above, *C^{Sec.} » *FAITH*, (*LICENSE(C^{Sec.}, PL.)*), *PK/[hi]). As part of the factorial typology of the MIM Schema, two other constraint hierarchies have been presented: full contrast, *FAITH*, (*PK/[hi]) » *LICENSE(C^{Sec.}, PL.)*, *C^{Sec.} (North-Western Transylvanian, NWT) and a modified version of MIM, *FAITH*, *LICENSE(C^{Sec.}, PL.)* » (*PK/[hi]) » *C^{Sec.} (Aromanian). The complex picture which represents the diachronic emergence of Romanian dialects is shown in (143) below:

⁹⁶ Constraints which are part of the MIM Schema are given in italics.

(143) Figure 12 Constraint reranking in the evolution of Romanian



If we consider the passage from Late Latin (Common Romanian) to present-day dialects of Romanian, we note that both promotion and demotion of markedness can be invoked. For example, the emergence of all of the three patterns illustrates the demotion of the markedness constraint which prohibits the occurrence of consonants with secondary articulation MIM pattern (*C^{Sec.}). This gives rise to a new, marked phonological structure represented by C^{Sec.}. On the other hand, we witness promotion of the licensing constraint above faithfulness in Standard Romanian (143a.), which accounts for the Singular-Plural asymmetry whereby consonants with secondary articulation occur in the grammatically Plural, but are disallowed in the unmarked Singular. The presence of secondary articulations in both the Singular and the Plural in North-Western Transylvanian

(143b.) is made possible by the demotion of LICENSE(C^{Sec.}, PL.) and *C^{Sec.} (and possibly also by the demotion of *PK/[hi]). The Aromanian case (143c.) is similar to that of Standard Romanian, with the exception of the relation between faithfulness and licensing, which are not crucially ranked with respect to each other. This allows for faithful parses of the affix in both the Singular and the Plural, but secondary articulation only in the marked Plural.

In sum, as to the reranking issue illustrated by the emergence of Romanian dialect patterns representing the factorial typology of the MIM Schema, no decisive argument can be made as regards a consistent rule of markedness promotion or demotion. Nevertheless, a unifying factor is represented by the demotion of the context-free markedness constraint *M. As a cross-linguistic generalization, this is a necessary condition for the emergence of MIM patterns in the daughter language(s) where such patterns occur.

4. An alternative approach: Morpheme Realization

As already shown, a scrutiny of Romanian number morphology reveals an asymmetry in the marking of Singular and Plural in that the latter is always expressed overtly. It would therefore seem reasonable to consider an analysis in terms of morpheme realization.

Constraints on morpheme realization have been proposed in the OT literature in a variety of forms (Samek-Lodovici 1992, 1993, Gnanadesikan 1997, Rose 1997, Walker 2000b, Kurisu 2001, Iscrulescu 2004a etc.). Although there are

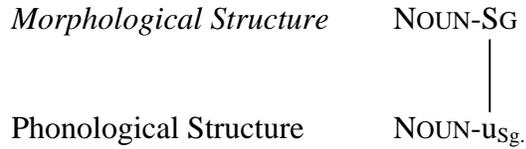
sometimes important differences between individual implementations of Morpheme Realization, most of the formulations have share the idea that inflected outputs contain phonological material that is affiliated to the respective inflectional morphemes. For example, Morpheme Realization can be stated as a correspondence constraint operating between morphological and phonological structure, as in Walker (2000b), Walker and Feng (2004), Iscrulescu (2004a) and Feng (2006):

(144) REALIZE-MORPHEME ‘A morpheme (X) in the output Morphological Structure has a correspondent in the Phonological Structure of the output.’

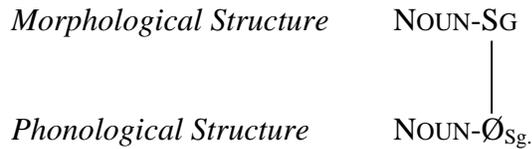
Given the way Morpheme Realization is defined in (144), REALIZE-MORPHEME has category-specific instantiations (Walker 2000b, Iscrulescu 2004a), because it presupposes correspondence between particular functional nodes in the Morphological Structure and material in the Phonological Structure. Thus we distinguish constraints that require the realization of a certain morpheme if the respective morpheme is represented by an inflectional node in the Morphological Structure (INFLECTIONAL MORPHEME \in {NUMBER, CASE, PERSON, TENSE...}). For the category of Number in Romanian, REALIZE-MORPHEME for the specific morpheme ‘Plural’ is assessed as follows:

(145) Figure 13 Assessing Morpheme Realization

a. REALIZE-MORPHEME satisfied:



b. REALIZE-MORPHEME violated:



In (145a.), REALIZE-MORPHEME is satisfied for the Singular, because the ‘singular’ node in Morphological Structure (MS) has a correspondent in Phonological Structure (PS). In (145b.), the constraint is violated, since the ‘plural’ node in MS lacks a correspondent in PS. The fact that plurality is always expressed in Romanian nominals would indicate that REALIZE-PLURAL is undominated (in descriptive terms, the syntactic head ‘plural’ in Morphological Structure always has a correspondent in the Phonological Structure of the output). A problem with the Morpheme Realization account is that REALIZE-MORPHEME (and in particular REALIZE-PLURAL) is blind as to the specific way in which the plural morpheme is realized, as long as there is detectable phonological material affiliated to it.

Another, more important objection to Morpheme Realization approaches is represented by the fact that they potentially overgenerate. The argument I present is based on Topintzi (2003), who shows that Morpheme Realization schemas are

inadequate for capturing the typology of Number marking. To adapt an example due to Topintzi, a constraint hierarchy like UNIFORMITY-IO_{Sg.} » REALIZE-MORPHEME » UNIFORMITY-IO_{Pl.} successfully captures the facts in Standard Romanian and Aromanian (coalescence and secondary articulation in the Plural only). The permutation REALIZE-MORPHEME » UNIFORMITY-IO_{Sg.}, UNIFORMITY-IO_{Pl.} corresponds to the situation in North Western Transylvanian Romanian (NWT), where secondary articulation is attested both in the Singular and the Plural. Languages exist where no secondary articulation is allowed, either in the Singular, or the Plural, under the ranking UNIFORMITY-IO_{Sg.}, UNIFORMITY-IO_{Pl.} » REALIZE-MORPHEME (Romance languages like Italian). However, the factorial typology associated with the Morpheme Realization schema would predict that there are languages where there is secondary articulation in the Singular, but not in the Plural (UNIFORMITY-IO_{Pl.} » REALIZE-MORPHEME » UNIFORMITY-IO_{Sg.}). The rankings are summarized in (146):

(146) Table 49 Factorial typology with Morpheme Realization

<i>Constraint ranking</i>	<i>Facts</i>	<i>Language</i>
a. UNIFORMITY-IO _{Sg.} » REALIZE-MORPHEME » » UNIFORMITY-IO _{Pl.}	Secondary articulation in the Plural, not the Singular	Standard Romanian, Aromanian
b. REALIZE-MORPHEME » UNIFORMITY-IO _{Sg.} , UNIFORMITY-IO _{Pl.}	Secondary articulation in Singular and Plural	North Western Transylvanian
c. UNIFORMITY-IO _{Sg.} , UNIFORMITY-IO _{Pl.} » » REALIZE-MORPHEME	No secondary articulation in Number marking	Italian
d. UNIFORMITY-IO _{Pl.} » REALIZE-MORPHEME » » UNIFORMITY-IO _{Sg.}	Secondary articulation in the Singular, not the Plural	Not attested

Languages such as those in (146a.), (146b.) and (146c.) are predicted to exist both under the MIM approach and the Morpheme Realization schema. In addition, the Morpheme Realization account predicts the existence of a type that is not attested (146d.), for which the MIM model makes the correct prediction and rules it out.

5. Summary

In this chapter I offered an account of Number marking in Romanian, where there is a notable asymmetry between the grammatically marked Plural and the unmarked Singular with respect to their ability to allow for marked phonological structure (consonants with secondary articulation).

In Standard Romanian, which constitutes the focus of the analysis, the Singular never sponsors secondary articulations as the (expected) result of the coalescence of the high vowel affix with the final consonant of the root, while the Plural displays palatalization whenever possible, in order to avoid a high vowel syllable peak except when a faithful parse of the Number affix is necessary for considerations of syllable well-formedness. Words that carry the morpho-syntactic specification for the unmarked category ('Singular') do not allow for consonants with secondary articulation, not even in final position before a front vowel.

Compare the nouns in (147):

(147) Blocking of secondary articulation in the Singular

- | | |
|--|---------------------|
| a) /mimi/ _{Pl.} → [mim ^j] | 'mimes' |
| b) /mimi/ _{Sg.} → [mimi] | 'proper name, Mimi' |

Although the forms (147) are similar in underlying segmental makeup, it is only in the plural (147a.) that the final consonant palatalizes before the front vowel [i], whereas no palatalization occurs in the singular form (147b.). In the plural word we find both a plain [m] (word-initially) and a palatalized one [m^j] word-finally, the latter being the expression of plurality.

This is not to say that the Singular and the Plural cannot express a similar range of contrasts. This possibility is instantiated by the North-West Transylvanian

dialect of Romanian, where both the Singular and the Plural can license secondary articulations (labialization in the former and palatalization in the latter).

There is also the possibility of having no contrast between the categories in point of plain and secondary articulation consonants, as we can see in other areas of Romance (Latin, Italian), where only plain consonants occur.

What we do not see is a language in which the (unmarked) Singular sponsors marked phonological structure that is disallowed in the (marked) Plural. The Marked in the Marked Schema and the factorial typology based on it predicts exactly this kind of result, which is in line with our predictions as to the asymmetry induced by the different typological markedness status of the categories.

CHAPTER 6

PHONOTACTIC MARKEDNESS IN MAYAK

0. Introduction

This chapter examines the application of the Marked in the Marked Schema (LICENSE(M,g) » FAITH » *M) in a case of marked phonotactic structure in the Mayak language. The relevant marked phonological structure is represented by intervocalic stops in the grammatically marked Passive Voice.

In Mayak, intervocalic stops generally spirantize and undergo voicing, but fail to do so in the Passive, while the less grammatically marked Active displays regular intervocalic voiceless stop spirantization. It should be noted that both the Active and the Passive are formed in a similar fashion, by suffixing a VC morpheme to a consonant-final root. To complicate the matter, the continuant obstruents that result from spirantization are allophones of the homorganic stops, which obscures to a certain extent the activity of the Marked in the Marked Schema and calls for the need of context-free markedness constraints to account for such cases.

The Mayak phenomena are particularly interesting because they highlight the interaction of the Marked in the Marked schema with allophonic variation, as in the general case the segments that are the outcome of lenition are allophones of the respective voiceless stops in intervocalic position.

In §1 I lay out the main facts about Mayak phonology and morphology that are subject to analysis. §2 discusses the content and applicability of the notion ‘lenition’ in Mayak, as well as the phonological markedness of vowel-stop-vowel sequences asymmetrically licensed in the Passive voice. §3 offers an analysis along the lines of the Marked in the Marked schema and shows how the general schema should be modified to accommodate the data and theory-internal requirements such as Richness of the Base. In §4 I discuss an alternative analysis and I show that the analysis put forth in this dissertation is superior. Finally, §5 briefly states the conclusion of the chapter.

1. Background data on Mayak phonology and morphology

1.1. The sound system and prosody of Mayak

Mayak (Northern Burun) is a Western Nilotic language spoken in the Blue Nile Province of Sudan (Köhler 1955, Hall and Hall 1996). The Mayak data and descriptive generalizations are due to Andersen (1999, 2000).

The vocalic inventory of Mayak comprises ten items, organized into two sets distinguished by the feature [ATR]:

(148) Mayak vowel inventory

[-ATR] ɪ ɛ a ɔ ʊ

[+ATR] i e ʌ o u

The relatively complex consonant inventory is shown in (149) below:

(149) Table 50 Mayak consonants

	Bilabial	Interdental	Alveolar	Palatal	Velar	Labio-dental	Glottal
Voiceless stop	p	t̪	t	c	k		ʔ
Voiced stop	b	d̪	d	j	g		
Implosive stop			d̥				
Voiced fricative		ð			ɣ		
Nasal	m	ɲ	n	ɲ	ŋ		
Lateral			l				
Trill			r				
Glide (approximant)				j		w	

Not all of the segments in Table (149) represent phonemes. For example, the dental nasal [ɲ] is an allophone of /n/ that occurs before dental stops. Of particular interest for the present case study is the fact that the approximants [w, j] and the fricatives [ð, ɣ] represent allophones of the homorganic voiceless stops in intervocalic position. Thus [w] is an allophone of /p/, [j] an allophone of [c], [ð] an allophone of /t/ and [ɣ] an allophone of /k/ (Andersen (2000)). Likewise, the implosive stop [d̥] is an allophone of intervocalic /t/. Also, the voice contrast does not operate in word final position, where stops are unspecified for [voice].

We should therefore not expect intervocalic voiceless stops in Mayak. As we shall see, these stops normally undergo lenition and in most cases are turned

into voiced continuants when they end up between two vowels in processes of affixation. The process of lenition fails to take place in the Passive voice, as compared to the Active, under comparable phonological circumstances (affixation of a VC marker to a CVC stem). I will return to these issues in §1.2. Intervocalic voiceless stops are sometimes attested in simplex words that represent unassimilated loans.

Mayak has a syllable inventory that excludes complex margins. The following types of syllables are attested⁹⁷:

(150) CV	k Λ	‘with’
	gu.dɔn	‘bull’
CVV	pii	‘water’
	taa.rɔk	‘person’
CVC	r Λ t	‘chief’
	kɪ.kat	‘broom’
CVVC	g u ok	‘dog’
	dɪm.bΛr	‘I weeded it’

⁹⁷ The relevant syllables in polysyllabic words are given in bold type.

V	a.ɬi.rim.biil	‘car’ ⁹⁸
	i.jʊʊ.jɬɾ	‘I found you’
VV	aa.mɛɛ.li	‘I’ll dance’
VC	al.bun	‘coffee’

1.2 Morpho-phonological processes

An important phonological process that affects Mayak consonants is lenition in intervocalic position⁹⁹. Mayak lenition affects the manner of articulation and voice features of voiceless stops, which become voiced fricatives or approximants, while the place of articulation is remains unchanged¹⁰⁰:

(151) Intervocalic lenition

p → w

t̥ → ð

c → j

k → ɣ

⁹⁸ This word has an intervocalic voiceless stop ([t̥]). It is most probably an unassimilated loan from English (‘automobile’).

⁹⁹ Another process that affects consonants is root-dominant coronal harmony, attested to some degree in Mayak as well as in other related Western Nilotic languages like Pãri (Andersen 1988, 1999).

¹⁰⁰ The voiceless alveolar stop [t̥] has a particular behavior in intervocalic position and alternates with the homorganic voiced implosive [ɖ]. I will discuss the behavior of [t̥] in more detail in § 2.

Intervocalic stop lenition is pervasive in Mayak morphology and affects both nominal and verbal inflectional paradigms, where it ensues from affixation processes.

In nouns, where most native roots are CVC or CVVC, lenition takes place in the formation of number. Mayak has inflections for both the Singular and the Plural, and stem-final stops lenite when a VC number suffix is attached. Lenition in number morphology is illustrated in (152) below (in some of the forms ATR vowel harmony occurs):

(152)	Singular	Plural	
	ʔeð-ɪ̄t̚	ʔēt̚	‘faeces’
	leɣ-ɪ̄t̚	lēk	‘tooth’
	ʔiw-ɪ̄t̚	ʔip	‘arrow’
	naac	nʌj-uk	‘calf’
	mɛɛk	mɪɣ-uk	‘spider’

Stem-final sonorants are not affected in intervocalic contexts:

(153)	Singular	Plural	
	kɪn-aṭ	kɪn	‘liver’
	rɪm-aṭ	rɪm	‘blood’
	caŋ	caŋ-ak	‘donkey’
	kʌʌl	kʌʌl-ak	‘hole’
	ḍir	ḍir-ak	‘shield’

In the Active voice, verbal morphology is subject to the same general morpho-phonological rules. This can be illustrated in the formation of the Past Tense active of subject-oriented transitive verbs:

(154)	Uninflected stem	Active	
	lep	lew-u	‘open’
	mɛṭ	mɛð-u	‘beat’
	mat	maɸ-u	‘suck’
	kac	kaj-u	‘bite’
	ṭak	ṭay-u	‘wash’

However, in the passive voice intervocalic stems do not undergo expected lenition of intervocalic stops. Consider again the same verb forms as in (154), this time inflected for the passive:

(155)	Uninflected stem	Passive	
	lep	lep-ir	‘open’
	mɛt̚	mɛt̚-ir	‘beat’
	mat	mat-ir	‘suck’
	kac	kac-ir	‘bite’
	t̚ak	t̚ak-ir	‘wash’

The asymmetric phonological behavior of intervocalic stops in Mayak verbs can be seen if we examine the inflectional paradigm of the verb *maat̚* (‘to drink’), where the consonant-final stop regularly undergoes lenition in the Active voice, but not in the Passive (note that the contexts in which lenition applies/ fails to apply are very similar, as the relevant suffixes are all VC):

(156)	/maaD/	‘to drink’
PASS	maat-ɪr	‘It is being drunk.’
1SG	maað-ɬr	‘I am drinking it.’
2SG	maað-ir	‘You are drinking it.’
3SG	maað-er	‘He is drinking it.’
1PL incl.	maat-ini	‘We are drinking it.’
1PL excl.	maað-ənən	‘We are drinking it.’
2PL	maað-er	‘You are drinking it.’
3PL	maat-ker	‘They are drinking it.’

In the Mayak data at hand person and number is specified only for the Active voice. It may be the case that in the Passive there is syncretism of person and number, so only one output exists – Andersen (1999) mentions a unique form in the Passive voice¹⁰¹. This situation has no essential impact on the analysis, since both Active and Passive voice are VC, irrespective of Number or Person specification.

Assuming underlying stem-final voiceless stops, we can see that in contrast with the Passive, where the stop is realized faithfully with respect to continuancy, all Active forms show spirantization of the intervocalic stop. The only apparent

¹⁰¹ This is in line with the observation of Greenberg (1966a), according to which marked grammatical categories make fewer distinctions than unmarked categories.

exception is the plural inclusive *maq̄t-ini* ‘we are drinking it’, whose stem-final stop [t̄] does not turn into homorganic [ð], as expected. Andersen (1999) attributes to diachrony the failure of the stem-final stop to lenite in the Plural and in the Passive. Historically, the first person Plural inclusive affix is consonant-initial (*tini*), and of course before a consonant-initial suffix the final stop of the root does not spirantize.

From the perspective of this dissertation, the interesting fact is that intervocalic stops do not lenite in the Passive voice, so the marked phonotactic structure (VTV) occurs. In contrast, stops flanked by two vowels generally turn into the homorganic voiced fricatives or approximants, with the exception of alveolar [t], which alternates with the homorganic implosive [d]. Before offering an analysis of the Mayak facts, I will discuss the notion of lenition and the phonological markedness of the phonotactic structures involved.

2. Lenition and phonological markedness

As we have seen, what Andersen (1999, 2000) labels ‘lenition’ in Mayak is actually a bundle of processes that can be lumped into two groups. First, most intervocalic voiceless stops [p, t̄, k, c] become voiced, continuant sounds, with the same place of articulation ([w, ð, ɣ, j]). Second, the voiceless alveolar stop [t] has a different behavior. In intervocalic position it does not change its manner of articulation and instead becomes a homorganic implosive [d].

Lenition is a somewhat imperspicuous term that covers a variety of phonological phenomena that affect consonants, including degemination, fricativization (spirantization), flapping, voicing, debuccalization and even deletion. Among processes of lenition, fricativization is very well represented cross-linguistically. In this respect, Lavoie (2001) finds that fricativization is represented in a significant proportion of the lenition language database under study (39 of 92 languages). According to Kirchner (1998, 2000, 2004), what underlies lenition phenomena is the articulatory criterion, according to which all instances of lenition involve some form of reduction of constriction degree (see Kirchner 1998 and the references therein for an extensive discussion and review).

Of interest from the perspective of the present study is the relative phonological markedness of the phonotactic structures involved in Mayak intervocalic lenition. In general, lenition processes involve a decrease in markedness of phonological structure (Lavoie 2001). More recently, Vijayakrishnan (2003) characterizes lenition as reduction of marked structure resulting in ‘weak’, relatively unmarked configurations, together with an overall increase in sonority.

Recall that the structure that is subject to lenition in Mayak is represented by a voiceless stop flanked by two vowels. From an articulatory point of view, producing a voiceless stop after a vowel involves an increase of the constriction degree (lower for the first vowel as compared to the adjacent stop) followed by a

decrease of constriction necessary for the articulation of the post-consonantal vowel. At the same time, along the dimension of voicing, the state of the vocal folds changes from vowel to voiceless stop and then to vowel. In contrast, a phonotactic structure consisting of a voiced fricative/approximant flanked by vowels involves more economical articulatory gestures. The vowel-stop passage calls for less variation in the constriction degree; also, the sequence is voiced throughout and no change is required in the state of the vocal folds. Thus intervocalic voiceless stops qualify as an articulatorily less natural, phonologically more marked structure. The lenition of intervocalic voiceless stops results in a decrease of articulatory gesture magnitude especially in the transition from vowel to consonant and from consonant to vowel and hence less articulatory markedness.

Lenition of intervocalic or postvocalic stops to voiced fricatives/ approximants is common cross-linguistically and is attested in a large number of languages, such as Spanish (Harris 1969, Martínez Celdrán 1991, Quilis 1993, Lewis 2001, Gonzalez 2003 etc.), Liverpool English (Harris 1990), Basque (Hualde 1991), Catalan (Hualde 1992), Gothic (Bennett 1980), Middle Korean (Ramsey 1991), Old Turkic (Hitch 1989), Hebrew (Idsardi 1998, Graf 1999, Koontz-Garboden 2001 etc.)¹⁰²

If fricativization and voicing of most intervocalic stops can be said to represent a process of lenition that leads to a decrease of phonological markedness, the treatment of the alveolar voiced stop [d], which turns into [d̪], is in all

¹⁰² See also numerous other examples and references in Kirchner (1998) and Lavoie (2001).

likelihood a different process, although Andersen (1999) mentions it as an instance of lenition on a par with the other ones. Moreover, Andersen regards [d̥] as an allophone of [d] that is the outcome of lenition in intervocalic position, but the same author also lists the implosive stop as one of the consonants that can occur in word-initial position, as in *dimɛt̪* ('bird'). An additional property that sets apart the alveolar stops [d] and [d̥] is their behavior with respect to consonant harmony (see Rose and Walker 2004 for an analysis of consonant harmony). Due to the scarcity of the data, we cannot go into details as to consonant harmony in Mayak, but it can be noted, following Andersen (1999), that while other root stops trigger place of articulation harmony in the suffix, the [d] is more permissive and allows for free variation.

It appears that the implosive stop occupies a singular position in the consonant inventory of Mayak and does not entirely pattern with the rest of the stops with respect to distribution and phonological processes in which it is involved. For these reasons, the so-called 'lenition' of [t] to [d̥] will not be discussed and will be left for future study.

In the following sections I will offer an optimality-theoretic account of Mayak intervocalic fricativization.

3. Analysis

3.1 Relevant constraints

Since Mayak lenition is blocked in the Passive Voice, where marked phonotactic structure is allowed, let us start by attempting to implement the Marked in the Marked Schema.

The essential ingredients are the constraint that licenses intervocalic stops in the Passive (LICENSE(VTV, PASS.)), the context-sensitive markedness constraint that bans intervocalic stops (*VTV) and the faithfulness constraint that militates for faithful preservation of continuancy (IDENT[cont]). The constraints are stated in (157) - (159) below:

(157) LICENSE(VTV, PASS.)

Let

- i. m be an occurrence of phonological structure ‘intervocalic voiceless stop (VTV)’ in an output O
- ii. γ be an occurrence of the morpho-syntactic feature(s) for a value ‘passive’ of the grammatical category of Voice

Then m in the Phonological Structure (PS) of an output O implies γ in the Morphological Structure (MS) of same output O.

(158) *VTV ‘No intervocalic voiceless stops.’

(159) IDENT[cont]¹⁰³ ‘IDENT[cont] ‘Let α be a segment in the input and β its correspondent in the output; if α is [γ continuant], then β is also [γ continuant].’

The activity of the contextual markedness constraint *VTV has been acknowledged among others by Hale and Reiss (1997), Cho (2001), Kawahara (2003), Flemming (2005). The existence of the constraint against intervocalic voiceless stops is in line with the remarks on the articulatory markedness of vowel-stop-vowel sequences discussed in §3.

In the analysis I will consider Active and Passive forms of the verb ‘to drink’, the Active *maað-er* (‘He is drinking it.’) and the Passive *maqt-ir* (‘It is being drunk.’). Both forms consist of a CVC stem to which a VC suffix is attached. To observe the principle of Richness of the Base, I will consider inputs with intervocalic stops (t) (§3.2) and inputs with intervocalic fricatives (ð) (§3.3).

3.2. Inputs with intervocalic stops

With respect to ranking arguments, the fact that there is no spirantization in the Passive voice indicates that IDENT[cont] dominates the constraint that bans intervocalic stops (*VTV):

¹⁰³ Although IDENT[voice] is also involved, since changes in the [voice] feature always accompany changes in continuancy, for ease of exposition I will restrict the faithfulness constraints in the analysis to IDENT[cont].

(160) Table 51 IDENT[cont] » *VTV (no lenition in the Passive)

/maat-ɪr _{Pass.} /	IDENT[cont]	*VTV
a. [maað-ɪr] _{Pass.}	*!	
b. ^ɸ [maat-ɪr] _{Pass.}		*

The emergence of output (160b.) as the actual winner is due to the fact that it satisfies the top-ranked faithfulness constraint IDENT[cont], which is violated by its competitor (160a.), so the violation of *VTV by the former candidate becomes immaterial.

However, in the Active voice we see lenition of intervocalic stops, which substantiates the partial ranking in (161):

(160) Table 52 LICENSE(VTV, PASS.) » IDENT[cont] (lenition in the Active)

/maat-ɛr _{Act.} /	LICENSE(VTV, PASS.)	IDENT[cont]
a. ^ɸ [maað-ɛr] _{Act.}		*
b. [maat-ɛr] _{Act.}	*!	

The suboptimal candidate (161b.) contains the marked VTV sequence, but it does not carry the morpho-syntactic features of the Passive voice, so it violates high-ranked LICENSE(VTV, Pass.). On the other hand, the licensing constraint does not apply to the optimal candidate (161a.), which does not contain an intervocalic stop, so the candidate in question wins, in spite of a violation of IDENT[cont].

From (160) and (161) it appears that the instantiation of Marked in the Marked Schema (162) works for the mappings /maat̩-ɛr_{Act.}/ → [maað-ɛr]_{Act.} and /maat̩-ɪr_{Pass.}/ → [maat̩r]_{Pass.}:

(162) The Marked in the Marked Schema for the Mayak Passive

LICENSE(VTV, PASS.) » IDENT[cont] » *VTV

Problems arise if we consider inputs that contain intervocalic fricatives or approximants, like /maað-ɛr_{Act.}/ or /maað-ɪr_{Pass.}/, which map onto the same output forms as above.

3.3 Inputs with intervocalic fricatives or approximants

Consider first the mapping /maað-ɛr_{Act.}/ → [maaðɛr]_{Act.} in the Active voice:

(163) Table 53 Active: /maað-ɛr_{Act.}/ → [maaðɛr]_{Act.}

/maað-ɛr _{Act.} /	LICENSE(VTV, PASS.)	IDENT[cont]	*VTV
a. ☞ [maaðɛr] _{Act.}			
b. [maat̩ɛr] _{Act.}	*!	*	*

In Tableau (163) the application of the constraint hierarchy (162) yields the actual output (163a.), since the output satisfies all relevant constraints, while the suboptimal candidate (163b.) violates LICENSE(VTV, PASS.).

The situation is different, though, for the mapping /maað-ɪr_{Pass.}/ →

[maatɪr]_{Pass.} in the Passive voice:

(164) Table 54 Passive: /maað-ɪr_{Pass.}/ → [maatɪr]_{Pass.}

/maað-ɪr _{Pass.} /	LICENSE(VTV, PASS.)	IDENT[cont]	*VTV
a. ☹ [maatɪr] _{Pass.}		*!	*
b. ☺ [maaðɪr] _{Pass.}			

The intended winner is the frowny face candidate (164a.) in Tableau (164).

It violates both IDENT[cont] and *VTV, as compared with the actual winner (164b.), which satisfies all constraints.

In keeping with the principle of Richness of the Base (Prince and Smolensky 1993/2004), the analysis should hold for any possible input, so the account of the Mayak data that takes into consideration only the constraints in (157) - (159) above turns out to be inadequate, as it leads to different results as a function of the structure of the input.

3.4 Interactions with allophonic variation

This situation encountered in the previous section is not entirely unexpected, since the general distribution of Mayak stops and fricatives or approximants is allophonic in the sense that fricatives and approximants are generally allophonic realizations of stops in intervocalic position.

In Optimality Theory, allophony is a derived property that emerges from a particular constraint hierarchy that captures the conflict between context-free markedness, context-sensitive markedness and faithfulness, as shown by Kager (1999). According to Kager, allophonic variation results from the following schema:

(165) Allophonic Variation

Contextual markedness » Context-free markedness » Faithfulness

In the particular case of Mayak, the contextual markedness constraint is *VTV (158), and the relevant faithfulness constraint is IDENT[cont] (159). The Marked in the Marked Schema (162) shares both these constraints with the schema for allophonic variation (165). What is missing from the picture is the context-free markedness constraint.

Heuristically, the context-free markedness constraint is one that bans fricatives or approximants, and can be conveniently defined in (166):

(166) *ð ‘No fricatives (ð).’¹⁰⁴

¹⁰⁴ See Lombardi (2000) for an analogous constraint against the voiceless intervocalic fricative (*θ). For work of the marked status of interdental fricatives see Gnanadesikan (1997), Ladefoged and Maddieson (1996), Lombardi (2000), Gonzalez (2003) Kirchner (2004) etc. What is at stake here is the markedness of the stop-vowel-stop sequence rather than the markedness of individual segments.

Note that the constraint in (166) represents a particular instantiation of a more general markedness constraint that bans fricatives/ approximants, which can be expressed in terms of feature co-occurrence (*([+consonantal], [-continuant])). For ease of exposition, I will continue to use the * δ constraint throughout the chapter.

The particular instantiation of the Allophonic Variation in Mayak can be stated as in (167):

(167) *VTV » * δ » IDENT[cont]

The ranking in (167) predicts that intervocalically no voiceless stops are allowed, and to avoid an intervocalic stop fricativization to [δ] becomes possible, at the cost of sacrificing faithfulness to continuancy. It is obvious that the Allophonic Variation schema alone does not work for Mayak, as the undominated contextual markedness constraint *VTV does not allow intervocalic stops to occur in the Passive Voice, contrary to the observed facts.

On the other hand, amending the Marked in the Marked schema to the effect that context-free markedness is sandwiched between the licensing constraint LICENSE(VTV, PASS.) and the faithfulness constraint IDENT[cont] yields the actual outputs for the Mayak Active-Passive consonant alternations.

Let us examine first the mappings /maat- ϵ r_{Act.}/ → [maa δ ϵ r]_{Act.} and

/maat-ɪr_{Pass.}/ → [maatɪr]_{Pass.}. The fact that the intervocalic stop spirantizes intervocalically in the Active voice offers a ranking argument for LICENSE(VTV, PASS.) and the context-free markedness constraint, which bans fricatives altogether:

(168) Table 55 LICENSE(VTV, PASS.) » *ð (lenition in the Active)

/maat-ɪr _{Act.} /	LICENSE(VTV, PASS.)	*ð
a. ☞ [maaðɪr] _{Act.}		*
b. [maatɪr] _{Act.}	*!	

The emergence of the actual output in (168) is ensured by the domination of *ð by LICENSE(VTV, PASS.). Indeed, the winning candidate (168a.) violates only the bottom-ranked constraint, which prohibits fricatives, while satisfying the top-ranked licensing constraint, which the loser (168b.), violates.

In the Passive voice, the constraint ranking in (169) ensures the success of the fully faithful candidate with no spirantization:

(169) Table 56 LICENSE(VTV, PASS.) » *ð (no lenition in the Passive)

/maat-ɪr _{Pass.} /	LICENSE(VTV, PASS.)	*ð
a. [maað-ɪr] _{Pass.}		*!
b. ☞ [maat-ɪr] _{Pass.}		

While the context-free markedness constraint *ð has been shown to be dominated by LICENSE(VTV, PASS.), it can be noted that *ð dominates faithfulness (IDENT[cont]). To see that this is the case, we need to examine the mappings involving inputs with fricatives (/maað-er_{Act.}/ → [/maaðer]_{Act.} and /maað-ir_{Pass.}/ → [maat̪ir]_{Pass.}). Recall that the mapping /maað-ir_{Pass.}/ → [maat̪ir]_{Pass.} has proven problematic for the initial Marked in the Marked Schema.

The faithful mapping in the Active (/maað-er_{Act.}/ → [/maaðer]_{Act.}) does not offer us a ranking argument for *ð and IDENT[cont]:

(170) Table 57 LICENSE(VTV, PASS.) » *ð, IDENT[cont]

/maað-er _{Act.} /	LICENSE(VTV, PASS.)	*ð	IDENT[cont]
a. [maat̪er] _{Act.}	*!		*
b. ↻ [maaðer] _{Act.}		*	

The ranking argument for *ð and IDENT[cont] is offered by the Passive forms, as shown in (171):

(171) Table 58 *ð » IDENT[cont] (no fricatives in the Passive)

/maað-ir _{Pass.} /	*ð	IDENT[cont]
a. ↻ [maat̪ir] _{Pass.}		*
b. [maaðir] _{Pass.}	*!	

In Tableau (171), the unlenited candidate (171a.) in the Passive wins over the lenited one (171b.) exactly because it satisfies high-ranking *ð.

From Tableau (160) we already know that IDENT[cont] dominates the context-sensitive markedness constraint *VTV. With this provision, we can state the final constraint ranking for Mayak intervocalic stop spirantization (*ð should be interpreted as a constraint that prohibits the occurrence of fricatives or approximants, seen as continuant consonants):

(172) LICENSE(VTV, PASS.) » *ð » IDENT[cont], *VTV

The hierarchy (172) can be regarded as a modification of the Marked in the Marked Schema (LICENSE(M,g) » FAITH » *M), which takes into account the effects of allophonic variation by restricting pure, phonological allophony to forms outside the grammatically marked category ‘passive’.

We can generalize the hierarchy in (172) by taking a closer look into the nature of the constraints. Because it states a (functionally grounded) morphological condition on the occurrence of phonological marked structure (M), the positive licensing constraint LICENSE(M,g) can be regarded as a morphological context-sensitive markedness constraint (M-CSM). The next constraint on the hierarchy is *ð, which bans fricatives and approximants irrespective of context, so it represents an instance of context-free markedness constraint (CFM). Next, IDENT[cont] is an

instance of faithfulness constraint (FAITH). Bottom-ranked *VTV is a phonological context-sensitive markedness constraint (P-CSM).

The generalized schema that emerges from the analysis is given in (173):

(173) M-CSM » CFM » FAITH, P-CSM

Note that the sub-hierarchy (M-CSM » CFM » FAITH) of schema (166) mirrors Kager's allophony ranking, but with morphological sensitivity. The schema above encapsulates the workings of grammatical (morphological) markedness as the driving force for the phonological asymmetry noted in Mayak. The analysis essentially rests on the assumption that Active and Passive morphology are similar to a large extent (affixes are VC in both), so the asymmetry stems from the special ability of the grammatically marked Passive to license a marked phonological configuration, an ability that we attribute to considerations of economy in the more frequent, less marked Active.

Before we conclude the discussion of Mayak, let us consider a couple of residual issues.

4. Residual issues

4.1 The representation of the Passive suffix

Throughout the analysis of Mayak lenition it has been assumed that intervocalic stops arise in the Passive Voice due to suffixation of a VC stop to a CVC root, and

the blocking of the process of spirantization is *prima facie* surprising, given its quasi-allophonic character.

For example, for the passive verb form *maqt-ir* ('it is being eaten') the voice affix *-ir* has been tacitly assumed to be underlyingly (and superficially) VC, under which circumstances resistance to lenition is problematic and calls for the application of the modified Marked in the Marked schema, as in the preceding section.

A closer examination of other passive forms in Mayak seems to suggest that the passive morpheme is actually consonant-initial underlyingly (/t̪ir/):

(174) Possible evidence for a consonant-initial passive suffix

- | | | |
|------------------|-------------------|---------------------|
| a) <i>gɛp-ir</i> | <i>gɪw-i-t̪ir</i> | 'It is being eaten' |
| b) <i>ʔip-ir</i> | <i>ʔip-i-t̪ir</i> | 'It is being shot' |

The examples in (174) show that the so-called 'underived' passive forms *gɛp-ir* and *ʔip-ir* display the expected VC suffix, while the 'derived' passives *gɪw-i-t̪ir* and *ʔip-i-t̪ir* contain a CVC passive suffix *t̪ir/t̪ir* (the vowel intervening between the root and the suffix may be a stem-building element). While the derived passives in (174) do not raise problems for the analysis (the intervocalic dental stop fails to lenite, as expected in the Passive), they may seem to offer evidence for a Passive suffix that starts with a dental stop. An alternative analysis

would have to be entertained, involving an opaque interaction of t -deletion and faithful parsing of the final consonant of the stem in underived passives.

This solution, attractive as it may seem, is faced with a number of difficulties. The essential problem, noted by Andersen (1999), is that positing a passive suffix that begins with $/\text{t}/$ after a root-final consonant would imply the existence of a rule of coronal harmony, whose consequence is the spreading of the place of articulation of a non-liquid to a following dental stop. The prediction of such a rule is that we should not find $[\text{t}]$ after any other consonants than liquids.

This prediction is not borne out in a number of words, such as *giriṅṅti* ('hippopotamus'). The sequence $[\text{nṅt}]$ is problematic, on the grounds that a dental consonant like $[\text{n}]$ should be analyzed, according to the phonology of Mayak, as the outcome of an underlying alveolar $/\text{n}/$ followed by a dental stop. If the rule of coronal harmony is active, the expected output of $/\text{giriṅṅti}/$ is $*[\text{girinti}]$, rather than the actual output *giriṅṅti*.

A possible answer could rest in the observation that most words that behave like *giriṅṅti* are loans from Arabic, so they should be treated separately from the words of native stock. Yet the dental voiced stop $[\text{d}]$ is found to occur after nasals in native words, for example in cases of plural affixation with the suffix $[\text{ḍin}]$, as in *jum-ḍin* ('monkeys'). It seems therefore that the consonant-initial Passive suffix hypothesis is hard to defend, so we have to assume that at least

synchronically one should entertain the view that the underlying form of the Passive morpheme is indeed VC.

As the vast majority of Active suffixes are vowel-initial as well, the analysis of the Active-Passive asymmetry in Mayak as motivated by a functionally grounded licensing asymmetry between the grammatical categories is borne out.

4.2 An alternative analysis: Positional Faithfulness

Another issue for analysis of the Mayak data is the potential to account for the facts without resorting to the positional markedness mechanism represented by positive licensing. An alternative analysis that could be in principle entertained for Mayak is one based on Positional Faithfulness (PF).

Let us assume a Positional Faithfulness schema of the type IDENT[cont]_{Pass.} » *VTV » IDENT[cont], as an instantiation of the general PF schema FAITH_α » M » FAITH already discussed in Chapter 3 §2.1

Without entering into details, as we can see from Tableaux (175) and (176) below, the PF schema works for the inputs with intervocalic stops discussed in §3.2:

(175) Table 59 Passive: /maat̪-ɪr_{Pass.}/ → [maat̪ɪr]_{Pass.}

/maat̪-ɪr _{Pass.} /	IDENT[cont] _{Pass.}	*VTV	IDENT[cont]
a. [maaðɪr] _{Pass.}	*!		*
b.  [maat̪ɪr] _{Pass.}		*	

(176) Table 60 Active: /maat-ɛr_{Act.}/ → [maað-ɛr]_{Act.}

/maat-ɛr _{Act.} /	IDENT[cont] _{Pass.}	*VTV	IDENT[cont]
a. ☞ [maað-ɛr] _{Act.}			*
b. [maat-ɛr] _{Act.}		*!	

Consider now the mappings with underlying intervocalic fricatives. In this case we run into the same problem as in the application of the MIM schema: the PF account works for the Active (Tableau (177)), but not in the Passive (Tableau (178)):

(177) Table 61 Active: /maað-ɛr_{Act.}/ → [maaðɛr]_{Act.}

/maað-ɛr _{Act.} /	IDENT[cont] _{Pass.}	*VTV	IDENT[cont]
a. ☞ [maaðɛr] _{Act.}			
b. [maatɛr] _{Act.}		*!	*

(178) Table 62 Passive: /maað-ɪr_{Pass.}/ → [maatɪr]_{Pass.}

/maað-ɪr _{Pass.} /	IDENT[cont] _{Pass.}	*VTV	IDENT[cont]
a. ☹ [maatɪr] _{Pass.}	*!	*	*
b. ☞ [maaðɪr] _{Pass.}			

As we can see in Tableau (178), the actual output (178a.), indicated by the frowny face symbol (☹) violates all relevant constraints, allowing candidate (178b.), which satisfies all of them, to win.

Recall that in the case of the MIM schema the analysis was rescued by taking into consideration context-free a markedness constraint (*Ǿ) ranked below LICENSE(VTV, PASS.), as in (179):

(179) LICENSE(VTV, PASS.) » *Ǿ » IDENT[cont], *VTV

The question that arises is whether the PF analysis can be rescued as well. As we are dealing with quasi-allophonic variation, the context-free markedness constraint against fricatives (*Ǿ) is a necessary ingredient of the analysis. If we examine Tableau (178), the only means by which to allow the actual output [maat̪ir]_{PASS.} to emerge as the winner is to assume that *Ǿ dominates IDENT[cont]_{PASS.}. This is tantamount to *Ǿ being undominated in Mayak, which would mean that no fricatives are allowed in the language. Nevertheless, this result is empirically inadequate, because we do see outputs that contain fricatives in Mayak.

Finally, a discussion of alternative approaches to Mayak morpho-phonology would remain incomplete without briefly mentioning yet another conceivable approach, represented by Output-Output (O-O) Correspondence (Benua 1997/2000 and others). O-O Correspondence could in principle be said to operate between the Passive and the uninflected stem (to which the voice affix is attached), resulting in underapplication of lenition in the Passive.

However, the O-O Correspondence account does not seem to be a viable alternative. This can be seen if we examine again the forms in (174), repeated below:

(180)

- | | | |
|-----------|------------|---------------------|
| a) gɛp-ir | gɪɪw-ɪ-ɬir | ‘It is being eaten’ |
| b) ʔip-ir | ʔip-i-ɬir | ‘It is being shot’ |

The forms in the second column of (180) represent the so-called ‘derived passive’, discussed in relation to the Passive suffix in §4.1 above. The failure of the O-O account is due to the resistance to lenition that [ɬ] displays in the suffix, not in the base of affixation.

The Mayak case is therefore best accounted for by a modification of the MIM schema that takes into consideration allophonic variation effects, as we have seen in §3.4. Both the Positional Faithfulness analysis and the O-O Correspondence account fail to capture the whole range of attested outputs.

5. Summary

Mayak lenition offers a fertile ground for testing the applicability of the Marked in the Marked hypothesis and schema in the particular case of voice inflection. As we have seen, Mayak has a productive process of intervocalic stop fricativization,

which, however, fails to apply in the Passive voice, whereas the Active, whose morphological markers are similar, regularly undergoes it.

The process of spirantization in Mayak is allophonic to a large extent (fricatives are generally allophones of stops in intervocalic position). However, the process of intervocalic spirantization is unexpectedly suspended in the Passive voice giving rise to phonotactically marked stop-vowel-stop sequences, while in the Active spirantization occurs regularly, although the phonological make-up of the two forms is relatively similar. I have argued that adding context-free markedness constraints to the Marked in the Marked schema so as to take into consideration allophonic variation can account for this behavior.

Finally, residual issues were addressed, notably the possibility to implement a Positional Faithfulness analysis of the Mayak data. The failure of the PF analysis due to the interaction with allophony demonstrates that the positional markedness approach represented by the MIM schema is not only empirically adequate, but also necessary.

CHAPTER 7

CONCLUDING REMARKS

The main claim defended in this dissertation is that grammatical or inflectional markedness, as encoded in grammatical markedness hierarchies, intersects with phonological markedness. As we have seen, under otherwise similar phonological conditions, outputs inflected for a marked grammatical category are characterized by equal or greater phonological markedness than outputs inflected for the unmarked category, a correlation dubbed the Marked in the Marked (MIM) generalization.

In Chapter 1 I introduced the research topic of the dissertation. Chapter 2 discussed the content of the notion ‘grammatical markedness’ and ‘phonological markedness’, respectively, introduced the MIM generalization and approached the issue of functional grounding of MIM effects. As regards grammatical markedness, the role of frequency of occurrence was highlighted as the main criterion. With respect to phonological markedness, for the purpose of this dissertation the main criteria were considered to be articulatory, perceptual and structural complexity and occurrence in phonological inventories across languages.

In Chapter 3 I discussed the way in which MIM effects can be modeled in Optimality Theory (Prince and Smolensky 1993/2004) and I proposed a class of formal licensing constraints $LICENSE(M,g)$ which are violated whenever marked a given phonological structure M in the Phonological Structure of an output occurs

outside a marked member g of grammatical category G or in uninflected outputs. MIM effects were shown to emerge from the constraint hierarchy LICENSE(M,g) » FAITH » *M (the MIM Schema). Filters on possible licensing constraints were discussed and the factorial typology of the MIM Schema was laid out. The upshot of the factorial typology is the prediction, supported by the case studies presented in the dissertation, that given two members g_1 and g_2 of grammatical category G such that $g_2 > g_1$ in point of grammatical markedness, marked phonological structure M can occur either in both g_1 and g_2 or only in g_2 and not in g_1 , or in neither of the two.

The introduction of licensing constraints LICENSE(M,g) is tantamount to enriching the inventory of optimality-theoretic constraints (CON) with a class of functionally grounded constraints. The necessity of positing such licensing constraints becomes clear as we examine alternatives to positional markedness. Specifically, although Positional Faithfulness could be used to account for some simpler cases of MIM, albeit less economically (Old Saxon, Chapter 4), the necessity of positive licensing becomes obvious for cases that involve more complex interactions with other phonological processes (as in Mayak, Chapter 6).

The positing of the mechanism of licensing of marked phonological structure in marked grammatical categories represents an enrichment of the class of functional licensors (recall that the licensors are the morpho-syntactic features of the marked category, which is in turn ultimately singled out by a functional factor such as frequency of occurrence). This represents a theoretical move in line

with Steriade (1995a), Casali (1997), Majors (1998), Beckman (1998/1999), Alber (2001) Smith (2002/2005), Walker (2004, 2005) etc.

Chapters 4,5 and 6 are three case studies proposed as illustrations of the MIM generalization. In Chapter 4 I discuss marked metrical structure (uneven trochees) in the marked Oblique case in Old Saxon. A type of marked segmental structure (consonants with secondary articulation) in the Plural of nominals in Romanian is discussed in Chapter 5, where extensions to dialects are also made. Chapter 6 deals with marked phonotactic structure (intervocalic voiceless stops) in the Passive voice in Mayak. All these three cases lend empirical support to the MIM hypothesis.

In this chapter, intended as a conclusion to the dissertation, I focus on the empirical coverage and predictions of the MIM generalization (§1) and point to issues for further research (§2).

1. Empirical coverage and predictions

In this thesis I put forth the Marked in the Marked (MIM) generalization, according to which under phonological similarity of inflectional coding, marked grammatical categories are more (or equally) prone to sponsor marked phonological structure than unmarked categories. The similarity condition was introduced in the statement of MIM in order to control the activity of the phonological factors which may contribute to the asymmetry between marked and unmarked categories. Under such circumstances, the asymmetry is attributable to

the workings of functional forces represented by the frequency of occurrence of inflected forms, which determines their status on a grammatical markedness scale.

The three case studies presented in Chapters 4-6 all conform to the phonological similarity condition. In Old Saxon (Chapter 4), both the marked Oblique Case and the unmarked Direct Case have the same underlying phonological exponent (/ -u/). In Romanian (Chapter 5), Number suffixes are both high vowels (/ -u/ for the Singular and / -i/ for the Plural) and they display relatively similar behavior with respect to their avoidance/retention in word final position. Finally, in Mayak (Chapter 6), both the (unmarked) Active Voice and the (marked) Passive Voice are built by attaching a VC suffix to a consonant-final stem.

The similarity condition was included in the statement of MIM for epistemological reasons. We need to know that there are MIM cases which satisfy it, in order for us to know that licensing constraints LICENSE(M,g) exist. Once evidence for licensing constraints has been produced, the similarity condition can be dropped. In what follows I will discuss some other cases which we can now apply licensing constraints to.

One such case is represented by the behavior of the vowel sequences that arise from article prefixation in the Singular and Plural in Italian (Saltarelli and Calvano 1979), already alluded to in Chapter 3 §4. The feminine Italian definite article is *la* in the Singular, and when attached to a vowel-initial noun the final vocalic segment of the determiner undergoes deletion, in avoidance of hiatus. In

the Plural, the determiner is *le*, but its final vowel is retained and hiatus arises.

This behavior is illustrated in (181), which repeats the data in (53):

(181) The behavior of article-noun sequences in Italian

a. Vowel deletion in the Singular

$/la_{\text{Def.}+entita}/ \rightarrow [len.ti.tá]_{\text{Sg. Def.}}$ ‘the entity’

b. Vowel retention in the Plural

$/le_{\text{Def.}+entita}/ \rightarrow [le.en.ti.tá]_{\text{Pl. Def.}}$ ‘the entities’

The licensing analysis can be applied to the Italian data, in which case the marked phonological structure tolerated in the (marked) Plural, but disallowed in the (unmarked) Singular is ‘hiatus’, or a VV sequence. The markedness constraint against the marked phonological structure is *VV. The relevant licensing constraint is LICENSE(VV, PLURAL), as already shown in §4 of Chapter 3. The Number forms in question are similar in that both of them potentially involve hiatus due to a VV sequence which emerges from article attachment to a vowel-initial noun stem.

Analyses along the lines of MIM can also be envisioned for more complex situations. Such is the case of nasal deletion/retention in Number formation in Tswana (Coetzee 2001). In Tswana there are a number of inflectional prefixes used in the formation of Singular and Plural forms that have in common the fact that underlyingly they either consist of a nasal segment unspecified for place of

articulation (/N/, Class 5 Singular) or of a sequence of segments ending in such a consonant (/diN/, Class 5 and 6 Plural). When these affixes attach to a consonant-initial stem, the nasal is either deleted or parsed as a syllable peak, but realization as a syllable peak is a last resort to ensure word minimality (Tswana words are minimally bisyllabic). The interesting fact is that while Singular forms parse the nasal as a syllable peak only to ensure word minimality, Plural forms unexpectedly parse it in the same way even when minimality is not at stake. This can be seen for monosyllabic roots in (182):

(182)	Root	Sg. (N-)	Pl. (diN-)
	pa	m.pa	di.m.pa
	ku	ŋ.ku	di.ŋ.ku
	tlo	n.tlo	di.n.tlo

The relevant marked phonological structure is the syllable peak represented by a nasal (PK/[nas]), against which militates the markedness constraint *PK/[nas]. The relevant licensing constraint is LICENSE (PK/[nas], PLURAL).

Another case which may be added to the repertoire of MIM phenomena is provided by the Tiwi language. In Tiwi (Northern Australian isolate), a marked grammatical category (Past Tense) allows marked phonotactic structure (hiatus) which it prohibits in the unmarked category (Present) or in the language in general. In this language, the status and treatment of heterosyllabic vowel sequences (V.V)

apparently depend on the affiliation to a grammatical category. In Tiwi, hiatus is generally avoided through a number of mechanisms including vowel deletion, but it occurs in the grammatically marked Past Tense, whereas the unmarked non-Past (Present) tense resolves it, resorting to vowel deletion (Osborne 1974, Lee 1987).

For example, in the Non-Past (a cover term for tense values that relate to the present, like the Present Tense proper or the Present Perfect), the affix vowel deletes in front of another vowel, for example, before vowel-initial stems (183a.). The Non-Past vowel surfaces, though, in front of consonant-initial morphemes (183b.):

(183) The behavior of the Non-Past affix with respect to hiatus

a) Vowel-final deletion before a vowel-initial morpheme

$\text{ŋəN} + \text{pə} + \text{apa} \rightarrow \text{ŋəm-p-apa}$
 you np eat 'You eat.'

$\text{aN} + \text{pə} + \text{akupauli} \rightarrow \text{am-p-akupauli}$
 she np go back 'She goes back.'

b) Vowel-final retention before a consonant-initial morpheme

$\text{ŋəN} + \text{pə} + \text{ɪə}^{105} + \text{kiŋani} \rightarrow \text{ŋəm-pə-ɪə-kiŋani}$
 you np lie 'You are lying.'

¹⁰⁵ The element ɪə appears invariably with consonant-initial roots, intervening between them and many CV affixes. It can also occur in conjunction with vowel-initial morphemes. It has no precise morphological affiliation and can be sometimes seen as a stem-building formative used to build an 'augmented' root, sometimes as a temporal affix without a precise value (Osborne 1974). Since it is a CV attached to a consonant-initial root, its presence does not have any impact on the phonotactics of prefix-stem interactions.

The behavior of Past Tense CV affixes is different in that the affix final vowel is retained irrespective of the initial segment of the following morpheme, which in turn fails to undergo vowel deletion:

(184) The Non-Past affix always retains its vowel

a) Consonant-initial morpheme

pu + tə + .ɪə + papuk → pu-tə-ɪə-papuk
 they p rub ‘They rubbed.’

b) Vowel-initial morpheme

ŋəN + tə + apa → ŋən-tu-apa
 we p eat ‘We ate.’

To summarize, the distribution of the tense affixes in Tiwi is:

(185) Table 63 The distribution of Tiwi tense prefixes

	C-stem	V-stem
Non-Past (np)	pə-	p-
Past (p)	tə-	tu-

The marked phonological structure involved is hiatus (VV), as in the case of Italian, but this time the marked grammatical category is the Past Tense¹⁰⁶. The analysis of Tiwi will employ the licensing constraint LICENSE(VV, PAST) and the

¹⁰⁶ We note that there is no unambiguous evidence for the similarity condition in Tiwi, due to the possibility of having affix representations like /pə_{np}/ in the Non-Past and /tu_p/ in the Past, and to the different phonological behavior of schwa and high vowels in the language. As mentioned above, once we have proved that licensing constraints do exist in CON, we can relax the statement of MIM and deal with cases where the similarity condition may not be met.

context-free markedness constraint *VV. Italian and Tiwi illustrate the use of licensing constraints for the same marked phonological structure M in the Phonological Structure of outputs inflected for marked values of different grammatical categories (Plural and Past Tense, respectively).

There are alternative accounts for some of these cases, but those may have problems of their own. For example, in his analysis of Tswana Coetzee employs a complex array of constraints to account for it, invoking considerations of extrametricality, stress assignment and morpheme realization. He argues that the behavior of nasal peaks in Tswana represents an instance of ‘emergence of the marked’. In my opinion it is worth attempting an analysis of the Tswana data in terms of licensing, which may prove simpler and also superior in point of explanatory power. This is due to the fact that the licensing account subsumes the phonological asymmetry between categories on a markedness scale to a single general principle and thus provide an explanation for the ‘emergence of the marked’ phenomenon.

In the dissertation I discussed only applications of the MIM generalization to morphological patterns of concatenation, in particular affixation. Specifically, Old Saxon and Romanian are instances of suffixation, and Mayak is an instance of prefixation. The potential cases of Italian, Tswana and Tiwi all illustrate prefixation. For the empirical coverage and predictions of the theory it is important to establish whether there are limitations or advantages of applying licensing accounts to other kinds of morphological processes.

In the area of concatenative morphology, MIM may not have applicability to reduplication. There are two reasons for this situation. First, cases where two or more members of the same grammatical category are realized by reduplication do not seem to be attested. This means that the similarity condition is virtually impossible to meet. This is not a principled difficulty, as we have seen that the similarity condition is no longer indispensable once licensing constraints have been shown to exist. The second reason for the inapplicability of MIM in reduplication has to do with the property of reduplication to create unmarked phonological structure (McCarthy and Prince 1994), so even if systems existed with two or more reduplicated members of G, there may not be relevant marked phonological structure to assess.

In the area of non-concatenative morphology too, MIM may have interesting applications. Consider, for illustration, umlaut phenomena, commonly encountered in Germanic, in German in particular. In the morphology of German, the Plural of certain nouns is formed by fronting the first vowel of the nominal stem (186a.), a process which is sometimes accompanied by suffix attachment (186b.), as shown below, where forms are given orthographically:

(186) German Plural formation by umlauting

	<i>Singular</i>	<i>Plural</i>	<i>Gloss</i>	<i>Alternation</i>
a.	Mutter	Mütter	‘mother(s)’	u ~ y
	Tochter	Töchter	‘daughter(s)’	o ~ ø

b.	Gast	Gäst-e	‘guest(s)	a ~ ε
	Fuss	Füß-e	‘foot/feet’	u ~ y

Such processes are a good testing ground for MIM effects. The similarity condition is met: the base stem and the umlauted one are both bare stems¹⁰⁷. If we compare the Singular and Plural forms above, we note that the umlauting process often involves an increase in phonological markedness in the affected vowel. This assertion is supported, for instance, by the alternations u ~ y and o ~ ø, whose second, umlauted element is a front rounded vowel, cross-linguistically a marked segment. There are two possible scenarios which can be entertained. First, assume that the stem contains underlying marked structure M (represented, for convenience, by the co-occurrence of the frontness and rounding features) and that the structure is ‘repaired’ in the Singular and turned into an unmarked back, unrounded vowel. I will briefly sketch an analysis along the lines of MIM. The relevant constraints are LICENSE([-back, +round], PLURAL), faithfulness as identity of backness/frontness specifications in input and output (FAITH) and the markedness constraint against front, rounded vowels is *[-back, +round]. As shown in Tableau (187), the MIM ranking accounts for formation of the Singular:

¹⁰⁷ Note, however, that alternative analyses are also available in which umlaut is reduced to concatenative morphology (see the observation in Chapter 2 according to which most, if not all instances of non-concatenative morphology are instances of concealed affixation). Specifically, umlaut may be considered a process of affixation of an autosegmental morpheme.

(187) Table 64 Singular: LICENSE([-back, +round],PLURAL) » FAITH » *[-back, +round]

/y/sg.	LICENSE([-back, +round],PLURAL)	FAITH	*[-back, +round]
a. φ [u]sg.		*	
b. [y]sg.	*!		*

In (187), the unlauted candidate (187b.) violates the licensing constraint, since it contains the marked phonological structure [-back, +round] in its Phonological Structure, but carries the ‘singular’ specification in the Morphological Structure. Thus (187b.) wins, in spite of a violation of faithfulness. The unlauted Plural is also predicted by the MIM ranking:

(188) Table 65 Plural: LICENSE([-back, +round],PLURAL) » FAITH » *[-back, +round]

/y/pl.	LICENSE([-back, +round],PLURAL)	FAITH	*[-back, +round]
a. φ [y]pl.			*
b. [u]pl.		*!	

The success of the winner (188a.) is ensured by satisfaction of faithfulness, which is violated by the suboptimal candidate (188b.). Thus the MIM Schema predicts the possibility of repairing underlying marked phonological structure in the unmarked category and its preservation in the marked category.

The second relevant scenario to be considered is the one in which the stem contains underlying unmarked structure and marked structure is created in outputs

inflected for the marked grammatical category and is preserved in the unmarked one. This time the MIM ranking fails to yield the expected output in the Plural:

(189) Table 66 Plural: LICENSE([-back, +round], PLURAL) » FAITH » *[-back, +round] (failed ranking)

/u/Pl.	LICENSE([-back, +round], PLURAL)	FAITH	*[-back, +round]
a. ☹ [u]Pl.			
b. ☺ [y]Pl.		*	*

The failure of the MIM Schema is due to the fact that the fully faithful candidate (189a.) wins over the actual output (189b.), symbolized by a frowny face, due to a fatal violation of faithfulness incurred by the latter.

Returning to predictions, recall that (187) and (188) were proposed to account for the behavior of Singular and Plural forms with respect to umlauting in German. However, the fact that LICENSE([-back, +round], PLURAL) is undominated predicts that front, rounded vowels are not allowed in the language outside the Plural. However, in German there are Singular forms which contain front, rounded vowels, so the proposed analysis cannot be generalized to all German forms. The bottom line is that MIM predicts such a language to exist.

German umlauting is also useful in other predictions of rankings involving licensing constraints. Under the ranking FAITH » LICENSE([-back, +round], PLURAL), *[-back, +round] (the ‘full contrast’ case in the factorial typology of the MIM Schema, Chapter 3 §5.2) we predict languages where marked

phonological structure occurs in both the Singular and the Plural as long as it is underlying.

We can split general faithfulness into identity constraints for roundedness (IDENT[rd]) and backness (IDENT[bk]). If IDENT[rd] is ranked above licensing and IDENT[bk] below it we obtain the constraint hierarchy in (190):

(190) IDENT[rd] » LICENSE([-back, +round], PLURAL) » IDENT[bk] » *[-back, +round]

To test the predictions of hierarchy (190), consider, for ease of exposition, the case of the back rounded vowel [u] alternating via umlaut with the front rounded vowel [y]. Due to the rankings in (190), stems which have underlying /u/ will yield outputs which have [u] both in the Singular and in the Plural, as shown in the tableau below:

(191) Table 67 Stems with underlying /u/ IDENT[rd] » LICENSE(y, PLURAL) »
 » IDENT[bk] » *y

A. /u/ _{Sg.}	IDENT[rd]	LICENSE(y, PLURAL)	IDENT[bk]	*y
a. φ [u] _{Sg.}				
b. [y] _{Sg.}		*!	*	*
B. /u/ _{Pl.}	IDENT[rd]	LICENSE(y, PLURAL)	IDENT[bk]	*y
a. φ [u] _{Pl.}				
b. [y] _{Pl.}			*!	*

If we now consider stems with underlying /y/, (190) will yield outputs which have [u] in the Singular and [y] in the Plural, as shown in Tableau (192):

(192) Table 68 Stems with underlying /y/ IDENT[rd] » LICENSE(y,PLURAL) »
 »IDENT[bk] » *y

A. /y/Sg.	IDENT[rd]	LICENSE(y,PLURAL)	IDENT[bk]	*y
a. φ [u] _{Sg.}			*	
b. [y] _{Sg.}		*!		*
B. /y/Pl.	IDENT[rd]	LICENSE(y,PLURAL)	IDENT[bk]	*y
a. [u] _{Pl.}			*!	
b. φ [y] _{Pl.}				*

In sum, Hierarchy (190) predicts a language with two kinds of nouns, nouns which do not contain front, rounded vowels in either the Singular and the Plural (191) and nouns which have front rounded vowels in the Plural, but not in the Singular (192). Such a language (‘German prime’) differs from German in that German has a third category of nouns, those which have front rounded vowels in both the Singular and the Plural.

Note also that the formation of German Plurals by umlauting is sometimes characterized by additional suffixation (the examples in (186b.) above), a situation known as ‘double morphemic exponence, DME’. DME represents a challenge to Morpheme Realization analyses, such as Kurisu’s (2001) Morpheme Realization Theory (RMT). RMT does not predict such systems¹⁰⁸, but the licensing approach advocated in this thesis can.

Throughout the dissertation, only instances involving a single type of marked phonological structure were discussed. One may also envision situations

¹⁰⁸ To deal with the problem posed by DME Kurisu proposes an account which uses the complex machinery of Sympathy Theory (McCarthy 1999). However, the RMT approach *per se* is questionable as it leads to predictions which are not supported empirically (Topintzi 2003).

where two or more instances of marked phonological structure are involved. Does MIM predict such cases? In its current formulation, the MIM schema does not exclude them, but it does not specifically address them either.

Let us explore the hypothetical case of two kinds of marked phonological structure (M and M') and one licensing constraint LICENSE(M,g), which is violated if M occurs outside g, in particular in the unmarked member g' of grammatical category G. For example, M can be an uneven trochee (HL), M', a high vowel syllable peak, g the Oblique Case and g' the Direct Case, as in Old Saxon (Chapter 4). Two trivial cases present themselves: the one in which M and M' can occur in both g and g' ('full contrast', if faithfulness dominates markedness) and one in which M and M' occur neither in g or nor in g' ('lack of variation', if context-free markedness constraints against M and M' are undominated). There are a few other, non-trivial cases which can be predicted.

For example, if only LICENSE(M,g) is considered, it may be the case that M occurs only in g, and M', in both g and g', or in neither, or only in g or only in g', as shown below:

(193) Table 69 The distribution of M and M'

M	M'
only in g	g, g' neither g nor g' g g'

What is not predicted is the occurrence of M in the unmarked value g' of the grammatical category without M being also able to occur in the marked member g. The Old Saxon case instantiates the situation where M (the uneven trochee) occurs only in g (Oblique), and M' (the high vowel syllable peak), both in g and g' (Direct).

We can also define a 'conjoint' licensing constraint LICENSE(M&M',g) to the effect that outputs are penalized only when they contain both M and M' and are not inflected for g. Such a scenario rules out the possibility of M and M' occurring together only in g', but not in g. The separate occurrence of M or M' in the two values of the grammatical category or even in the same member of the grammatical category is not precluded.

For example, to use the same illustration as above, M may be an uneven trochee and M', a high vowel syllable peak. Our 'conjoint' licensing constraint analysis predicts that there are no instances of outputs inflected for g' which contain both uneven trochees and high vowel syllable peaks. It is also predicted that uneven trochees and high vowel syllable peaks may occur separately in either g or g' or in both.

It should be noted that all the scenarios above have implications on the structure of the substantive filter on licensing constraints and also that they are based on the assumption that M and M' are independent (for example, that the footing process is not sensitive to the nature of syllable peaks). All these predictions await testing on actual cases.

Most of the cases discussed in the dissertation are instances of two-way grammatical categories (Singular and Plural for Number, Active and Passive for Voice, Present and Past for Tense). There are, however, more complex morphological systems which involve n-way contrasts between the values of a given grammatical category. Such a system is Old Saxon (Chapter 4), for which an analysis was laid out that relies on grouping of four Case values (Nominative, Accusative, Dative, Instrumental) into two (Direct and Oblique). This grouping was based on the commonalities between the members of the Case category (in §4.2.1 we saw that the grouping was also necessary to make the analysis work). This issue too has implications for the nature of the filter on licensing constraints.

2. Issues for further research

The present dissertation represents a first attempt to investigate the connection between grammatical markedness and the phonology. Its main finding is that marked phonological structure is confined to outputs inflected for marked grammatical categories to a greater or equal extent than in the unmarked categories (the MIM generalization)

As concerns the mechanism that underlies MIM phenomena, it was claimed that it is grounded in principles of economy, phonetics and speech processing. However, as we have seen, not all aspects of the functional grounding mechanism assumed for MIM are clear – while from the perspective of speech production the advantages of MIM are obvious, it is for further research to uncover

and clarify the implication of MIM effects especially for speech perception and language acquisition. Also, the approach adopted in this thesis is a synchronic one, so the diachronic implications of MIM effects have been largely left unexplored. Issues such as the way in which MIM effects emerge in the history of languages and the extent to which they can impact language change represent challenges upon which future research needs to shed light.

In this chapter I explored the applicability of a licensing-based analysis to other cases, including non-concatenative morphology and systems where more than one type of marked phonological structure is licensed in an output. Predictions were made as to such situations. It is a desideratum for future research to test those predictions and also to investigate the applicability of the analysis to other linguistic systems, for example for other grammatical categories and/or marked phonological structures than those exemplified in this dissertation.

Finally, in investigating the correlation between grammatical markedness and phonological properties we started by looking at grammatical markedness hierarchies which were to a large extent taken as a given (although the functional factors behind them, like frequency of occurrence, were highlighted). If MIM phenomena are active cross-linguistically, one may expect the study of phonological asymmetries in markedness between inflected outputs to be able to give us information regarding the status of the respective grammatical categories. This could potentially lead to the formulation of new grammatical markedness scales. It may also be the case that certain asymmetries in the phonological

behavior of lexical categories (notably, between nouns/adjectives and verbs¹⁰⁹) can be correlated with similar functional factors as the asymmetries that hold between forms inflected for grammatical categories on a markedness hierarchy. This issue too merits further investigation.

¹⁰⁹ See Smith (1999, 2001) and Iscrulescu (2004b) for work on phonological asymmetries between lexical classes.

REFERENCES

- Aissen, Judith. 1999/2001. Markedness and Subject Choice in Optimality Theory. *Natural Language and Linguistic Theory* 17, 673-711. Reprinted in Geraldine Legendre, Jane Grimshaw, and Sten Vikner (eds.) *Optimality-Theoretic Syntax*. Cambridge, Mass.: MIT Press. 61-96.
- Aissen, Judith. 2003. Differential Object Marking: Iconicity vs. Economy. *Natural Language and Linguistic Theory* 21. 435-483.
- Alber, Birgit. 1997. Quantity Sensitivity as the Result of Constraint Interaction. In Geert Booij and Jeroen van de Weijer (eds.), *Phonology in Progress - Progress in Phonology*. HIL Phonology Papers III. The Hague: Holland Academic Press. 1-45.
- Alber, Birgit. 2001. Maximizing first positions. In C. Féry, A. D. Green and R. van de Vijver (eds.), *Proceedings of HILP 5. Linguistics in Potsdam*, Vol. 12. 1-19.
- Albright, Adam. 2004. Sub-optimal Paradigms in Yiddish. *Proceedings of WCCFL* 23. 1-14.
- Alderete, John. 1995/2001. Faithfulness to prosodic heads. [ROA-94]. [Published in John McCarthy (ed.), *Optimality Theory in phonology: Selected readings*, Oxford: Blackwell. 215-227.]
- Alderete, John. 1999/2001. *Morphologically governed accent in Optimality Theory*. Ph.D. Dissertation, University of Massachusetts, Amherst [Published in 2001 by Garland, New York]
- Andersen, Torben. 1988. Consonant alternation in the verbal morphology of Pári. *Afrika und Übersee* 71. 63-113.
- Andersen, Torben. 1999. Consonant Alternation and Verbal Morphology in Mayak (Northern Burun). *Afrika und Übersee* 82. 65-95.
- Andersen, Torben. 2000. Number Inflection in Mayak (Northern Burun). In Rainer Vossen, Angelika Mietzner and Antje Meissner (eds.) *Mehl als nur Worte... Afrikanistische Beiträge zum 65 Geburtstag von Franz Rottland*. Köln: Rüdiger Köppe Verlag. 28-43.

- Andersen, Henning. 2001. Markedness and the theory of linguistic change. In Henning Andersen (ed.) *Actualization: Linguistic Change in Progress (Current Issues in Linguistic Theory 219)*. Amsterdam–Philadelphia: John Benjamins. 19-57.
- Ann, Jean. 2006. *Frequency of Occurrence and Ease of Articulation of Sign Language Handshapes: The Taiwanese Example*. Washington, D. C.: Gallaudet University Press.
- Archangeli, Diana; Pulleyblank, Douglas. 1994. *Grounded Phonology*. Cambridge, Mass.: MIT Press.
- Archangeli, Diana; Langendoen, D. Terence. 1997. *Optimality Theory – An Overview*. Oxford: Blackwell.
- Aslin, R. N.; Saffran, J. R.; Newport, E. L. 1998. Computation of conditional probability statistics by 8-month-old infants. *Psychological Science*, 9. 321-324.
- Atkins, Sue; Clear, Jeremy; Ostler, Nicholas. 1992. Corpus Design Criteria. *Literary and Linguistic Computing* 7(1). 1-16.
- Augerot, James E. 1974. *Romanian phonology: a generative phonological sketch of the core vocabulary of standard Romanian*. University of Idaho: Idaho Research Foundation, Inc.
- Bailyn, John Frederick; Nevins, Andrew. 2004. Markedness and Allomorphy in Distributed Morphology: Exemplification from Russian. Talk presented at the SUNY-CUNY-NYU Miniconference.
- Baković, Eric. 2000. *Harmony, Dominance and Control*. Ph.D. Dissertation, Rutgers University.
- Balota, D.A.; Chumbley, J.I. 1985. The locus of word-frequency effects in the pronunciation task: Lexical access and/or production? *Journal of Memory and Language* 24. 89-106.
- Battistella, Edwin L. 1990. *Markedness: the evaluative superstructure of language*. Albany: The State University of New York.
- Battistella, Edwin L. 1996. *The Logic of Markedness*. Oxford: Oxford University Press.

- Beckman, Jill. 1997. Positional faithfulness, positional neutralisation and Shona vowel harmony. *Phonology* 14. 1-46.
- Beckman, Jill. 1998/1999. *Positional Faithfulness*. Ph.D. Dissertation, Amherst, MA: University of Massachusetts. [Published in 1999 by Garland Publishing]
- Bendjaballah, Sabrina. 1998. La palatalisation en somali. *Linguistique Africaine* 21. 5-52.
- Bennett, William Holmes. 1980. *An Introduction to the Gothic Language*. New York: The Modern Language Association.
- Benua, Laura. 1997/2000. *Transderivational Identity: Phonological Relations between Words*. Ph.D. Dissertation, University of Massachusetts, Amherst [ROA-259]. [Published as *Phonological Relations between Words*. New York: Garland. 2000].
- Bermúdez-Otero, Ricardo. 1996. Stress and quantity in Old and early Middle English: evidence for an Optimality-Theoretic model of sound change. Ms., University of Manchester.
- Bermúdez-Otero, Ricardo. 1999. Opacity: evidence from West Germanic Gemination. Paper presented at the Spring Meeting of the Linguistics Association of Great Britain, Manchester.
- Bermúdez-Otero, Ricardo. 2001. Underlying nonmoraic consonants, faithfulness, and sympathy. Ms., University of Manchester.
- Biber, Douglas. 1993. Using Register-Diversified Corpora for General Language Studies. *Computational Linguistics* 19 (2). 219-242.
- Billerey, Roger. 2000. Optimality and sound change: Old French codas. Paper presented at the 75th Annual LSA Meeting, Chicago.
- Blake, Barry J. 2001. *Case*. Cambridge: Cambridge University Press.
- Blevins, Juliette. 1997. Rules in Optimality Theory: two case studies. In Iggy Roca (ed.), *Derivations and Constraints in Phonology*. New York: Oxford University Press. 227-60.
- Blevins, Juliette. 2004. *Evolutionary phonology*. Cambridge: Cambridge University Press.

- Bobaljik, Jonathan. 2002. Syncretism without Paradigms: Remarks on Williams 1981, 1994. *Yearbook of Morphology* 2001. 53-85.
- Boersma, Paul. 1998. *Functional Phonology*. The Hague: Holland Academic Graphics.
- Bonet, Eulalia. 1991. *Morphology after Syntax: Pronominal Clitics in Romance*. Ph.D. Dissertation, MIT.
- Breban, Nicolae. 2002. *Bunavestire* [Annunciation]. Bucharest: Paralela 45.
- Brunner, Jana. 2003. Economy in Number Marking: Structural Coding and Phonological Length. Ms., Berlin: Humboldt University.
- Bybee, Joan. 1994. A view of phonology from a cognitive and functional perspective. *Cognitive Linguistics* 5(4). 285-305.
- Bybee, Joan L. 1985. *Morphology: A study of the relation between meaning and form*. Amsterdam: John Benjamins.
- Bybee, Joan. 2001. *Phonology and Language Use*. Cambridge: Cambridge University Press.
- Bye, Patrik A. 2001. *Virtual Phonology: Rule Sandwiching and Multiple Opacity in North Saami*. Ph.D. Dissertation, University of Tromsø.
- Byrd, Dani. 1992. Perception of assimilation in consonant clusters: A gestural model. *Phonetica* 49. 1-24.
- Campbell, Alistair 1959. *Old English Grammar*. Oxford: Oxford University Press.
- Caragiu-Marioteanu, Matilda. 1968. *Fono-morfologie aromana – studiu de dialectologie structurala*. [Aromanian Phono-morphology – a Study in Structuralist Dialectology]. Bucharest: Romanian Academy Publishing House.
- Caragiu-Marioteanu, Matilda. 1975. *Dialectologie romana: curs*. [A Course in Romanian Dialectology]. Bucharest: Editura Didactica si pedagogica.
- Casali, Roderic. 1997. Vowel Elision in Hiatus Contexts: Which Vowel Goes? *Language* 73(3). 493-533.
- Casali, Roderic. 1998. *Resolving Hiatus*. New York: Garland.

- Cathey, James E. 2000. *Old Saxon*. Munich: Lincom Europa.
- Chitoran, Ioana 1996. Prominence vs. Rhythm: The Predictability of Stress in Romanian. In Karen Zagona (ed.), *Grammatical Theory and Romance languages: Selected papers from the 25th Linguistic Symposium on Romance Languages (LSRL XXV) Seattle, 2-4 March 1995*. Amsterdam, The Netherlands: John Benjamins Publishing Co. 47-58.
- Chitoran, Ioana 2002. *The Phonology of Romanian: A Constraint-Based Approach*. Berlin-New York: Mouton de Gruyter.
- Cho, Young-mee Yu. 1998. Language Change as Reranking of Constraints. In Hogg, R. M. and L. van Bergen (eds.), *Historical Linguistics 1995*. Vol.2. Amsterdam and Philadelphia: John Benjamins. 45-62.
- Cho, Hyeonkwan 2001. On phonological opacity in English word stress. *Chungnam National University Studies in Phonetics, Phonology, Morphology* 7.2. 423-448.
- Chomsky, Noam. 1957. *Syntactic Structures*. The Hague: Mouton de Gruyter.
- Chomsky, Noam. 1965. *Aspects of the Theory of Syntax*. Cambridge, Mass.: MIT Press.
- Chomsky, Noam. 1981. Principles and parameters in syntactic theory. In Norbert Hornstein and David Lightfoot (eds.) *Explanation in Linguistics: The logical problem of language acquisition*. London: Longman. 123-146.
- Chomsky, Noam. 1986. *Knowledge of Language*. New York: Praeger.
- Chomsky, Noam. 1988. *Language and Problems of Knowledge: The Managua Lectures*. Cambridge, Mass.: The MIT Press.
- Chomsky, Noam 1995. *The Minimalist Program*. Cambridge, Mass.: MIT Press.
- Chomsky, Noam and Miller, George 1963. Introduction to the formal analysis of natural languages. In R. D. Luce, R. R. Bush and E. Galanter (eds.), *Handbook of Mathematical Psychology, II*. New York: John Wiley and Sons. 269-321.
- Chomsky, Noam; Halle, Morris. 1968. *The Sound Pattern of English*. New York: Harper and Row.

- Clements, George N. 1985. The geometry of phonological features. *Phonology* 2. 223-250.
- Clements, George N. 1988. The Role of the Sonority Cycle in Core Syllabification. Working Papers of the Cornell Phonetics Laboratory 2. 1-68.
- Clements, George N. 1990. The role of the sonority cycle in core syllabification. In John Kingston and Mary E. Beckman (eds.) *Papers in laboratory phonology I: between the grammar and physics of speech*. Cambridge: Cambridge University Press. 283-333.
- Clements, George N. 2004. Features and Sound Inventories. Talk presented at the Symposium on Phonological Theory: Representations and Architecture CUNY, February 22-24, 2004.
- Coetzee, Andries W. 2001. Nasal-only syllables in Tswana. In Graham Horwood and Se-Kyung Kim (eds.) *RuLing Papers 2: Working Papers of Rutgers University*. New Brunswick: Department of Linguistics, Rutgers University. 1-20.
- Contreras, Heles. 1977. Spanish Epenthesis and Stress. *Working Papers in Linguistics* 3. University of Washington, Seattle.
- Côté, Marie-Hélène. 2000. *Consonant cluster phonotactics: A perception-based approach*. Ph.D. Dissertation, MIT.
- Croft, William. 1990. *Typology and Universals*. Cambridge: Cambridge University Press.
- Croft, William. 2003. *Typology and Universals*. Second edition. Cambridge: Cambridge University Press.
- Crosswhite, Katherine. 2000. Length neutralization and vowel lengthening in Orlec Čakavian. In Tracy Holloway King and Irina A. Sekerina (eds.) *Annual workshop on formal approaches to Slavic linguistics: the Philadelphia meeting 1999*. Ann Arbor, MI: Michigan Slavic Publications. 152-167.
- Crosswhite, Catherine. 2001. *Vowel Reduction in Optimality Theory*. New York and London: Routledge.
- Crystal, David. 1985. *A dictionary of Linguistics and Phonetics*. 2nd edition. New York: Basil Blackwell.

- Culicover, Peter W. 1976. *Syntax*. New York: Academic Press.
- Culicover, Peter W. 1984. Learnability explanations and processing explanations. *Natural Language and Linguistic Theory* 2(1). 77-104.
- Curtin, Suzanne. 2002. *Representational Richness in Phonological Development*. Ph.D. Dissertation, University of Southern California.
- Deo, Ashwini; Sharma, Devyani. 2005. Typological Variation in the Ergative Morphology of Indo-Aryan Languages. Ms., Stanford University.
- Dewhurst, Stephen A.; Hitch, Graham J.; Barry, Christopher. 1998. Separate Effects of Word Frequency and Age of Acquisition in Recognition and Recall. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 24(2). 284-298.
- Donegan, Patricia. 1978. *On the Natural Phonology of Vowels*. Ph.D. Dissertation, Ohio State University.
- Donegan, Patricia; Stampe, David. 1979. The study of Natural Phonology. In D. Dinnsen (ed.) *Current Approaches to Phonological Theory*. Bloomington, Indiana: Indiana University Press. 126-173.
- Drellishak, Scott. 2005. Coordination and Processing. To appear in *University of Washington Working Papers in Linguistics* 24 (2005).
- Dresher, Elan B.; Lahiri, Aditi. 1991. The Germanic foot: Metrical coherence in Old English. *Linguistic Inquiry* 22(2). 252-86.
- Dresher, Elan B. 2003. The contrastive hierarchy in phonology. *Toronto Working Papers in Linguistics* 20. 47-62.
- Dresher, Elan B.; Piggott, Glyne; Rice, Keren. 1994. Contrast in phonology: overview. *Toronto Working Papers in Linguistics* 13:1. iii-xvii.
- Dresher, Elan ; Rice, Keren. 1993. Complexity in phonological representations. *Toronto Working Papers in Linguistics* 12:2. i-vi.
- Dresher, Elan B.; van der Hulst, Harry. 1998. Head-Dependent Asymmetries in Phonology: Visibility and Complexity. *Phonology* 15(3). 317-352.
- Dressler, Wolfgang U. 1985a. On the predictiveness of Natural Morphology. *Journal of Linguistics* 21. 321-337.

- Dressler, Wolfgang U. 1985b. Typological aspects of Natural Morphology. *Wiener linguistische Gazette*. 35-36.
- Dressler, Wolfgang; Kilani-Schoch, M.; Klampfer, S. 2002. How Does a Child Detect Morphology? Evidence from Production. *Trends in Linguistics. Studies and Monographs* 151. Berlin: Mouton de Gruyter. 391-425.
- Dressler, Wolfgang U. 2003. Some mutual challenges. On-line Proceedings of the Fourth Mediterranean Morphology Meeting, Catania 2003.
- van Driem, George. 1987. *A Grammar of Limbu*. Berlin: Mouton de Gruyter.
- Dryer, Matthew S. 1989. Large Linguistic Areas and Language Sampling. *Studies in Language* 13-2. 257-292.
- Dryer, Matthew S. 1992. The Greenbergian Word Order Correlations. *Language* 68(1). 81-138.
- Dyck, Carrie 1993. Complexity and the nature of metaphony. *Toronto Working Papers in Linguistics* 12:2. 19-41.
- Dyck, Carrie. 1995. *Constraining the Phonology-Phonetics Interface: with Exemplification from Spanish and Italian Dialects*. Ph.D. Dissertation, University of Toronto.
- Elías-Ulloa, José. 2004. Quantity (In)sensitivity and Underlying Glottal Stop Deletion in Capanahua. In Tania Granadillo, Meghan O'Donnell and Stacey Oberly (eds.) *Coyote Papers XIII - Special Volume Dedicated to the Indigenous Languages of the Americas*. Tucson: University of Arizona. 15-30.
- Engstrand, Olle. 1997. Why are clicks so exclusive? Papers from FONETIK-97, The Ninth Swedish Phonetics Conference, Umeå May 28-30, 1997. *Reports from the Department of Phonetics, Umeå University (PHONUM)* 4. 191-194.
- Fabricius, Anne H. 1998. *A Comparative Survey of Reduplication in Australian Languages*. München: LINCOM Europa.
- Feng, Guanjun (Bella). 2006. *Morpheme Recognition in Prosodic Morphology*. Ph.D. Dissertation, University of Southern California.
- Fenk-Oczlon, Gertraud. 1991. Frequenz und Kognition – Frequenz und Markiertheit. *Folia Linguistica* 25(3-4). 361-394.

- Fenk-Oczlon, Gertraud. 2001. Familiarity, information flow, and linguistic form. In Joan Bybee and Paul Hopper (eds.) *Frequency and the Emergence of Linguistic Structure*. Amsterdam: John Benjamins. 431-449.
- Fidelholtz, James L. 1975. Word frequency and vowel reduction in English. *CLS* 11.
- Fikkert, Paula; Levelt, Clara C. To appear. How does place fall into place? The lexicon and emergent constraints in the developing phonological grammar'. In P. Avery, B. Elan Dresher and K. Rice (eds.) *Contrast in phonology: Perception and Acquisition*. Berlin: Mouton.
- Flemming, Edward. 1995. *Auditory Representations in Phonology*. Ph.D. Dissertation, UCLA.
- Flemming, Edward. 2005. Speech perception in phonology. In David Pisoni and Robert Remez (eds.) *The Handbook of Speech Perception*. London: Blackwell. 156-182.
- Foley, William A. 1991. *The Yimas Language of New Guinea*. Stanford: Stanford University Press.
- Gallée, Johan Hendrik. 1910. *Altsächsische Grammatik*. Second revised edition. Halle: Max Niemeyer.
- Gardiner, J. M. 1988. Functional aspects of recollective experience. *Memory & Cognition*. 16. 309-313.
- Gess, Randall. 2001. On re-ranking and explanatory adequacy in a constraint-based theory of phonological change. Ms., University of Utah.
- Ghini, Mirco. 1993. Φ -formation in Italian: A new proposal. *Toronto Working Papers in Linguistics* 12:2. 41-79.
- Ghini, Mirco. 2001. *Asymmetries in the Phonology of Miogliola*. Berlin: Mouton de Gruyter.
- Givón, Talmy. 1993. *English Grammar. A Function-Based Introduction*. Amsterdam: John Benjamins.
- Glanzer, M.; Eisenreich, S. L. 1979. Structure and search of the internal lexicon. *Journal of Verbal Learning and Verbal Behavior* 18. 381-398.

- Gnanadesikan, Amalia E. 1996. The Acquisition of Phonology as the Promotion of Faithfulness Constraints: A case study in onset selection. Paper presented at WCHSALT, OTS, Utrecht University.
- Gnanadesikan, Amalia E. 1997. *Phonology with Ternary Scales*, Ph.D. Dissertation. Amherst, MA: University of Massachusetts. [ROA-195]
- Goldsmith, John. 1990. *Autosegmental and metrical phonology*. Oxford: Blackwell.
- Golston, Chris; Wiese, Richard. 1996. Zero morphology and constraint interaction: subtraction and epenthesis in German dialects. In G. Booij and J. van Marle (eds.), *Yearbook of Morphology 1995*. Dordrecht: Kluwer Academic Publishers. 143-159.
- Gonzalez, Carolina. 2003. *The Effect of Stress and Foot Structure on Consonantal Processes*. Ph.D. Dissertation, University of Southern California.
- Goodsitt, J. V.; Morgan, J. L.; Kuhl, P. K. 1993. Perceptual strategies in prelingual speech segmentation. *Journal of Child Language* 20. 229-252.
- Gordon, B. 1983. Lexical access and lexical decision: mechanisms of frequency sensitivity. *Journal of Verbal Learning and Verbal Behavior*, 18. 24-44.
- Gouskova, Maria. 2003. *Deriving Economy: Syncope in Optimality Theory*. Ph.D. Dissertation, University of Massachusetts, Amherst. [ROA-610]
- Gouskova, Maria. 2004. Minimal Reduplication as a Paradigm Uniformity Effect. In B. Schmeiser, V. Chand, A. Kelleher and A. Rodriguez (eds.) *Proceedings of WCCFL 23*. Somerville, MA: Cascadilla Press. 101-114.
- Graf, Dafna. 1999. *Metrical Structure of Modern Hebrew Nominals*. MA paper, Heinrich Heine University, Düsseldorf.
- Green, Anthony Dubach. 2001. The promotion of the unmarked: representing sound change in Optimality Theory. Paper presented at the 10th International Conference on English Historical Linguistics, University of Manchester.
- Greenberg, Joseph H. 1966a. *Language Universals, with Special Reference to Feature Hierarchies*. The Hague: Mouton.
- Greenberg, Joseph H. 1966b. Some universals of grammar with particular reference to the order of meaningful elements. In J.H. Greenberg, (ed.), *Universals of Language*. Cambridge, Mass.: MIT Press. 73-113.

- Grice, Paul H. 1975. Logic and Conversation. In P. Cole and J. Morgan (eds.) *Speech Acts. Syntax and Semantics* vol. 3. New York: Academic Press. 41-58.
- Grimshaw, Jane. 1993. Minimal Projections and Optimality. Ms., Rutgers University.
- Grimshaw, Jane. 1997. Projections, Heads and Optimality. *Linguistic Inquiry* 28. 373-422.
- Gurevich, Naomi. 2001. A Critique of Markedness-Based Theories in Phonology. *Studies in the Linguistic Sciences* 31.2. 89-114.
- Hale, Mark; Reiss, Charles. 1997. Grammar Optimization: The simultaneous acquisition of constraint ranking and a lexicon. Ms., Concordia University, Montréal.
- Haiman, John. 1983. Iconic and Economic Motivation. *Language* 59 (4). 781-819.
- Hall, Beatrice; Hall, R. M. R. 1996. From cognate set to etymology in the reconstruction of Proto-Nilotic. *Afrikanische Arbeitspapiere* 45. Cologne: Institut für Afrikanistik, Universität zu Köln. 151-175.
- Halle, Moris; Marantz, Alec. 1993. Distributed Morphology and the Pieces of Inflection. In Kenneth Hale and Samuel Jay Keyser (eds.) *The View from Building 20. Essays in Honor of Sylvain Bromberger*. Cambridge, Mass.: The MIT Press.
- Hamann, Silke. 2003. *The Phonetics and Phonology of Retroflexes*. Ph.D. Dissertation, Utrecht University, Holland.
- Hamilton, Philip. 1996. *Phonetic constraints and markedness in the phonotactics of Australian aboriginal languages*. Ph.D. Dissertation, University of Toronto.
- Hammond, Michael. 1995. There is no lexicon! Ms., University of Arizona.
- Harley, Heidi. 2004. The Importance of Impoverishment. Talk presented at the Phi-Workshop, Montreal.
- Harris, James. 1969. *Spanish Phonology*. Cambridge, Mass.: MIT Press.
- Harris, James. 1980. Nonconcatenative Morphology and Spanish Plurals. *Journal of Linguistic Research* 1. 15-31.

- Harris, John. 1990. Segmental Complexity and Phonological Government. *Phonology* 7(2). 255-300.
- Harris, Zellig S. 1955. From phoneme to morpheme. *Language* 31. 190-222.
- Haspelmath, Martin. 1999. Optimality and diachronic adaptation. *Zeitschrift für Sprachwissenschaft* 18. 180–205.
- Haspelmath, Martin. 2002. Functional and formal explanation in linguistics. Handout, Düsseldorf Summer School.
- Haspelmath, Martin. 2003. Against iconicity and markedness. Ms., Stanford University.
- Haspelmath, Martin. 2005. Against markedness (and what to replace it with). Ms., Max-Planck-Institut für evolutionäre Anthropologie.
- Hatzivassiloglou, Vasileios; McKeown, Kathleen. 1995. A quantitative evaluation of linguistic tests for the automatic prediction of semantic markedness. In *Proceedings of the 33rd Annual Meeting of the Association for Computational Linguistics*. Cambridge, Mass. 97-204.
- Havens, L. L.; Foote, W. E. 1963. The effect of competition on visual duration threshold and its independence of stimulus frequency. *Journal of Experimental Psychology* 65. 6-11.
- Hawkins, John A. 1983. *Word Order Universals*. New York: Academic Press.
- Hawkins, John A. 1990. A parsing theory of word order universals. *Linguistic Inquiry* 21. 223-261.
- Hawkins, John A. 1992a. Heads, parsing, and word order universals. In Greville Corbett, Norman M. Fraser and Scott McGlashan (eds.) *Heads in Grammatical Theory*. Cambridge: Cambridge University Press.
- Hawkins, John A. 1992b. Syntactic weight versus information structure in word order variation. In J. Jacobs (ed.) *Informationsstruktur und Grammatik*. Opladen: Westdeutscher Verlag. 196-219.
- Hawkins, John A. 1994. *A performance theory of order and constituency*. Cambridge: Cambridge University Press.

- Hawkins, John A. 2003. Efficiency and complexity in grammars: Three general principles. In John Moore and Maria Polinsky (eds.) *The nature of explanation in linguistic theory*. Stanford, CA: CSLI Publications. 121-152.
- Hawkins, John A. 2004. *Efficiency and Complexity in Grammars*. Oxford: Oxford University Press.
- Hayes, Bruce. 1985. Iambic and trochaic rhythm in stress rules. In M. Niepukuj et al. (eds.) *Proceedings of the Berkeley Linguistics Society* 11. 429-446.
- Hayes, Bruce. 1995. *Metrical Stress Theory*. Chicago and London: Chicago University Press.
- Hayes, Bruce. 1999. Phonetically driven phonology: The role of Optimality Theory and inductive grounding. In M. Darnell et al. (eds.), *Formalism and Functionalism in Linguistics*, vol. I. Amsterdam: John Benjamins. 243-285.
- Hayes, Bruce. 2004. Phonological acquisition in Optimality Theory: the early stages. In René Kager, Joe Pater and Wim Zonneveld, Wim, (eds.), *Fixing Priorities: Constraints in Phonological Acquisition*. Cambridge: Cambridge University Press.
- Hayes, Bruce; Kirchner, Robert; Steriade, Donca (eds.) 2004. *Phonetically-Based Phonology*. Cambridge: Cambridge University Press.
- Hayes, J. R.; Clark, H. H. 1970. Experiments in the segmentation of an artificial speech analog. In J. R. Hayes (ed.) *Cognition and the development of language*. New York: Wiley. 221-234.
- Hendricks, P. 1989. Palatalization and labialization as morphemes in Chaha. Ms., Yale University.
- Heukstra, Teun; Kooij, Jan G. 1988. The innateness hypothesis. In John A. Hawkins (ed.) *Explaining Language Universals*. Oxford: Blackwell. 31-55.
- Hickok, Gregory. 2001. Functional Anatomy of Speech Perception and Speech Production: Psycholinguistic Implications. *Journal of Psycholinguistic Research* 30(3). 225-235.
- Hickok, Gregory; Poeppel, David. 2000. Towards a functional neuroanatomy of speech perception. *Trends in Cognitive Science* 4. 131-138.

- Hitch, Douglas. 1989. Old Turkic b' and p'. In K. Sagaster and H. Einer (eds.) *Religious and Lay Symbolism in the Altaic World and Other Papers*, Proceedings of the 27th Meeting of the Permanent International Altaist Conference.
- Hoffman, Sebastian. 2004. Are low-frequency complex prepositions grammaticalized? On the limits of corpus data — and the importance of intuition. In Hans Lindquist and Christian Mair (eds.) *Corpus Approaches to Grammaticalization in English*. Amsterdam: John Benjamins. 171-210.
- Hogg, Richard M. 1997. The morphology and dialect of Old English bisyllabic nouns. In Raymond Hickey and Stanisław Puppel (eds.) *Language History and Linguistic Modelling. A Festschrift for Jacek Fisiak on his 60th Birthday*, Volume 1. Berlin - New York: Mouton de Gruyter. 113-126.
- Hogg, Richard M. 2000. On the (non-)existence of High Vowel Deletion. In A. Lahiri (ed.) *Markedness and Language Change*. Berlin: Mouton de Gruyter. 353-376.
- Holthausen, Ferdinand. 1921. *Altsächsisches Elementarbuch*. Second edition. Heidelberg: Carl Winter's Universitätsbuchhandlung.
- Hooper, Joan B. 1976. Word frequency in lexical diffusion and the source of morphophonological change. In W. Christie (ed.) *Current Progress in Historical Linguistics*. Amsterdam: North Holland. 96-105.
- Hopper, Paul J. 1992. Grammaticalization. In William Bright, William (ed.) *International Encyclopedia of Linguistics*. Oxford: Oxford University Press.
- Howe, Darin; Pulleyblank, Douglas. 2001. Patterns and timing of glottalization. *Phonology* 18:45-80.
- Hualde, Juan. 1991. *Basque Phonology*. London: Routledge.
- Hualde, Juan. 1992. *Catalan*. London: Routledge.
- d'Hulst, Yves. 2006. Romance Plurals. *Lingua* 116. 1303-1329.
- Hume, Elizabeth. 2004. Deconstructing markedness. *Berkeley Linguistics Society* 30.

- Hume, Elizabeth; Johnson, Keith; Seo, Minsun, Tserdanelis, Georgios; Winters, Steve. 1999. A Cross-linguistic Study of Stop Place Perception. *Proceedings of the XIVth International Congress of Phonetic Sciences*. 2069-2072.
- Idsardi, William. 1998. Tiberian Hebrew Spirantization and Phonological Derivations. *Linguistic Inquiry* 29(1). 37-73.
- Inkelas, Sharon 1994. The consequences of optimization on underspecification. Ms., UC Berkeley. [ROA-40].
- Isculescu, Cristian. 2004a. Realize-morpheme: one constraint, or a family? In Brian Agbayani et al. (eds.) *Proceedings of WECOL 2003*, California State University, Fresno. 61-71.
- Isculescu, Cristian. 2004b. Cross-category phonological contrast as a result of morphological marking. Paper presented at WECOL 2004, University of Southern California.
- Itô, Junko. 1986/1988. *Syllable Theory in Prosodic Phonology*. Ph.D. Dissertation, Amherst, MA: University of Massachusetts. [Published as *Syllable Theory in Prosodic Phonology*. New York: Garland.]
- Itô, Junko. 1989. A prosodic theory of epenthesis. *Natural Language and Linguistic Theory* 7. 217-60.
- Itô, Junko; Armin Mester, Jaye Padgett 1995. Licensing and underspecification in Optimality Theory. *Linguistic Inquiry* 26. 571-614.
- Itô, Junko and Armin Mester 1996. Rendaku I: Constraint Conjunction and the OCP. Lecture handout, the Kobe Phonology Forum, Kobe, Japan. [ROA-144].
- Jacobs, Heike 1995. Optimality Theory and sound change. *Proceedings of NELS* 25. [ROA-129]
- Jakobson, Roman. 1932/1984. Structure of the Russian verb. In Linda R. Waugh and Morris Halle (eds.) *Russian and Slavic Grammar: Studies 1931-1981* (Janua Linguarum, Series Maior 106). The Hague: Mouton. 1-14. (Originally published as 'Zur Struktur des russischen Verbums', Charistera Guglielmo Mathesio, 74-84, Prague, 1932)

- Jakobson, Roman. 1939/1984. Zero sign. In Linda R. Waugh and Morris Halle (eds.) *Russian and Slavic Grammar: Studies 1931-1981* (Janua Linguarum, Series Maior 106). The Hague: Mouton. 151-160. [Originally published as 'Signe zéro'. In *Mélanges de linguistique offerts à Charles Bally*, Geneva, 1939]
- Jakobson, Roman; Halle, Morris. 1956. *Fundamentals of language*. The Hague: Mouton.
- Johnson, C. D. 1975. Phonological channels in Chaha. *Afroasiatic Linguistics* 2.2. 1-12.
- Jun, Jongho. 1995. *Perceptual and Articulatory Factors in Place Assimilation: An Optimality Theoretic Approach*. Ph.D. Dissertation, UCLA.
- Jun, Jongho. 2001. Positional Markedness vs. Positional Faithfulness. *Eoneohag* [Journal of the Linguistic Society of Korea] 29. 57-84.
- Jun, Jongho 2004. Place assimilation. In Bruce Hayes, Robert Kirchner and Donca Steriade (eds.) *Phonetically-based phonology*. Cambridge: Cambridge University Press. 58-87.
- Kager, René. 1993. Alternatives to the iambic-trochaic law. *Natural Language and Linguistic Theory* 11. 381-432.
- Kager, René. 1995. Review of Hayes 1995. *Phonology* 12. 437-464.
- Kager, René. 1999. *Optimality Theory*. Cambridge: Cambridge University Press.
- Kager, René. To appear. Lexical irregularity and the typology of contrast. In Kristin Hanson and Sharon Inkelas (eds.) *The Structure of Words*. Cambridge, Mass.: The MIT Press.
- Kawahara, Shigeto. 2003. Root-controlled Fusion in Zoque: Root-Faith and Neutralization Avoidance. Ms., University of Massachusetts, Amherst. [ROA-599]
- Kaye, Jonathan; Lowenstamm, Jean; Vergnaud, Jean-Roger. 1985. The internal structure of phonological representations: a theory of Charm and Government. *Phonology Yearbook* 2. 305-328.
- Kenstowicz, Michael. 1994. *Phonology in Generative Grammar*. Cambridge, Mass.: Blackwell.

- Kerswill, Paul; Williams, Ann. 2002. 'Salience' as an explanatory factor in language change: evidence from dialect leveling in urban England. In M.C. Jones and E. Esch (eds.) *Language Change: the interplay of external, internal and extra-linguistic factors*. Berlin: Mouton de Gruyter. 81-110.
- Kikuchi, Seiichiro. 2005. The Emergence of The Unmarked in Galician Plural Formation. In *On'in Kenkyu [Phonological Studies]* 8. 17-24.
- Kiparsky, Paul. 1979. Metrical structure is cyclic. *Linguistic Inquiry* 10. 421-441.
- Kiparsky, Paul 2004. Fenno-Swedish quantity: contrast in stratal OT. Ms., Stanford University.
- Kirby, Simon. 1994. Adaptive explanations for language universals. *Sprachtypologie und Universalieforschung (STUF)* 47(3). 186-210.
- Kirchner, Robert. 1996. Synchronic Chain Shifts in Optimality Theory. *Linguistic Inquiry* 27. 341-350.
- Kirchner, Robert. 1997. Contrastiveness and Faithfulness. *Phonology* 14(1). 83-111.
- Kirchner, Robert. 1998. *An Effort-Based Approach to Consonant Lenition*. Ph. D. Dissertation, UCLA. [ROA-276].
- Kirchner, Robert. 2000. Geminate inalterability and lenition. *Language* 76(1). 509-545.
- Kirchner, Robert. 2004. Consonant Lenition. In Bruce Hayes, Donca Steriade and Robert Kirchner (eds.) *Phonetically Based Phonology*. Cambridge: Cambridge University Press. 313-346.
- Kitto, Catherine; de Lacy, Paul 1999. A correspondence theory of epenthetic quality. In Catherine Kitto and Carolyn Smallwood (eds.) *Proceedings of AFLA (Austronesian Formal Linguistics Association) VI*. Toronto Working Papers in Linguistics. 181-200.
- Kochetov, Alexei. 2001/2002. *Production, perception, and emergent phonotactic patterns: A case of contrastive palatalization*. Ph.D. Dissertation, University of Toronto. [Published as *Production, Perception and Emergent Phonotactic Patterns*. New York and London: Routledge.]
- Köhler, Oswin. 1955. *Geschichte der Erforschung der nilotischen Sprachen*. Berlin: Dietrich Reimer.

- Kohler, K.J. 1990. Segmental reduction in connected speech: Phonological facts and phonetic explanations. In William Hardcastle and Alain Marchal (eds.) *Speech Production and Speech Modeling*. Dordrecht: Kluwer. 69-92.
- Kohler, K.J. 1991. The phonetics/phonology issue in the study of articulatory reduction. *Phonetica* 48. 180-192.
- Koontz-Garboden, Andrew. 2001. Tiberian Hebrew Spirantization and Related Phenomena in Stratal OT. [ROA-607]
- Kučera, Henry; Monroe, George K. 1968. A Comparative Quantitative Phonology of Russian, Czech, and German. New York: American Elsevier.
- Kučera, Henry; Francis, Nelson W. 1967. *Computational Analysis of Present Day American English*. Providence, RI: Brown University Press.
- Kurusu, Kazutaka. 2001. *The Phonology of Morpheme Realization*, Ph.D. Dissertation. Santa Cruz: University of California. [ROA-490]
- de Lacy, Paul. 2001. Markedness in prominent positions. In Ora Matushansky, Albert Costa, Javier Martin-Gonzalez, Lance Nathan, and Adam Szczegielniak (eds.) *HUMIT 2000, MIT Working Papers in Linguistics* 40. Cambridge, MA: MITWPL. 53-66. [ROA-432]
- de Lacy, Paul 2002. *The Formal Expression of Markedness*. Ph.D. Dissertation, University of Massachusetts, Amherst. [ROA-542]
- Ladefoged, Peter. 1971. *Preliminaries to Linguistic Phonetics*. Chicago: University of Chicago Press.
- Ladefoged, Peter. 1982. *A Course in Phonetics*. 2nd edition. New York: Harcourt Brace Jovanovich.
- Ladefoged, Peter; Maddieson, Ian. 1996 *The Sounds of the World's Languages*. Oxford: Blackwell.
- Landauer, T.K.; Streeter, L.A. 1973. Structural differences between common and rare words: failure of equivalence assumptions for theories of word recognition, *Journal of Verbal Learning and Verbal Behavior* 12. 119-131.
- Lavoie, Lisa M. 2001. *Consonant strength: phonological patterns and phonetic manifestations*. New York: Garland.

- Lee, Jae-Young. 2000. On the Root-Affix Faithfulness Metaconstraint in English Phonology. Ms., Seoul National University.
- Lee, Jennifer R. 1987. *Tiwi today: a study of language change in a contact situation*. Pacific Linguistics C, 96. Canberra: Australian National University.
- Levinson, Stephen C. 2000. *Presumptive Meanings: The Theory of Generalized Conversational Implicature*. Cambridge, Mass.: MIT Press.
- Lewis, Anthony. 2001. *Weakening of intervocalic /p,t,k/ in two Spanish dialects*. Ph.D. Dissertation, University of Illinois at Urbana-Champaign.
- Lewis, Geoffrey N. 2000. *Turkish Grammar*. New York and London: Oxford University Press.
- Lieber, Rochelle. 1980. *On the Organization of the Lexicon*. Ph.D. Dissertation, University of New Hampshire.
- Liljencrants, Johan; Lindblom, Björn. 1972. Numerical simulation of vowel systems: the role of perceptual contrast. *Language* 48. 839-862.
- Lindblom, Björn; Maddieson, Ian. 1988. Phonetic universals in consonant systems. In Larry Hyman and C. Li (eds.) *Language, Speech and Mind: Studies in Honor of Victoria A. Fromkin*. London: Routledge. 62-78.
- Lindblom, Björn. 1986. Phonetic universals in vowel systems. In John Ohala and Jeri Jaeger (eds.) *Experimental Phonology*. Orlando: Academic Press.
- Lindblom, Björn. 1990. Explaining phonetic variation: a sketch of the H and H theory. In Hardcastle, W. and Marchal, A. (eds.), *Speech Production and Speech Modeling*. Dordrecht: Kluwer Academic Publishers. 403-439.
- Lindblom, Björn. 1990a. Explaining phonetic variation: a sketch of the H&H theory. In William Hardcastle and Alain Marchal (eds.) *Speech Production and Speech Modeling*. Netherlands: Kluwer. 403-439.
- Lombardi, Linda. 1999. Positional Faithfulness and Voicing Assimilation in Optimality Theory. *Natural Language and Linguistic Theory* 17. 267-302.
- Lombardi, Linda. 2000. Second language data and constraints on Manner: explaining substitutions for the English interdental. [ROA-418]

- Lombardi, Linda. 2001. Why Place and Voice are different: constraint-specific alternations in Optimality Theory. In Linda Lombardi (ed.), *Segmental Phonology in Optimality Theory. Constraints and Representations*. Cambridge: Cambridge University Press. 13-45.
- Luce, P. A. 1986. Neighborhoods of words in the mental lexicon. *Research on Speech Perception Progress Report, No. 6*. Bloomington: Indiana University, Psychology Department, Speech Research Laboratory.
- MacBride, Alexander. 2004. *A Constraint-Based Approach to Morphology*. Ph.D. Dissertation, UCLA.
- Maddieson, Ian. 1984. *Patterns of Sounds*. Cambridge: Cambridge University Press.
- Maddieson, Ian; Precoda, Karen. 1989. Updating UPSID. *UCLA WPP 74*. 104-111.
- Majors, Tivoli. 1998. *Stress-Dependent Vowel Harmony: Phonological Analysis and Phonetic Explanation*. Ph.D. Dissertation. Austin: University of Texas.
- Mańczak W. 1980. Frequenz und Sprachwandel. In H. Lüdtke (ed.), *Kommunikationstheoretische Grundlagen des Sprachwandels*. Berlin/ New York: Walter de Gruyter. 37-79.
- Marquardt T.P., Reinhart J.B., Peterson H.A. 1979. Markedness analysis of phonemic substitution errors in apraxia of speech. *J. Commun. Disord.* 12(6). 481-94.
- Marslen-Wilson, William. 1990. Activation, competition, and frequency in lexical access. In G. Altmann (ed.) *Cognitive Models of speech processing*. Cambridge, Mass.: MIT Press. 148-172.
- Martínez Celdrán, Eugenio. 1991. Sobre la naturaleza fonética de los alófonos de /b,d,g/ en español y sus distintas denominaciones. *Verba* 18. 235-253.
- Mayerthaler, Willi. 1981. *Morphologische Natürlichkeit*. Wiesbaden: Athenaion. [Translated as Mayerthaler, Willi. 1988. *Naturalness in morphology*. Ann Arbor: Karoma.]
- Mayerthaler, Willi. 1987. System-independent morphological naturalness. In Dressler, Wolfgang U.; Mayerthaler, Willi; Panagl, Oswald; Wurzel; Wolfgang U. (eds.) *Leitmotifs in Natural Morphology*. (Studies in Language Companion Series, 10.) Amsterdam: John Benjamins. 25-58.

- McCall, Betsy. 1999. Vowel lengthening in a moraic trochee system: stress in Ancient Egyptian. Ms., Indiana University.
- McCarthy, John. 1983. Consonantal Morphology in the Chaha Verb. In M. Barlow, D. Flickinger, and M. Wescoat (eds.) *Proceedings of the West Coast Conference on Formal Linguistics 2*. Stanford, CA: Stanford Linguistics Association.
- McCarthy, John. 1999. Sympathy and Phonological Opacity. *Phonology* 16. 331-399.
- McCarthy, John J. 2002. A Thematic Guide to Optimality Theory. Cambridge: Cambridge University Press.
- McCarthy, John J.; Prince, Alan 1986. Prosodic Morphology. Ms., Amherst: University of Massachusetts.
- McCarthy, John; Prince, Alan. 1993. Generalized Alignment. In G. Booij and J. van Marle (eds.) *Yearbook of Morphology 1993*. Dordrecht: Kluwer. 79-153.
- McCarthy, John; Prince, Alan. 1994. The Emergence of the Unmarked: Optimality in Prosodic Morphology. In M. Gonzalez (ed.), *Proceedings of the 24th meeting of NELS*. Amherst, MA: GLSA. 333-379. [ROA-13]
- McCarthy, J., and Prince, A. 1995. Faithfulness and reduplicative identity. In Beckman, Jill; Dickey, Laura Walsh and Urbanczyk, Suzanne (eds.), *University of Massachusetts Occasional Papers 18: Papers in Optimality Theory*. 249-384.
- McCartney, Steven. 2002. Resolved—not Germanic—feet in Old English. Ms., Austin: University of Texas.
- Mellander, Evan (2001). Quantitative Processes in Trochaic Systems. In Karine Megerdooian and Leora Anne Bar-el (eds.) *Proceedings of the Twentieth West Coast Conference on Formal Linguistics*. Somerville, MA: Cascadilla Press. 414-427.
- Mellander, Evan. 2003. (HL)-creating processes in a theory of foot structure. *The Linguistic Review* 20. 243–280.
- Mester, Armin; Itô, Junko. 1989. Feature Predictability and Underspecification: Palatal Prosody in Japanese Mimetics. *Language* 65. 258-293.

- Metsala, J. 1997. An examination of word frequency and neighbourhood density in the development of spoken word recognition. *Memory and Cognition* 25. 47-56.
- Miller, George; Chomsky, Noam. 1963. Finitary models of language users. In R. D. Luce, R. R. Bush and E. Galanter (eds.), *Handbook of Mathematical Psychology, II*. New York: John Wiley and Sons. 419-491.
- Miller, George; Isard, S. 1964. Free recall of self-embedded English sentences. *Information and Control* 7. 202-303.
- Monaghan, Padraic; Chater, Nick; Christiansen, Morten H. 2005. The differential role of phonological and distributional cues in grammatical categorisation. *Cognition* 96. 143-182.
- Morén, Bruce Timothy 1997. Markedness and Faithfulness Constraints on the Association of Moras: The Dependency between Vowel Length and Consonant Weight. Ms., University of Maryland, College Park.
- Morén, Bruce Timothy 1999. *Distinctiveness, Coercion and Sonority: A Unified Theory of Weight*. Ph.D. Dissertation, University of Maryland, College Park. [ROA-346]
- Moreton, Elliott 2004. Non-computable functions in Optimality Theory. In John J. McCarthy (ed.), *Optimality Theory in Phonology*. 141-164.
- Morin, Annick. 2005. Anti-Markedness Language Change in Gascon and Québec French. Paper presented at the University of Tromsø.
- Morton, J.; Long, J. 1976. Effect of word transitional probability on phoneme identification. *Journal of Verbal Learning and Verbal Behavior* 15. 43-51.
- Motley, M. T.; Baars, B. J. 1975. Encoding sensitivities to phonological markedness and transitional probability: Evidence from spoonerisms. *Human Communication Research* 1. 353-361.
- Nasu, Akio. 2003. Reduplicants and Prefixes in Japanese Onomatopoeia. In T. Honma, M. Okazaki, T. Tabata and S. Tanaka (eds.) *A New Century of Phonology and Phonological Theory - A Festschrift for Professor Shosuke Haraguchi on the Occasion of his Sixtieth Birthday*. Tokyo: Kaitakusha. 210-221.

- Nespor, Marina; Vogel, Irene. 1986. *Prosodic Phonology*. Dordrecht: Foris
- Nevins, Andrew. 2006. Dual is Still more Marked than Plural. Colloquium Talk, Syracuse University.
- Newmeyer, Frederick J. 1998. *Language Form and Language Function*. Cambridge, Mass.: MIT Press.
- Ní Chiosáin, Máire; Padgett, Jaye. 2001. Markedness, Segment Realization, and Locality in Spreading. In Linda Lombardi (ed.) *Segmental Phonology in Optimality Theory*. Cambridge: Cambridge University Press. 118-156.
- Nooteboom, Sieb. 1981. Lexical retrieval from fragments of spoken words: beginnings vs. endings. *Journal of Phonetics* 9. 407-424.
- Noske, Manuela. 2000. ATR harmony in Turkana: A case of Faith-Suffix » Faith-Root. *Natural Language and Linguistic Theory* 18. 771-812.
- Noyer, Rolf. 1992. *Features, Positions and Affixes in Autonomous Morphological Structure*. Ph.D. Dissertation, MIT.
- Oh, Young-Il. 2002. Historical Sound Change in Optimality Theory. *SNU Working Papers in English Language and Linguistics* 1, 127-141.
- Ohala, John. 1983. The origin of sound patterns in vocal tract constraints. In Peter MacNeilage (ed.) *The Production of Speech*. New York: Springer-Verlag.
- Ohala, John J. 1990. The phonetics and phonology of assimilation. In J. Kingston and M. Beckman (eds.) *Papers in Laboratory Phonology I: Between the Grammar and Physics of Speech*. Cambridge: Cambridge University Press. 258-275.
- Osborne, C. R. 1974. *The Tiwi Language*. Australian Aboriginal Studies No. 55. Linguistic Series No. 21. Canberra: Australian Institute of Aboriginal Studies.
- Padgett, Jaye. 2001. Contrast dispersion and Russian palatalization. In Elizabeth Hume and Keith Johnson, (eds.) *The role of speech perception in phonology*. San Diego, CA: Academic Press. 187-218.
- Padgett, Jaye. 2003a. Contrast and Post-Velar Fronting in Russian. *Natural Language and Linguistic Theory* 21. 39-87.

- Padgett, Jaye. 2003b. The emergence of contrastive palatalization in Russian. In Eric Holt (ed.), *Optimality Theory and language change*. Dordrecht: Kluwer Academic Press. 307-335.
- Padgett, Jaye; Zygis, Marzena. 2003. The evolution of sibilants in Polish and Russian. In T. A. Hall and Silke Hamann (eds.) *ZAS papers in linguistics volume 32*. Berlin: Zentrum für Allgemeine Sprachwissenschaft. 155-174.
- Peinovich, Michael P. 1979. *Old English noun morphology: a diachronic study*. Amsterdam - New York: North-Holland Pub. Co.
- Phillips, Betty. 1980. Old English an ~ on: A new appraisal. *Journal of English Linguistics* 14. 20-3.
- Pierrehumbert, Janet. 2000. The phonetic grounding of phonology. *Les Cahiers de l'ICP, Bulletin de la Communication Parlée* 5. 7-23.
- Pierrehumbert, Janet. 2003. The Voice of Markedness. Talk presented at the IAP Workshop on markedness and the lexicon, MIT.
- Pisoni, D. B.; Nusbaum, H. C.; Luce, P. A.; Slowiaczek, L. M. 1985. Speech perception, word recognition, and the structure of the lexicon. *Speech Communication* 4. 75-95.
- Postal, Paul. 1974. *On Raising*. Cambridge, Mass.: The MIT Press.
- Prince, Alan. 1990. Quantitative Consequences of Rhythmic Organization. In M. Ziolkowski, M. Noske & K. Deaton (eds.) *Papers from the Chicago Linguistic Society* 26:2. 355-398.
- Prince, Alan; Smolensky, Paul. 1993/2004. *Optimality Theory: Constraint interaction in generative grammar*. London: Blackwell [Originally published as Technical Report CU-CS-696-93, Department of Computer Science, University of Colorado at Boulder, and Technical Report TR-2, Rutgers Center for Cognitive Science, Rutgers University, New Brunswick, NJ, April 1993]
- Pulleyblank, Douglas. 1996. Neutral Vowels in Optimality Theory: A Comparison of Yoruba and Wolof. *Canadian Journal of Linguistics/Revue canadienne de linguistique* 41(4). 295-347.
- Quilis, Antonio. 1993. *Tratado de fonología y fonética españolas*. Madrid: Gredos.

- Ramsey, Robert S. 1991. Proto-Korean and the Origin of Korean Accent. In William G. Boltz and Michael C. Shapiro (eds.) *Asian Historical Phonology*. Amsterdam-Philadelphia: John Benjamins.
- Revithiadou, Anthi. 2004. The Iambic/Trochaic Law revisited - Lengthening and shortening in trochaic systems. In Boban Arsenijevic et al. (eds.), *Leiden Papers in Linguistics* 1.1. 37-62.
- Rice, Curt. 1992. Binariness and ternariness in metrical theory: parametric extensions. Ph.D. Dissertation. Austin: University of Texas.
- Rice, Keren. 2003. Featural markedness in phonology: variation. In Lisa Cheng and Rint Sybesma (eds.) *The Second Glot International State-of-the-Article Book*. Berlin-New York: Mouton de Gruyter. 389-429.
- Rice, Keren; Peter Avery. 1995. Variability in a deterministic model of language acquisition: A theory of segmental elaboration. In J. Archibald (ed.) *Phonological acquisition and phonological theory*. Hillsdale, NJ: Lawrence Erlbaum. 23-42.
- Rice, Keren; Avery, Peter. 2004. The representational residue: the role of contrast in phonology. Paper presented at the 12th Manchester Phonology Meeting, University of Manchester.
- Ringen, Catherine O.; Vago, Robert. 1998. Hungarian vowel harmony in Optimality Theory. *Phonology* 15. 393-416.
- Rose, Sharon. 1994. Palatalization, underspecification, and plane conflation in Chaha. In *Proceedings of the Twelfth West Coast Conference on Formal Linguistics*. Stanford, CA: CSLI Publications. 101-116.
- Rose, Sharon. 1997. *Theoretical Issues in Comparative Ethio-Semitic Phonology and Morphology*, Ph.D. Dissertation, Montreal: McGill University.
- Rose, Sharon; Walker, Rachel. 2004. A typology of consonant agreement as correspondence. *Language* 80. 475-531.
- Ross, John Robert. 1967. *Constraints on Variables in Syntax*. Ph.D. Dissertation, MIT.
- Rubach, Jerzy. 1984. *Cyclic and lexical Phonology: The Structure of Polish*. Dordrecht: Foris Publications.

- Rubach, Jerzy. 2002. An Overview of Palatalization-i. *Studies in Phonetics, Phonology and Morphology* 8. 169-186.
- Russell, Paul. 1995. *Introduction to the Celtic Languages*. New York: Longman.
- Russell, Kevin. 1999. MOT: Sketch of an OT approach to morphology. Ms., University of Manitoba.
- Rusu, Grigore. 1983. *Structura fonologica a graiurilor dacoromane*. [The Phonological Structure of Daco-Romanian Dialects.] Bucharest: Editura Stiintifica si Enciclopedica.
- Saeed, John Ibrahim. 1993. *Somali Reference Grammar*. Kensington, MD: Dunwoody Press.
- Saffran, J.R.; Aslin, R.N.; Newport, E.L. 1996. Statistical learning by 8-month old infants. *Science* 274. 1926-1928.
- Saffran, J.R.; Newport, E.L.; Aslin, R.N.; Tunick, R.A.; Barrueco, S. 1997. Incidental language learning: Listening (and learning) out of the corner of your ear. *Psychological Science* 8. 101-105.
- Sagey, Elizabeth. 1986/1990. *The Representation of Features and Relations in Non-Linear Phonology*. Ph. D., MIT. [Published as *The Representation of Features and Relations in Non-Linear Phonology*. New York, Garland]
- Saltarelli, Mario. 1970. Spanish Plural Formation: Apocope or Epenthesis? *Language* 46 (1). 89-96.
- Saltarelli, Mario 2001. The Realization of Number in Italian and Spanish. In J. Herschensohn, E. Mallén and K. Zagona (eds.) *Features and Interfaces in Romance*, Amsterdam: John Benjamins. 239-254.
- Saltarelli, Mario; Calvano, William. 1979. The Morphological Measure of Phonological Rules. *Lingua* 48. 1-14.
- Samek-Lodovici, Vieri. 1992. Universal Constraints and Morphological Gemination: A Crosslinguistic Study. Ms., Brandeis University.
- Samek-Lodovici, Vieri. 1993. A Unified Analysis of Crosslinguistic Morphological Gemination. *CONSOLE Proceedings*.

- de Saussure, Ferdinand. 1916/1972. *Cours de linguistique générale*. [Course in General Linguistics, English translation by Roy Harris]. La Salle, Illinois: Open Court Classics.
- Schane, Sanford A. 1984. The fundamentals of Particle Phonology. *Phonology* 1. 129-155.
- Scott, Mike. 1996. Wordsmith 4.1. Software developed for Oxford University Press.
- Segalowitz, Sidney J.; Lane, Korri C. 2000. Lexical Access of Function versus Content Words. *Brain and Language* 75. 376-389.
- Selkirk, Elizabeth O. 1980. The role of prosodic categories in English word stress. *Linguistic Inquiry* 11. 563-605.
- Selkirk, Elizabeth. 1984. On the Major Class features and Syllable Theory. In M. Aronoff and R.T. Oehrle (eds.), *Language Sound Structure: Studies in Phonology Dedicated to Morris Halle by his Students*. Cambridge, Mass: MIT Press. 107-136.
- Selkirk, Elisabeth O. 1995. Surface restrictions in the distribution of lexical contrasts: The role for root faithfulness. Ms., University of Massachusetts, Amherst.
- Shi, Rushen; Morgan, James L.; Allopenna, Paul. 1998. Phonological and acoustic bases for earliest grammatical category assignment: A cross-linguistic perspective. *Journal of Child Language*, 25. 169-201.
- Sievers, Eduard. 1876. *Grundzüge der Lautphysiologie*. (Bibliothek indogermanischen Grammatiken 1) Leipzig: Breitkopf und Hartel.
- Smith, Jennifer L. 1999. Noun faithfulness and accent in Fukuoka Japanese. In Sonya Bird, Andrew Carnie, Jason D. Haugen, and Peter Norquest (eds.), *Proceedings of WCCFL XVIII*. Somerville, MA: Cascadilla Press. 519-531.
- Smith, Jennifer L. 2001. Lexical category and phonological contrast. In Robert Kirchner, Joe Pater, and Wolf Wikely (eds.), *Papers in Experimental and Theoretical Linguistics 6: Workshop on the Lexicon in Phonetics and Phonology*. Edmonton: University of Alberta. 61-72.

- Smith, Jennifer. 2002/2005. *Phonological Augmentation in Prominent Positions*. New York: Routledge. Originally published as *Phonological Augmentation in Prominent Positions*. Ph.D. Dissertation, Amherst: University of Massachusetts.
- Smith, Jennifer L. 2004a. Functional grounding inside the phonology: Evidence from positional augmentation. Paper presented at *GLOW* 2004.
- Smith, Jennifer L. 2004b. Making constraints positional: toward a compositional model of CON. *Lingua* 114 (2004). 1433-1464.
- Smolensky, Paul. 1995. On the Structure of the Constraint Component *Con* of UG. Talk handout, UCLA [ROA-86].
- Stampe, David. 1973. *A Dissertation on Natural Phonology*. Bloomington, Indiana: Indiana University Linguistics Club.
- Stemberger, J. P.; MacWhinney, B. 1986. Frequency and the storage of regularly inflected forms. *Memory and Cognition* 14. 17-26.
- Steriade, Donca. 1984. Glides and Vowels in Romanian. *Berkeley Linguistics Society* 10, 47-64.
- Steriade, Donca. 1993. Positional Neutralization. Talk presented at North Eastern Linguistics Society 24, University of Massachusetts, Amherst.
- Steriade, Donca. 1995a. Underspecification and markedness. In John Goldsmith (ed.), *The Handbook of Phonological Theory*. London: Blackwell. 114-74.
- Steriade, Donca. 1995b. Neutralization and the expression of contrast. Ms., UCLA.
- Steriade, Donca. 1995c. Positional neutralization. Ms., UCLA.
- Steriade, Donca. 1997. Phonetics in phonology: the case of laryngeal neutralization. Ms., UCLA.
- Steriade, Donca. 2001. The Phonology of Perceptibility Effects: the P-map and its consequences for constraint organization. Ms., UCLA.
- Stonham, John T. 1994. *Combinatorial Morphology*. Amsterdam: John Benjamins.
- Svartvik, Jan. 1990. The London-Lund Corpus of Spoken English: Description and Research. *Lund Studies in English* 82. Lund: Lund University Press.

- Swadesh, Morris. 1971. *The Origin and Diversification of Language*. Chicago: Aldine-Atherton.
- Tesar, Bruce; Paul Smolensky. 1993. The Learnability of Optimality Theory: An Algorithm and Some Basic Complexity Results. [ROA-2]
- Tesar, Bruce; Paul Smolensky. 1996. Learnability in Optimality Theory. Rutgers Optimality Archive [ROA-110]
- Tesar, Bruce; Smolensky, Paul. 1998. Learning Optimality-Theoretic grammars. *Lingua* 106. 161-196.
- Tessier, Anne-Michelle. 2004. Root-restricted Markedness and Morpho-Phonological Domains. Talk presented at the Montreal-Ottawa-Toronto Phonology Workshop, University of Ottawa.
- Tiersma, Peter Meijes. 1982. Local and General Markedness. *Language* 58(4). 832-849.
- Topintzi, Nina. 2003. Issues of locality and morphologically induced non-identity in the N. Karanga assertive and non-assertive patterns. In Ad Neeleman and Reiko Vermeulen (eds.) *UCL Working Papers in Linguistics* 15. 327-354.
- Trubetzkoy, Nikolaj. 1931. Die phonologischen Systeme. [The Phonological Systems] *Travaux du Cercle Linguistique de Prague* 4: 96–116.
- Trubetzkoy, Nicholas. 1939/1969. *Principles of phonology*. (Translation of *Grundzüge der Phonologie*, Prague, 1939). Berkeley and Los Angeles: University of California Press.
- Uehara, Keiko. 2003. *Center Embedding and Nominative Repetition in Japanese Sentence Processing*. Ph.D. Dissertation, The City University of New York.
- Urbanczyk, Suzanne. 1996/2001. *Patterns of Reduplication in Lushootseed*. Ph.D. Dissertation, University of Massachusetts, Amherst. [Published as *Patterns of Reduplication in Lushootseed* New York: Garland.]
- Ussishkin, Adam. 2000. Root-and-Pattern Morphology Without Roots or Patterns. In M. Hirotani, A. Coetzee, N. Hall, J.-Y. Kim (eds.), *Proceedings of the Northeastern Linguistics Society* [NELS] 30. 655-670

- Ussishkin, Adam; Wedel, Andrew. 2002. Neighborhood Density and the Root-Affix Distinction. In M. Hirotani (ed.), *Proceedings of the Northeastern Linguistics Society [NELS]* 32. 539-549.
- Vasiliu, Emanuel 1965. *Fonologia limbii române* [The Phonology of Romanian]. Bucharest: Editura Stiintifica.
- Vennemann, Theo. 1974. Words and syllables in natural generative grammar. *CLS* 10: Papers from the Parasession on Natural Phonology. 346-374.
- Vijayakrishnan, K.G. 2003. Weakening Processes in the Optimality Framework. In Jeroen van de Weijer, Vincent J. van Heuven and Harry van der Hulst (eds.) *The Phonological Spectrum*. Amsterdam: John Benjamins. 241-255.
- Vitevitch, Michael S. 1997. The neighborhood characteristics of malapropisms. *Language and Speech* 40(3). 211-228.
- Vogel, Irene Barrie. 1977. *The syllable in phonological theory, with special reference to Italian*. Ph.D. Dissertation, Stanford University.
- Walker, Rachel 2000a. *Nasalization, Neutral Segments and Opacity Effects*. New York: Garland.
- Walker, Rachel 2000b. Nasal reduplication in Mbe affixation. *Phonology* 17. 65-115.
- Walker, Rachel. 2001a. Round licensing, harmony, and bisyllabic triggers in Altaic. *Natural Language and Linguistic Theory* 19. 827-878.
- Walker, Rachel. 2001b. Positional markedness in vowel harmony. In Caroline Féry, Antony Dubach Green and Ruben van de Vijver (eds.), *Proceedings of HILP 5, Linguistics in Potsdam 12*. Potsdam: University of Potsdam. 212-232.
- Walker, Rachel. 2004. Vowel feature licensing at a distance: Evidence from Northern Spanish language varieties. In Vineeta Chand et al. (eds.) *Proceedings of WCCFL* 23. 787-800.
- Walker, Rachel. 2005. Weak triggers in vowel harmony. *Natural Language and Linguistic Theory* 23. 917-989.

- Walker, Rachel; Feng, Guanjun (Bella). 2004. A ternary model of morphology-phonology correspondence. In Vineeta Chand et al. (eds.) *Proceedings of WCCFL 23*. 773-786.
- Wang, Hsu Samuel; Wu, Jui-Chun. 2001. The Effect of Vowel Duration on the Perception of Postvocalic Voiced/ Voiceless Consonants. *Concentric: Studies in English Literature and Linguistics* 27(2). 35-52.
- Werner, Otmar. 1989. Sprachökonomie und Natürlichkeit im Bereich der Morphologie. *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung* 42: 34-47.
- Willerman, Raquel. 1994. *The Phonetics of Pronouns: Articulatory Bases of Markedness*. Ph.D. dissertation, University of Texas.
- Williams, Edwin. 1981. On the notions 'Lexically Related' and 'Head of a Word'. *Linguistic Inquiry* 12. 245-274.
- Woolford, Ellen. 2001. Case patterns. In Géraldine Legendre, Jane Grimshaw, Sten Vikner (eds.) *Optimality-theoretic syntax*. Cambridge, Mass.: MIT Press. 509- 543.
- Wurzel, Wolfgang U. 1989. *Inflectional morphology and naturalness*. Dordrecht: Kluwer.
- Wurzel, Wolfgang U. 1998. On markedness. *Theoretical Linguistics* 24.1. 53-71.
- Zipf, George K. 1949. *Human Behavior and the Principle of Least Effort*. Cambridge, Mass.: Addison-Wesley.
- Zoll, Cheryl. 1993. Directionless syllabification and ghosts in Yawelmani. Ms., UC Berkeley. [ROA-28].
- Zoll, Cheryl. 1996. *Parsing Below the Segment in a Constraint-Based Framework*. Ph.D. Dissertation. Berkeley: University of California.
- Zoll, Cheryl. 1997. Conflicting directionality. *Phonology* 14. 263-286.
- Zoll, Cheryl. 1998. Positional Asymmetries and Licensing. Paper presented at the 1998 Annual Meeting of the Linguistic Society of America, New York.
- Zygis, Marzena. 2004. (Un)markedness of trills: the case of Slavic r-palatalisation. *ZAS Papers in Linguistics* 37. 137-166.