Chain-shifting Mutation in Irish and Multi-valued Features

Jochen Trommer

jtrommer@uni-leipzig.de

Universität Leipzig
Institut für Linguistik

OCP 6 – January 24, 2009

The Concatenativist Hypothesis

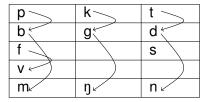Morphology = Concatenation + Suppletion + Phonology

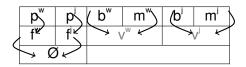(cf. Stonham, 1994)

Corollary

Nonconcatenative Morphology $\subset$ Concatenative Morphology

Chain-shifting Mutation in Irish

Eclipsis

Lenition

Problems for the Concatenativist Hypothesis

▶ The phonological contribution of eclipsis and lenition to the shape of their bases is non-monotonic

▶ Lenition is rather subtractive than additive

Hypothesis

Mutation morphemes are floating grid marks

in multivalued featural representations of phonological scales

Overview

- ▶ Preliminaries

- ▶ Eclipsis as Sonority Affixation

- ▶ Lenition as Aperture Affixation

Preliminaries

The Consonant System of Irish

▶ No phonemic contrast between fricatives and approximants

▶ Consonants come in 2 series, 'broad' and 'slender':

Slender consonants are palatalized

Broad labials are labialized

Broad coronals and dorsals are velarized

The Consonant System of Irish

pʷ	pʲ	t̪ⁱʲ	tʲ/tʃ			kⁱʲ	kʲ	
bʷ	bʲ	d̪ⁱʲ	dʲ/dʒ			gⁱʲ	gʲ	
fʷ	fʲ	sⁱʲ	ʃ			xⁱʲ	ç	h
βʷ/w/vʷ	vʲ					ɣⁱʲ	j/ʝ	
mʷ	mʲ	n̪ⁱʲ	nʲ	n̪̊ⁱʲ	n̥ʲ	ŋⁱʲ	ŋʲ	
		l̪ⁱʲ	l̝ʲ	l̪̊ⁱʲ	l̥ʲ			
		rⁱʲ/ɹ	rʲ/ɹ̝	r̪ⁱʲ/ɹ				

(Pullman,2004:2)

Jochen Trommer jtrommer@uni-leipzig.de   Chain-shifting Mutation in Irish and Multi-valued Features

The Framework

- ▶ Stratal Optimality Theory
  (Bermudez-Otero, 2009)

- ▶ Simplistic Colored Containment Theory
  (Trommer, 2008 departing from van Oostendorp, 2004)

Simplistic Colored Containment Theory

- ▶ Input structure cannot be literally deleted in outputs
  It can just be rendered phonetically invisible

- ▶ Every morpheme has a unique morphological color
  All phonological material belonging to the morpheme
  bears this colour

- ▶ Gen cannot change morphological color

Simplistic Colored Containment Theory

Underlying /t/   Underlying /d/   Underlying /tn/
Surfacing [t]   Surfacing [t]   Surfacing [dn]

[+vc]   [+vc] **[–vc]**   [–vc]   [+vc]

[–son–cont]   [–son–cont]   [–son–cont][+son–cont]

REALIZE MORPHEME

For every morpheme in the input,

some phonological element

should be present in the output.

$$\approx$$

Every morphological color *C* in an output form

should be detectable by at least

one phonetically visible phonological element of color *C*

($\approx$ van Oostendorp, 2005 $\approx$ Akinlabi, 1996)

Sonority by Multi-valued Features

Inherent Voicing Scale

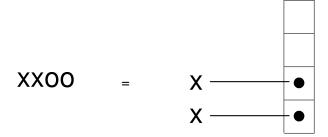|	Representation	Abbreviation
Voiceless Obstruents & Laryngeals:	son:oo	son:
Voiced Obstruents:	son:xo	son:x^1
Sonorants:	son:xx	son:x^2

Aperture Scale

	Representation	Abbreviation
Nasal and Oral Stops:	ap:oo	ap:
Fricatives and Approximants:	ap:xo	ap:x^1
Laryngeals (and Ø):	ap:xx	ap:x^2

(cf. Gnanadesikan, 1997 and de Lacy, 2002)

The Internal structure of multiple feature values

XXOO   =   X ——————— ●

         X ——————— ●

Multi-valued vs. Binary/Privative Features

"Are there any differences, then, between these two very different theories of essentially the same problem? Explicit discussion of this question is rare, and the arguments raised are unpersuasive, tending to emphasize methodological rather than empirical differences." (McCarthy 1988:94)

Restricting Reference to the Sonority Scale

Only constraints referring to prosodic elements
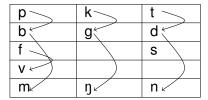
may explicitly refer to prosodic scales

(de Lacy, 2002:49)

Eclipsis as Sonority Affixation

Irish Eclipsis (Gnanadesikan, 1997:97; Pullman,2004:13)

| **t**ʲax | ə | **d**ʲax | **[–vc] Stop** | ⇒ | **[+vc] Stop** |
| house | their | house | | | |

| **f**ʲiə | ə | **v**ʲiə | **[–vc] Fricative** | ⇒ | **[+vc] Fricative** |
| deer | their | deer | | | |

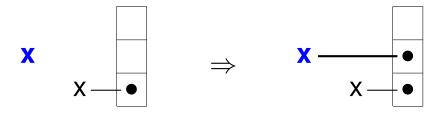| **d**oːrəs | ə | **n**oːrəs | **[+vc] Stop** | ⇒ | **Nasal** |
| door | their | bag | | | |

Irish Eclipsis

The Eclipsis Morpheme

$$E \longleftrightarrow X_{son}$$

Eclipsis as Affixation of a Grid Mark

Constraint Ranking

REALIZE MORPHEME

$\gg$

IDENT [continuant]

$\gg$

IDENT [nasal]

$\gg$

IDENT [voice]

Eclipsis of Voiceless to Voiced Stops

Input: x_{son} + [son: –cont –vc –nas] (k)

	RM	ID cont	ID nas	ID vc
a. [son: –cont –vc –nas] (k)	*!			
b. [son: +cont +vc –nas] (x)	*!	*		*
c. [son:x^1 +cont +vc –nas] (ɣ)		*!		*
☞ d. [son:x^1 –cont +vc –nas] (g)				*
e. [son:x^2 –cont +vc +nas] (ŋ)			*!	*

Eclipsis of Voiced Stops to Nasals

Input: x_{son} + [son:x^1 –cont +vc –nas] (b)

	RM	ID cont	ID nas	ID vc
a. [son:x^1 –cont +vc –nas] (b)	*!			
b. [son:x^1 +cont +vc –nas] (v)	*!	*		
☞ c. [son:x^2 –cont +vc +nas] (m)			*	
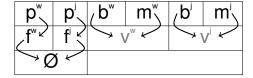
Lenition as Aperture Affixation

Irish Lenition
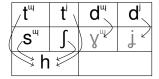
kʲark	mə	**x**ʲark	**Stop**	⇒	**Fricative**
hen	my	hen			
tʲax	mə	**h**ʲax	**Stop**	⇒	**Laryngeal**
house	my	house'			
ma:lə	mə	**w**a:lə	**Nasal**	⇒	**Fricative**
bag	my	bag			
sʲo:l	**h**ʲo:l		**Fricative**	⇒	**Laryngeal**
sail	sailed				

(Ní Chiosáin, 1991)
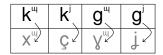
Lenition of Labials

Lenition of Coronals

Lenition of Dorsals

$k^ɯ$	k^j	$g^ɯ$	g^j
$x^ɯ$	$ç$	$ɣ^ɯ$	j

Multi-Value Representation of Consonantal Aperture

	Representation	Abbreviation
Nasal and Oral Stops:	ap:oo	ap:
Fricatives and Approximants:	ap:xo	ap:x[1]
Laryngeals (and Ø):	ap:xx	ap:x[2]
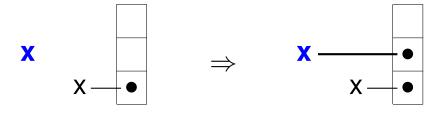
Ø-Aperture

- ▶ Ø-Aperture of consonants corresponds to segments with no overt oral articulator

- ▶ If such sounds have a laryngeal articulator, a glottal sound results, otherwise the sound is phonetically Ø

- ▶ Ø lenited from fʲ is still traceable through palatalization which attaches to preceding words (Gnanadesikan,1997:190)

The Lenition Morpheme

$$\text{L} \longleftrightarrow \text{X}_{ap}$$

Lenition as Affixation of a Grid Mark

Analysis

- ▶ Attachment of x_{ap} to a nasal/stop, shifts this by 1 in aperture to a fricative

- ▶ Attachment of x_{ap} to a fricative, shifts this by 1 to h/Ø

- ▶ Attachment of x_{ap} to t shifts this by 2 to h to avoid a change in stridency (cf. Pullman, 2004)

1-Step Lenition of p to f

Input: x_{ap} + [ap: –cont –vc LAB] (pa $\Rightarrow$ fa)

	RM	ID cont	ID nas	ID vc	ID PLC
a. [ap: –cont –vc LAB] (p)	*!				
☞ b. [ap:x^1 +cont –vc LAB] (f)		*			
c. [ap:x^2 +cont –vc LAB] (Ø)		*			*!

1-Step Lenition of f to Ø

Input: x_{ap} + [ap:x^1 +cont −vc LAB] (fa ⇒ Øa)

	RM	ID cont	ID nas	ID vc	ID PLC
a. [ap:x^1 +cont −vc LAB] (f)	*!				
☞ c. [ap:x^2 +cont −vc LAB] (Ø)					*

Jochen Trommer `jtrommer@uni-leipzig.de`   Chain-shifting Mutation in Irish and Multi-valued Features

1-Step Lenition of s to h

Input: x_{ap} + [ap:x^1 +cont –vc COR] (sa $\Rightarrow$ ha)

	RM	ID cont	ID nas	ID vc	ID PLC
a. [ap:x +cont –vc COR] (s)	*!				
☞ c. [ap:$x^{\mathbf{2}}$ +cont –vc COR **LAR**] (h)					*

2-Step Lenition of Coronal Stops to h

Lenition to sibilants is skipped
to avoid a featural change to [+strident]

2-Step Lenition of Coronal Stops to h

Input: x_{ap} + [ap:x^1 –vc –strid COR] (ta $\Rightarrow$ ha)

	RM	ID [+strid]	ID cont	ID PLC
a. [ap:x^1 –vc –strid COR] (t)	*!			
b. [ap:x^1 –vc +strid COR] (s)		*!	*	
☞ c. [ap:x^2 –vc –strid COR **LAR**] (h)			*	*

Jochen Trommer jtrommer@uni-leipzig.de   Chain-shifting Mutation in Irish and Multi-valued Features

Conclusions

Related Analyses

- **Rice (1993):**
  - ☺ Multiple privative feature analysis of eclipsis
  - ☹ doesn't extend to aperture

- **Grijzenhout (1995):**
  - ☺ Unified accounts of lenition and eclipsis
  - ☹ Eclipsis is feature-adding, lenition feature-deleting

- **Gnanadesikan (1997):**
  - ☺ Unified approach to sonority and aperture scale
  - ☹ Problematic implementation of REALIZE MORPHEME

REALIZE MORPHEME in Gnanadesikan (1997:94)

(14) Morpheme Realization (MORPH REAL):

A Morpheme must be realized by fulfilling one of the following conditions:

(a) the output affixed form contains at least one segment not in the unaffixed form, and that segment(s) is coindexed with a segment(s) in the affix's input

(b) the output affixed form contains a segment which is coindexed with the affix's input and that segment has a scale (or feature) value contained in the affix's input but not in the unaffixed form

(c) the output affixed form contains a segment which is coindexed with the affix's input and that segment has a scale value adjacent to that of the affix's input. That value does not occur in the unaffixed form.

Advantages of the Grid-based Analysis

- ▶ Unified Account for Chain-Shifting

- ▶ Only standard OT-constraints are needed

- ▶ Chain-shifting morphology is captured
  in a purely concatenative way

Predictions

- ▶ Anti-Irish – chain-shifting fortition – should be impossible

- ▶ No chain-shifting process should systematically shift by two or more scale positions

- ▶ Chain-shifting should occur in other scales (e.g. tone)

Appendix

Appendix: Additional Details of Irish Mutation

▶ Non-Mutation

▶ Vowel-Initial Stems

▶ The Shape of Ø-Aperture

Non-Mutation

Non-Eclipsis

▶ Vowels and Glottals (h)

▶ Sonorants

▶ Sibilants

Non-Lenition

▶ Vowels and Glottals (h)

▶ Sonorants except m

Non-Mutation by the Irish Segment Inventory

In Irish . . .

▶ There is no other laryngeal than h

▶ There is no more sonorous labial than m

▶ There are no voiced sibilants

Non-Mutation by Faithfulness

- ► IDENT [–continuant]:
  Nasals cannot be derived from fricatives

- ► IDENT [+lateral]:
  Laterals cannot be derived from non-laterals

- ► Ident [+continuant]$_{[+sonorant]}$:
  Rhotics cannot be derived from non-rhotics

- ► IDENT [-consonant]:
  Vowels cannot be derived from non-vowels

Explaining Non-Eclipsis

▶ **Sibilants:** cannot be voiced (not allowed by the segment inventory) and not mutated into more sonorous segments due to IDENT constraints

▶ **Sonorants:** cannot be mutated into more sonorous segments due to IDENT constraints

▶ **Glottal h** cannot be mutated into any other laryngeal sound due to the inventory

Explaining Non-Lenition

- ▶ **Vowels and glottals:** already have maximal aperture

- ▶ **Coronal nasals and laterals:** blocked by IDENT constraints

- ▶ **Rhotics:** cannot get more aperture except by changing into approximants or vowels which violates the inventory or IDENT constraints

Lenition with Place of Articulation Shift

Shifting PoA avoids creating voiced sibilants
which are independently excluded in Irish

Ø-Aperture in Labials and Coronals

f	s
Ø	h

Why does coronal Ø become laryngeal, but labial Ø does not?

Constraints governing the Place of Ø-Aperture

*Ø-PLACE   Root nodes should be overtly associated
                      to at least one oral or laryngeal PLACE feature

*ORAL-PLACE$_{ap:xx}$ Consonantal root nodes with maximal overt aperture
                      should not be associated to oral place features

*[LAB LAR]   A root node associated to (over or non-overt) LABIAL
                      should not be linked to overt LARYNGEAL

(DEP ORAL-PLACE dominates all constraints discussed in the following

while DEP LAR and MAX ORAL-PLACE are ranked below the constraints explicitly given)

Ø-Aperture in Labials and Coronals

Input: $:x_{ap}$ + [ap:x +cont −vc LAB] (fa ⇒ Øa)

	*ORAL PL$_{ap:xx}$	*[LAB LAR]	*Ø-PL
☞ a. [ap:x^2 +cont −vc LAB] (Ø)			*
b. [ap:x^2 +cont −vc LAB **LAR**] (h)		*!	
c. [ap:x^2 +cont −vc LAB] (Ø$_{LAB}$)	*!		

Input: x^{ap} + [ap:x^1 +cont −vc COR] (sa ⇒ ha)

	*ORAL PL$_{ap:xx}$	*[LAB LAR]	*Ø-PL
a. [ap:x^2 +cont −vc COR] (Ø)			*!
☞ b. [ap:x^2 +cont −vc COR **LAR**] (h)			
c. [ap:x^2 +cont −vc COR] (Ø$_{COR}$)	*!		

V-initial Stems

▶ **Eclipsis:** Insertion of n before the vowel

▶ **Lenition:** Neither mutation nor insertion (Ø)

Eclipsis with Consonant-initial Stems

Input: x_{son} + Stop

	|| *COMPL	RM	IDENT	...
	a. Stop		*!		
☞	b. Mutated-Stop			*	
	c. n+Stop	*!			

Input: x_{son} + s

	|| *COMPL	IDENT	RM	...
☞	a. s				
	b. Mutated-s		*!		
	c. n+s	*!			

Eclipsis with Vowel-initial Stems

Input: $x_{son} + V$

		*COMPL	IDENT	RM	. . .
	a. V			*!	
	b. Mutated-V		*!		
☞	c. n+V				

		RM	IDENT	*VCDOBSTR	DEP F
	a. x^0 V (ta)	*!			*
	a. x^0 V (Øa)	*!			
	b. x^1 V (da)			*!	*
☞	c. x^2 V (na)				*

Lenition with Vowel-initial Stems

Input: x_{ap} + V

	*COMPL	IDENT	RM	...
a. V			*!	
b. Mutated-V		*!		
☞ c. n+V				

	RM	IDENT	*VCDOBSTR	DEP F
a. x^0 V (ta)	*!			*
b. x^1 V (na)				*!
c. x^2 V (sa)				*!
☞ d. x^2 V (Øa)				

References

Bermudez-Otero, R. (2009) Stratal Optimality Theory, Ms. University of Manchester.

de Lacy, P. (2002) The Formal Expression of Markedness. PhD thesis, UMass Amherst.

Gnanadesikan, A. (1997) Phonology with Ternary Scales. PhD thesis, UMass Amherst.

Grijzenhout, J. (1995) Irish Consonant Mutation and Phonological Theory. OTS Dissertation. Utrecht: LEd.

Ní Chiosáin, M. (1991) Topics in the Phonology of Irish. Ph.D. Dissertation, University of Massachusetts, Amherst.

Pullman, T. (2004) The Morphophonology of Consonant Mutations in Irish. MA thesis, Cambridge University.

Rice, K. (1993) A Reexamination of the Feature [sonorant]: The Status of Sonorant Obstruents, Language 69, 308-344.

Stonham, J. (1994) Combinatorial Morphology. Amsterdam: Benjamins.

Trommer, J. (2008) Voicing and Polarity in Luo. Ms., University of Leipzig.

van Oostendorp, M. (2004). Phonological recoverability in dialects of Dutch. Ms., Meertens Institute, Amsterdam.