Constraint-based models applied to the phonology of Romance languages

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OPTIMALITY THEORY (1): THE BASICS

Summary

1. ORIGINS

Once upon a time…

(1) Alan Prince & Paul Smolensky → *Optimality Theory*
- Arizona Phonology Conference
- LSA Linguistic Institute (University of California at Santa Cruz)
- «Optimality Theory: Constraint interaction in Generative Grammar» (1993)

(2) John J. McCarthy & Alan Prince
- «Prosodic Morphology I: Constraint interaction and satisfaction» (1993a)
- «Generalizad Alignment» (1993b)

(3) Rutgers Optimality Archive [http://roa.rutgers.edu]
- Rutgers University (New Jersey)
- 1350 papers

2. GENESIS

Experience is the name every one gives to their mistakes
Oscar Wilde, *Lady Windermere's*

2.1 *Classic generative phonology (60-70s)*

(4) Noam Chomsky & Morris Halle (1968) *The Sound Pattern of English* (SPE)
(5) Faculty of language → universal
- Universal patterns in language acquisition
- Universal patterns in natural languages

(6) Unpredictable and predictable forms
- Unpredictable forms → underlying / phonological representations
- Unpredictable forms → surface / phonetic forms
- Language regularities («phonological tendencies»)
  → phonological rules

(7) Underlying representations (UR): example from Catalan

pa	[pá]	/pan/	(cf. *pa*[n]s, *pa*[n]*aderia*, *pa*[n]*ificadora*)
bo	[bɔ́]	/bɔn/	(cf. *bo*[n]s, *bo*[n]*a*, *bo*[n]*íssim*)
fi	[fi]	/fin/	(cf. *fi*[n]s, *fi*[n]*a*, *fi*[n]*or*)
sa	[sá]	/san/	(cf. *sa*[n]s, *sa*[n]*a*, *sa*[n]*íssim*)

(8) Phoneme → Feature matrix

/p/	/n/
+consonantal	+consonantal
+obstruent	–obstruent
–voiced	+voiced
+labial	–labial
–coronal	+coronal
…	…

(9) The application of rules (expression of the «phonological tendencies»)

Underlying representation / phonological representation: /pan/ ~ /bɔn/

↓

Word-final posttonic –*n* deletion rule

↓

Surface representation / phonetic representation: [pá] ~ [bɔ́]

(10) Word-final posttonic –*n* deletion rule

/n/ ⟶ ∅ / V́ ____ ##

(11) Rule-ordering (rule interaction) → derivation: example from Catalan

— Word-final cluster simplification

llam[p]*ec* ~ *llam*[∅]
tom[b]*ar* ~ *tom*[∅]
pon[t]*et* ~ *pon*[∅]
moribun[d]*a* ~ *moribun*[∅]
al[t]*a*, *al*[t]*itud* ~ *al*[∅]
heràl[d]*ica* ~ *heral*[∅]
ban[k]*er* ~ *ba*[ŋ]
fan[g]*eig*~ *fa*[ŋ]

Descriptive generalization
Word-final clusters composed by a nasal followed by a homorganic stop are solved through a process of simplification consisting of the deletion of the final stop.

— Word-final –*n* deletion

(12) The importance of rule ordering

Underlying representation: /pɔnt/~/pan/
↓
Word-final cluster deletion rule
↓
'pɔn' ~ 'pan' (intermediate state)
↓
Word-final posttonic –*n* deletion rule
↓
Surface representation: *[pɔ́] ~ * [pá]

Underlying representation: /pɔnt/~/pan/
↓
Word-final cluster deletion rule
↓
'pɔnt' ~ 'pa' (intermediate state)
↓
Word-final cluster deletion rule
↓
Surface representation: [pɔ́n] ~ [pá]

(13) Problems
Insufficient (phonetic and typological) foundation of the rules
No plausibility of rule ordering
Little (if any) psychological reality of the intermediate stages in the derivation
Arbitrary structural description of rules

OT ☺ It remains: UR → SR
☺ It remains: Universal principles
☹ It disappears: Rules & derivations

2.2. *Non-linear phonology (70-80s)*

(14) *Autosegmental phonology* (Goldsmith 1976, Mascaró 1984, McCarthy 1986, Hayes 1986, Goldsmith 1990)

(15) *Metrical phonology* (Goldsmith 1990)

(16) *Feature geometry* (Mascaró 1983, Clements 1985, Sagey 198)

(17) *Underspecification theory* (Archangely 1984, Archangely 1988, Archangely & Pulleyblank 1986)

(18) Contention on the possible rules

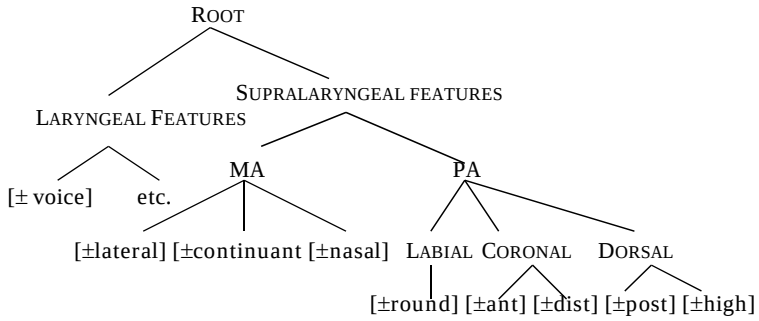
→ Basic operations
deletion → disassociation of features, deletion of segments
insertion → association of features
assimilation → disassociation of features, association of features
dissimilation → disassociation of features, insertion of features

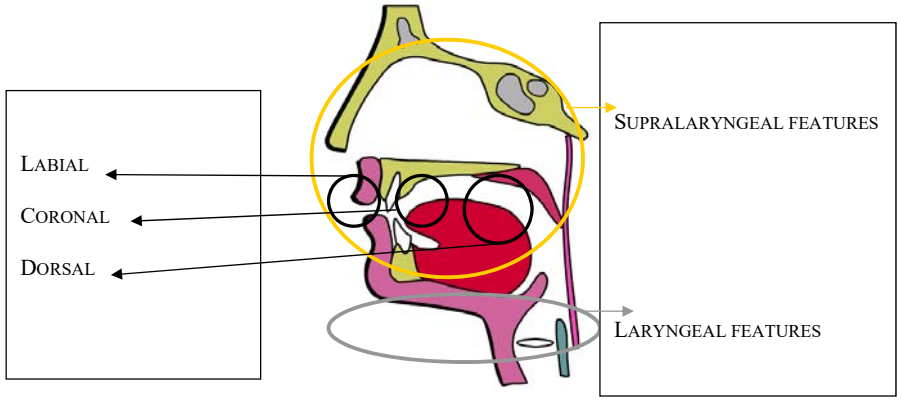
→ Ruled by general phonological principles (well-formedness conditions)
Obligatory Contour Principle
Onset Principle

(19) Contention on the interaction of rules

(20) Enrichment and sophistication of UR → feature geometry

Grouping and hierachization of features in (coherent) nodes

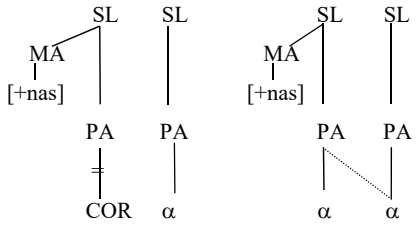




(21) Nasal place assimilation in Spanish

Un árbol	[un árβol]	(→ no assimilation)
Un burro	[um búro]	(→ bilabialization)
Un fuego	[uŋ fwéɣo]	(→ labiodentalization)
Un diente	[un̪ djén̪te]	(→ dentalization)
Un lomo	[un lómo]	(→ no assimilation)
Un yeso	[uɲ jéso]	(→ palatalization)
Un cuento	[uŋ kwén̪to]	(→ velarization)
Un juego	[uɴ χwéɣo]	(→ uvularization)

(22) Assimilation → disassociation, association



un burro /n b/ [m b]
un fuego /n f/ [ŋ f]

(23) Underspecification theory

→ Certain features <u>are not specified</u> in underlying representations

What is it useful for? → To express behavioral asymmetries (see 24)
→ To express UR ambiguities (cf. *banco*)

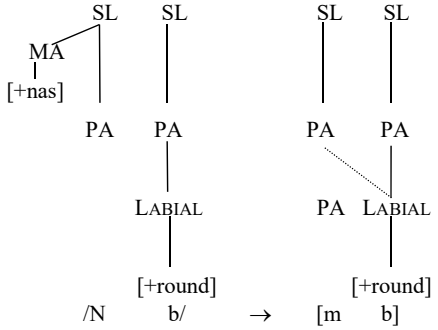
(24) Asymmetry in place assimilation in Central Catalan

són amics	/so+n##əmiɡ+z/	[sò.nə.míks]	
són bons	/so+n##bɔn+z/	[sòm.bóns]	
són feliços	/so+n##fəlis+z/	[sòŋ.fə.lí.sus]	
són dos	/so+n##dos/	[son̪.dós]	(cf. *som dos* [som.dós])
són joves	/so+n##ʒov+ə+z/	[son̪.ʒó.βəs]	(cf. *som joves* [som.ʒó.βəs])
són lliures	/so+n##ʎiwr+z/	[soɲ.ʎíw.rəs]	(cf. *som lliures* [som.ʎíw.rəs])
són grans	/so+n##ɡran+z/	[soŋ.ɡráns]	(cf. *som grans* [som.ɡráns])
set	/sɛt/	[sɛ́t]	
set coses	/sɛt##kɔz+ə+z/	[sɛk.kɔ́.zəs]	(cf. *cap cosa* [kap.kɔ́.zə])
set botes	/sɛt##bɔt+ə+z/	[sɛb.bɔ́.təs]	(cf. *puc beure* [pug.bɛ́w.rə])
set flautes	/sɛt##flawt+ə+z/	[sɛp.fláw.təs]	(cf. *puc fer* [puk.fé])
set mans	/sɛt##man+z/	[sɛm.máns]	(cf. *cap mà* [kab.má])
set liles	/sɛt##lil+ə+z/	[sɛl.lí.ləs]	(cf. *cap lila* [kab.lílə])
set llums	/sɛt##ʎum+z/	[sɛʎ.ʎúms]	(cf. *sóc lliure* [sog.ʎíw.rə])

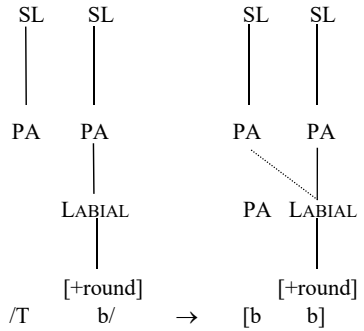
(25) Formalization of the asymmetry in place assimilation in Central Catalan

— CORONALS assimilate the PA of the following consonant.
— LABIALS and NASALS do not.

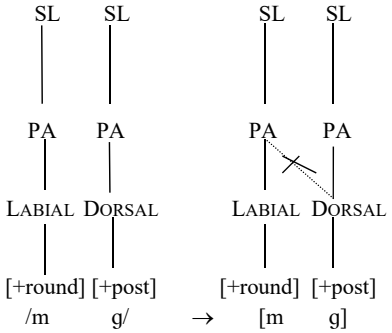
— Assimilation of CORONAL nasals (*són bons* /so+n##bɔn+z/ [sòm.bóns])



— Assimilation of CORONAL STOPS (*set botes* /sɛt##bot+ə+z/ [sɛb.bó.təs])



— NO assimilation of LABIALS and DORSALS (*som grans* [som.gráns])



TO ☺ It remains: UR → SR
☺ It remains: universal principles
☺ It remains: Conditions of well-formedness → Constraints
☹ It disappears: Sofistication of representations - underspecification

2.3. *Natural (generative) phonology (70-80s)*

(Stampe [1973] 1979, Hooper 1976, Vennemann 1988)

— First phases of acquisition → natural processes (reduced and unmarked)
— Posterior phases of acquisition → suppression of these unmarked process (because of the exposition to the adult language)

→ tension between ease of articulation and phonological intention
→ «tension between clarity and ease» (Stampe 1979: 9)

TO ☺ It remains: tension between ease of articulation & phonological intention

Markedness constraints *Faithfulness constraints*

2.4. *Summary*

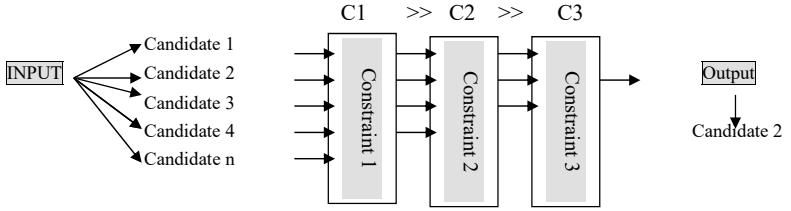
Optimality Theory properties inherited from previous models:

— The faculty of language is innate and universal
— Search for universals → universal constraints
— UR & SR
— Functional arguments
  - Obtention of unmarked structures → markedness constraints
  - Preservation of lexical constrasts → faithfulness constraints

3. THE BASICS OF OPTIMALITY THEORY

Multi sunt vocati, pauci vero electi

(25) The selection of the optimal candidate (adapted from Kager 1999: p. 8)



Everyday example (1): Public competition

Constraints	*Candidates*
Teaching	Candidate 1 has a great teaching record
Research	Candidate 2 has a great research record
Management	Candidate 3 has management experience
Friend of the committee	Candidate 4 is friend of the committee

Rankings (= committee / public competition priorities)

Friend of the committee >> Teaching >> Management >> Research	Candidate 4
Teaching >> Management >> Research >> Friend of the committee	Candidate 1
Research >> Teaching >> Management >> Friend of the committee	Candidate 2
Management >> Research >> Friend of the committee >> Teaching	Candidate 3

Etc.

Everyday example (2): Musical casting

Constraints	*Candidates*
Good voice	Candidate 1 has interpretative skills
Interpretative skills	Candidate 2 has a lot of experience
Experience	Candidate 3 has good presence

Good presence Candidate 4 has a good voice

Good voice >> Interpretative skills >> Experience >> Good presence Candidate 4
Interpretative skills >> Experience >> Good presence >> Good voice Candidate 1
Experience >> Interpretative skills >> Good presence >> Good voice Candidate 2
Etc.

(26) Constraints

— *Markedness constraints* (→ MC express the need to obtain surface forms well-constructed structurally to the detriment of the preservation of the underlying representation properties; **MC evaluate only surface forms, *i.e.* candidates**)

MC ban marked phonological structures, such as...

— Presence of certain segments (voiced obstruents, nasal vowels, etc.)
— Syllables without onset, syllables with coda, complex onsets and codas, etc.
— Voice contrasts in coda position
— No assimilation of voicing, of point of articulation, of manner of articulation between adjacent consonants
— ...

MC promote non-marked phonological structures (favored interlinguistically due to articulatory, acoustic and perceptual reasons), such as...

— Presence of certain segments (voiceless obstruents, oral vowels, etc.)
— Syllables with onset, syllables without coda, simplex onsets and codas, etc.
— Voice neutralization in coda position
— Voice assimilation across adjacent segments
— ...

— *Faithfulness constraints* (→ FC ensure that surface forms are identical, namely, faithful, to the underlying representations; **FC evaluate the relation established between the underlying representation and the surface forms, *i.e.* candidates**)

FC ban any change in the surface from in relation to the underlying form

— Insertion of epenthetic material
— Deletion of underlying segments
— Changes in voicing, in point of articulation, and in manner of articulation
— Fusion and splitting
— ...

4. THE COMPONENTS OF THE GRAMMAR IN OPTIMALITY THEORY

(27) *Components*

Lexicon (LEX): LEX contains the UR of morphemes and words
Generator (GEN): GEN generates a series of surface forms (*i.e.* candidates) for each UR
Evaluator (EVAL): EVAL evaluates these surface forms and selects one as the optimal (through the constraint hierarchy)
Constraints (CON): CON contains all the universal constraints

(28) *Interaction of components* (adapted from Kager 1999: 19)

LEX ($input_1$, $input_2$, $input_3$...)
GEN ($input_1$) → {$cand_1$, $cand_2$,..., $cand_n$}
EVAL (C_1 >> C_2 >> C_3) {$cand_1$, $cand_2$,..., $cand_n$} → output

CON (C_1 , C_2 , C_3...)

4.1 PROPERTIES OF THE COMPONENTS OF THE GRAMMAR

4.1.1 The LEXICON: richness of the base

All inputs are possible
Prince & Smolensky 1993, *Optimality Theory*

There are no constraints on the structure or the properties of the underlying representations. In case of absence of empirical evidence in favor of a specific underlying representation → more than one underlying representation (= rich base), as long as the constraint hierarchy (the grammar) leads to the selection of the actual candidate in the language.

Example: Empirical evidence for the PA specification of a nasal in Spanish

NO	YES
comprar [komprár]	*son pocos* [som pókos]
→ /kompr+a+r/ ~ /konpr+a+r/	→ *son* [són]
richness of the base	*imposible* [imposíβle]
	→ *inesperado* [inesperáðo]

Remember!
— Archiphoneme (structural phonology)
— Underspecification (autosegmental phonology)

4.1.2 The LEXICON: optimization

Avoid deep / surface disparities whenever possible
Prince & Smolensky 1993, *Optimality Theory*

In case of absence of empirical evidence in favor of a specific underlying representation → the underlying representation more similar to the actual surface form, in benefit of the

economy of analysis (→ minimization of the number of changes with respect to the underlying representation, minimization of the number of faithfulness violations)

Example:

comprar [kompɾáɾ]
→ /kompr+a+ɾ/

4.1.3 The LEXICON: free-rides

According to the FRML, «when alternation data tell the learner that some surface [B]s are derived from underlying /A/s, the learner will under certain conditions generalize by deriving *all* [B]s, *even nonalternating ones*, from /A/s», so that «an adequate learning theory must [...] incorporate a procedure that allows nonalternating [B]s to take a "free ride" on the /A/ → [B] unfaithful map.» (p. 19). The conditions under which learners take the free ride strategy in nonalternating forms are the following: when, by generalizing the unfaithful map, a *a*) «consistent» and *b*) «more restrictive» grammar than the one obtained by an identity map is achieved (p. 21). Following Prince & Tesar (2004: 252), «[t]he r[estrictiveness]-measure for a constraint hierarchy is determined by adding, for each faithfulness constraint in the hierarchy, the number of markedness constraints that dominate that faithfulness constraint», so that a grammar that grants «more power to markedness constraints» is «more restrictive» (p. 32).

The free ride strategy has proven to be true, for instance, for cases of coalescence in Sanskrit, Choctaw and Rotuman (McCarthy 2005), for cases of hyperrhoticity in some varieties of English (Krämer 2012), or for vowel epenthesis in Majorcan Catalan, for which there is independent evidence based on its interaction with underapplication of vowel reduction, that learners generalize the unfaithful map /∅/ → [ə], derived from dynamic morphopohnemic alternations, to nonalternating items (Pons-Moll & Lloret 2014, Lloret & Pons-Moll 2016).

4.1.4 The GENERATOR: freedom of analysis and coherence

Everything is possible but not everything is permitted
Richard Howard, *The Victor Vanquished*

Responsible for generating candidates for a specific underlying representation

— *Freedom of analysis*: the generator generates as much structures and candidates as necessary; and, at least, it has to provide a number of candidates sufficiently extensive and diverse to comprise all possibilities of variation in the world languages.

/C_1C_2##C_3/

$C_1C_2C_3$	→	Preservation
$C_1VC_2C_3$; $C_1C_2VC_3$	→	Insertion
C_1C_3; C_2C_3	→	Deletion
		→ *Too many solutions problem*

— *Coherence of occurrences*: the set of forms generated by GEN cannot present modifications with respect to the morphematic structures present in the underlying representations. Example: /pino/ → *[kása], *[pwérta] ...

4.1.5 The EVALUATOR: transitivity, strict domination and parallelism

Responsible for selecting an optimal candidate among the candidates generated by GEN through the constraint hierarchy.

— *Transitivity*:

If	C1 >> C2
And	C2 >> C3
Then	C1 >> C3

— *Strict domination:* The constraints ranked higher in the hierarchy are more determinant than the constraints ranked lower, in order to select a candidate as the optimal. Namely: the violation of a constraint ranked high in the hierarchy cannot be compensated by satisfying a constraint (or more than one constraint) ranked lower in the hierarchy.

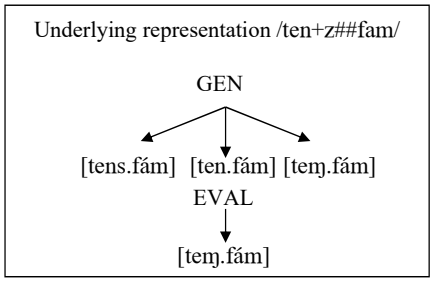
— *Parallelism:* The candidates are evaluated simultaneously by the different constraints. GEN emits a set of candidates fully specified, which can be the result of the effect of the different phonological processes. This means that derivation, in each stage of which a process or a rule operated leading to an intermediate form, disappears from the analysis.

Example from Majorcan Catalan:

Classic generative phonology

Underlying representation: /ten+z##fam/
↓
Cluster simplification rule
↓
Intermediate form: 'ten fam'
↓
Nasal assimilation rule
↓
Surface representation: [teŋ.fám]

Optimality Theory



4.4 CONSTRAINTS*: conflict, universality and violability*

No tingueu por de la perfecció perquè mai l'assolireu
Salvador Dalí

The constraints express linguistic preferences, which can adopt two directions depending on if they are markedness constraints or faithfulness constraints. Both constraints refer to the output; only to the output in the case of markedness constraints, and to the output in relation to input, in the case of faithfulness constraints.

— *Conflict*: Certain faithfulness constraints are in conflict with certain markedness constraints, in the sense that the satisfaction of a specific faithfulness constraint necessarily leads to the violation of a specific markedness constraint and the other way around.

Example: *COMPLEX-CODA vs. NO INSERTION (DEP-IO), NO DELETION (MAX-IO)

verde /berd/
→ [bérd] (it satisfies NO INSERTION, NO DELETION but it violates *COMPLEX-CODA)
→ [bérðe] (it satisfies *COMPLEX-CODA but it violates NO INSERTION)
→ [bér] (it satisfies *COMPLEX-CODA but it violates NO DELETION)

— *Universality:* Constraints have a universal character and respond to functional motivations. The favored structures by markedness constraints are more frequent because of some type of articulatory, perceptual or cognitive requirement. (Humans are physiologically similar and have the same type of capacities and limitations, and this explains recurrent behaviors across world languages.) Faithfulness constraints are responsible for the preservation of lexical contrasts limiting therefore the possibilities of change of underlying representation, in benefit of clarity and comprehensibility of language.

What is *particular* is the constraint hierarchy, which varies from one language to another. Within the same language, dialect or variety, different constraint rankings are not possible.

— *Violability:* Constraints are universal but violable: a certain candidate can be selected as optimal even though it violates certain constraints. *Fallacy of perfection* → there are no perfect candidates, in that they always violate some constraint.

5. CORRESPONDENCE THEORY

So God created mankind in his own
Genesis 1:27 NIV

(29) McCarthy & Prince (1995a)

(30) Relation between base and reduplicant

(31) Faithfulness relation between input and output

(32) «Given two strings S_1 and S_2, correspondence is a relation $\Re$ from the elements of S_1 to those of S_2. Elements $\alpha \in S_1$ and $\beta \in S_2$ are referred to as correspondents of another when $\alpha \Re \beta$.» (McCarthy & Prince 1995a)

(33) Each pair of sequences (S_1, S_2) comes from GEN equipped with a correspondence relation.

(34) The function of the EVALUATOR is to evaluate if this relation is complete, if there is identity between the elements in correspondence, etc.

6. CONSTRAINT TYPOLOGY

Todo tiene una explicación

(35)
— Faithfulness constraints
— Positional faithfulness constraints
— Context-free markedness constraints
— Contextual markedness constraints
— Families of constraints
— Universal hierarchies of constraints

6.1. *Faithfulness constraints*. FC express the need to preserve the underlying properties, independently of the context.

(36)

CONSTRAINT	FORMULATION
MAX-IO	Assign one violation mark for every segment in the input that has no correspondent in the output. (Against deletion)
DEP-IO	Assign one violation mark for every segment in the output that has no correspondent in the input. (Against insertion / epenthesis)
IDENTITY-IO(F)	Assign one violation mark for every segment in S_1 which has a different feature specification in S_2.
CONTIGUITY-IO	Assign one violation mark for every portion of S_1 whose elements do not show the same contiguous relation in S_2. (Against deletion of underlying material inside the morpheme)
CONTIGUITY-OI	Assign one violation mark for every portion of S_2 whose elements do not show the same contiguous relation in S_1. (Against insertion inside the morpheme)
ANCHOR-IO	Assign one violation mark for every element at the designated periphery of S_1 which has no correspondent at the designated periphery of S_2. (Against deletion at the periphery.)
LINEARITY-IO	Assign one violation mark for every pair of segments in S_1 whose precedence relation is not preserved in S_2. (Against metathesis)
UNIFORMITY-IO	Assign one violation mark for every element in S_2 that has more than one correspondent in S_1. (Against coalescence and fusion.)
INTEGRITY-IO	Assign one violation mark for every element in S_1 that has more than one correspondent in S_2. (Against splitting.)

(37) Standard formulations (McCarthy 2008: 195-198)

MAX (No deletion)
Let *input* = $i_1 i_2 i_3 \ldots i_n$ and *output* = $O_1 O_2 O_3 \ldots O_m$.
Assign one violation mark for every i_x
if there is no o_y where $i_x R o_y$.

DEP (No epenthesis)
Let *input* = $i_1 i_2 i_3 \ldots i_n$ and *output* = $o_1 o_2 o_3 \ldots o_m$.
Assign one violation mark for every o_y
if there is no i_x where $i_x R o_w$.

UNIFORMITY (UNIF) (No coalescence)
Let *input* = $i_1 i_2 i_3 \ldots i_n$ and *output* = $o_1 o_2 o_3 \ldots o_m$.
Assign one violation mark for every pair i_x and i_y
if $i_x R o_z$ and $i_y R o_z$.

LINEARITY (LIN) (No metathesis, no movement)
Let *input* = $i_1 i_2 i_3 \ldots i_n$ and *output* = $o_1 o_2 o_3 \ldots o_m$.
Assign one violation mark for every pair i_w and i_y
if $i_w R o_x$ and $i_y R o_z$.

6.2. *Positional faithfulness constraints.* PFC express the need to preserve the underlying properties depending on the context. Cf. *Positional faithfulness theory*: there is a set of positions more prominent than others from a phonetic, perceptual and psychological point of view. These positions are characterized by: (1) the preservation of contrasts which are neutralized elsewhere; (2) the resistance to certain processes which apply elsewhere; (3) the triggering of phonological processes.

Examples:

(38) *Catalan*
ma[z]*over* ~ *ma*[s]
(40) *Dutch*
bewij[z]*en* ~ *bewij*[s]
(42) *Russian*
ro[z]*a* ~ *ro*[s]

(39) *Occitan*
ma[z]*ièr* ~ *ma*[s]
(41) *German*
bewei[z]*en* ~ *Bewei*[s]
(43) *Polish*
wa[d]*a* ~ *wa*[t]

Descriptive generalization:

1. Obstruent voicing neutralization in coda position.
2. Obstruent voicing preservation in onset position.

(44) Analysis with positional faithfulness

Markedness constraint → *VOICEDOBSTRUENT
Faithfulness constraint → IDENTITY(voice)
Positional faithfulness constraint → IDENTITIYONSET(voice)

(45) Analysis with positional faithfulness

IDENTITIYONSET(voice) >> *VOICEDOBSTRUENT >> IDENTITY(voice)

Cf. contextual markedness constraints

6.3. *Context-free markedness constraints:* CFMC express certain tendencies that can't be related to a specific (morpho)phonological context.

In the literature, they have been formulated positively or negatively:

(46)

ONSET: Syllables must have onset.
LATERAL-CORONAL: Lateral consonants are coronal.

(47)

*CODA: Syllables can't have coda.
*COMPLEX-CODA: Codas with more than one consonant are not allowed.
*VOICED-OBSTRUENT: Voiced obstruents are not allowed.
*V_{NASAL}: Vowels can't be nasal.

6.4. *Contextual markedness constraints:* CMC express certain tendencies that can be related to a specific (morpho)phonological context. They prohibit the occurrence of certain segments in certain positions (Cf. positional faithfulness constraints).

In the literature, they have been formulated positively or negatively:

(48)

*VOICEDOBSTRUENT-CODA: Obstruents consonants in coda position can't be voiced.
*Mid-Vowel-Unstressed: Unstressed vowels can't be mid.

AGREE(PA): Adjacent consonants must have the same PA.
AGREE(voice): Adjacent consonants must have the same specification for voicing.

Example:

(49) *Catalan*
ma[z]*over* ~ *ma*[s]
(51) *Dutch*
bewij[z]*en* ~ *bewij*[s]
(53) *Russian*
ro[z]*a* ~ *ro*[s]

(50) *Occitan*
ma[z]*ièr* ~ *ma*[s]
(52) *German*
bewei[z]*en* ~ *Bewei*[s]
(54) *Polish*
wa[d]*a* ~ *wa*[t]

Descriptive generalization (repeated):

3. Obstruent voicing neutralization in coda position.
4. Obstruent voicing preservation in onset position.

(55) Analysis with contextual markedness

*VOICEDOBSTRUENT-CODA >> IDENTITY(voice)

→ They combine context-free markedness (*VOICEDOBSTRUENT) and contextual markedness (*CODA)

→ Contextual markedness and positional faithfulness are in principle mutually excluding.

(56)

<u>*Important remarks about the formulation of the constraints*</u>

How to formulate or define constraints:

→ Assign a violation mark for every...

IDENT(voice): Assign a violation mark for every output segment with a specification for voicing different than its input correspondent.

IDENTONSET(PA): Assign a violation mark for every output segment syllabified in onset position with a specification for voicing different than its input correspondent.

*VOICEDOBSTRUENT: Assign one violation mark for every voiced obstruent.

*VOICEDOBSTRUENT-CODA: Assign one violation mark for every voiced obstruent in coda position.

Wording to avoid:

"are", "must be", "should not be", "tend to be", "avoid", "unless", "as long as", "if", etc.

Example of bad formulation: *Avoid voiced obstruents, unless they are placed in onset position*. (→ Descriptive generalization)

(57)

Remarks about the justification of constraints → theory of CON

1. Formal justification
   - Constraints must be of markedness or faithfulness
   - Constraints tend to belong to families of constraints

2. Functional justification (phonetic and cognitive)

   - Ease of articulation

   → *VOICEDOBSTRUENT / *CODA-VOICEDOBSTRUENT
   → AGREE(voice), AGREE(PA)

   - Ease of perception / comprehension

   → Faithfulness in general
   → Faithfulness to prominent positions (onset, word-initial position)
   → Marked structures in prominent positions (sonorant segments)
   → Triangular vowel systems

3. Typological justification (consequence of 2)

   → Markedness constraints capture patterns / tendencies which are recurrent interlinguistically

4. In conclusive analyses, *ad hoc* constraints must be avoided.

6.5. *Constraint families*

(58)

PA $=_{def}$ {labial, coronal, dorsal}
IDENT(PA) = {IDENT(labial), IDENT(coronal), IDENT(dorsal)}
*LABIAL, *DORSAL, *CORONAL

MA $=_{def}$ {sibilant, continuous, sonorant...}
IDENT(MA) = {IDENT(sibilant), IDENT(continuous), IDENT(sonorant)}

LARYNGEAL $=_{def}$ {aspirated, voiced, constricted glottis...}
IDENT(Laryngeal) = {IDENT(aspirated), IDENT(voice)...}
FEATURES = $_{def}$ {laryngeal, manner, PA}

IDENT(voice), IDENT(PA), IDENT(MA)
IDENT = $_{def}$ {IDENTONSET, IDENT}
IDENTONSET(PA), IDENT(PA)

6.6. *Universal constraint rankings*

Markedness → harmonic scales and implicational relationships (+ restrictiveness)

(59)

- PA (Prince & Smolensky 1993 [2004])

Universal harmony scale: CORONAL ≻ LABIAL, DORSAL
Universal constraint hierarchy: *LABIAL, *DORSAL >> *CORONAL

(60)

- ONSETS (Prince & Smolensky 1993 [2004])

Universal harmony scale: ONSET / voiceless stop ≻ ONSET / voiceless fricative ≻ ONSET / voiced stop ≻ ONSET / voiced fricative ≻ ONSET / nasal ≻ ONSET / lateral ≻ ONSET / rhotic ≻ ONSET / glide

Universal constraint hierarchy: *ONSET / glide >> *ONSET / rhotic >> *ONSET / lateral >> *ONSET / nasal >> *ONSET / voiced fricative >> *ONSET / voiced stop >> *ONSET / voiceless fricative >> *ONSET / voiceless stop

- CODAS (Prince & Smolensky 1993 [2004])

Universal harmony scale: CODA / glide ≻ CODA / rhotic ≻ CODA / lateral ≻ CODA / nasal ≻ CODA / voiced fricative ≻ CODA / voiced stop ≻ CODA / voiceless fricative ≻ CODA / voiceless stop

Universal constraint hierarchy: *CODA / voiceless stop >> *CODA / voiceless fricative >> *CODA / voiced stop >> *CODA / voiced fricative >> *CODA / nasal >> *CODA / lateral >> *CODA / rhotic >> *CODA / glide

- STRESSED VOWELS (Prince & Smolensky 1993 [2004])

Universal harmonic scale: STRESSEDV/a ≻ STRESSEDV/ɛ,ɔ ≻ STRESSEDV/e,o ≻ STRESSEDV/i,u ≻ STRESSEDV/ə

Universal constraint hierarchy: *STRESSEDV/ə >> *STRESSEDV/i,u >> *STRESSEDV/e,o >> *STRESSEDV/ɛ,ɔ >> *STRESSEDV/a

- UNSTRESSED VOWELS (Prince & Smolensky 1993 [2004])

Universal harmonic scale: UNSTRESSEDV/ə ≻ UNSTRESSEDV/i,u ≻ UNSTRESSEDV/e,o ≻ UNSTRESSEDV/ɛ,ɔ ≻ UNSTRESSEDV/a

Universal constraint hierarchy: *UNSTRESSEDV/a >> *UNSTRESSEDV/ɛ,ɔ >> *UNSTRESSEDV/e,o >> *UNSTRESSEDV/i,u >> *UNSTRESSEDV/ə

(61) Faithfulness and stringency (McCarthy 2008: 67)

/bad/		IDENT(voice)	IDENTONSET(voice)
a.	[bat]	*	
b.	[pad]	*	*
c.	[pat]	**	*

7. FORMALISM AND SYMBOLISM

7.1 *Constraint tableau* (→ it focuses on violations, useful when the constraint hierarchy is known)

(62) Constraint rakings

CONSTRAINT 1 >> CONSTRAINT 2, CONSTRAINT 3
CONSTRAINT 1 >> CONSTRAINT 2 >> CONSTRAINT 3

— The presence of '>>' in between two constraints indicates that the constraint on the left occupies a higher position in the hierarchy than the constraint place on the right.
— The presence of a comma (',') in between two constraints indicates that they occupy the same position in the hierarchy.

(63) Violation tableaux

/input/	CONSTRAINT 1	CONSTRAINT 2	CONSTRAINT 3
a. Candidate 1	*!		
b. Candidate 2		*	*!
c. ☞ Candidate 3			*

/input/	CONSTRAINT 1	CONSTRAINT 2	CONSTRAINT 3
a. Candidate 1	*!		
b. Candidate 2		*!	*
c. ☞ Candidate 3			*

— On the top row, we place the constraint hierarchy.
— On the left column, we place the generated candidates for a given input.
— A continuous line in between two constraints indicates that the one on the left is more relevant than the one on the right (equivalent to '>>').
— A continuous line in between two constraints indicates that they have the same relevance, that they occupy the same level in the hierarchy (equivalent to ',').
— The asterisk ('*') in a cell indicates that the candidate placed in the same row violates the constraint placed on the top part of the same column.
— The admiration symbol ('!') next to the asterisk indicates that the concerned candidate has fatally violated the constraint placed on the superior part and that therefore it can no longer be selected as optimal. The violation of the following constraints by this candidate is not relevant, circumstance which can also be expressed by the grey shading on the corresponding cells.
— The symbol '☞' before a candidate indicates that it is the optimal, the selected one, the real one.
— The symbol '💣' before a candidate indicates that it is erroneously selected as optimal.
— The symbol '☹' before a candidate indicates that, although being the real one, is erroneously discarded.

(64) Exemplification

/son##kas+a+s/	MAX	DEP	AGREE(PA)	IDENT(cor)
☞ a. [soŋ kasas]				*
b. [son kasas]			*!	
c. [so kasas]	*!			
d. [son e kasas]		*!		

7.2 *Comparative tableaux* (→ it focuses on the relation between the winning candidate and the rest of candidates, the losers; useful when the constraint hierarchy is not known)

(65) Exemplification

/son##kas+a+s/	MAX	DEP	IDENT(cor)	AGREE(PA)
a. [soŋ kasas] ~ [son kasas]			L	W
b. [soŋ kasas] ~ [so kasas]	W		L	
c. [soŋ kasas] ~ [son e kasas]		W	L	

W = *winner*
L = *loser*

Every L must be dominated by some W.

Ranking arguments in (65):

- AGREE(PA) >> IDENT(cor)
- MAX >> IDENT(cor)
- DEP >> IDENT(cor)

7.3 *Combination tableau*

(66) Violation tableau + comparative tableau

/son##kas+a+s/	MAX	DEP	AGREE(PA)	IDENT(cor)
☞ a. [soŋ kasas]				*
b. [son kasas]			*W	L
c. [so kasas]	*W			L
d. [son e kasas]		*W		L

8. Optimality Theory, factorial typology and variation

A plaça tot es ven

Languages differ primarily [...] in the way they rank these universal constraints [...]
Prince & Smolensky, *Optimality Theory*

8.1. *Variation and factorial typology*

→ All possible combination of the same set of constraints
→ Each combination → a factual language

(67)

3	Constraints	3!	3.2.1	= 6 combinations
4	Constraints	4!	4.3.2.1	= 24 combinations
5	Constraints	5!	5.4.3.2.1	= 120 combinations

8.2. *Variation across languages*

(68)

- SonIntr: Assign one violation mark for every syllable in which the elements do not show a falling sonority profile from the nucleus.
- Max-IO: Assign one violation mark for every segment in the input that has no correspondent in the output. (Against deletion)
- Dep-IO: Assign one violation mark for every segment in the output that has no correspondent in the input. (Against insertion / epenthesis)
- Contiguity: Assign one violation mark for every portion of S_1 whose elements do not show the same contiguous relation in S_2. (Against deletion of underlying material inside the morpheme) / Assign one violation mark for every portion of S_2 whose elements do not show the same contiguous relation in S_1. (Against insertion inside the morpheme)

Factorial typology → 4! = 4.3.2.1. = 24 combinations, which lead to different outputs

(69)

spaghetti, state, spoon, skin

Preservation	External epenthesis	Internal epenthesis	Deletion
1	**2**	**3**	**4**
[spagétti] *It.*	[əspəɣéti] *Cat.*	[su]*paghetti Jap.*	*speak* [pîki] *Sranan Tongo Creole*
[spəgétʰi] *Engl.*	[aspaɣéti] *Cat.*	[su]*paghetti Cor.*	*spoon* [pun] *Guyanese Creole*
[ʃpagéti] *Germ.*	[espaɣéti] *Spa.*	[si]*poon Cambodian*	*skin* [kîn] *Jamaican Creole*
	[iʃpɐgéti] *BP*		
	[estáti] *Haitian Creole*		

(70) *Varieties 1 → Preservation (possible combination of constraints)*

/spagetti/	Max	Dep	Contig	SonIntr
☞a. [spəgétʰi]				*
b. [əspəgétʰi]		*!		
c. [pəgétʰi]	*!			
d. [səpəgétʰi]		*!	*	

Note that there are other combinations of constraints that would lead to the same result (see below). In fact, there is no ranking argument to rank faithfulness constraints. With these data, we just have evidence for: Max, Dep, Contig >> SonIntr.

(71) *Varieties 2 → External epenthesis (possible combination of constraints)*

/spagetti/	SonIntr	Contig	Max	Dep
a. [spəɣéti]	*!			
☞ b. [əspəɣéti]				*
c. [pəɣéti]			*!	
d. [səpəɣéti]		*!		*

Note that there are other combinations of constraints that would lead to the same result (see below). In fact, there is no ranking argument to rank SonIntr, Contig, Max. With these data, we just have evidence for: SonIntr, Contig, Max >> Dep.

(72) *Varieties 4 → Deletion (possible combination of constraints)*

/spagetti/	SonIntr	Dep	Contig	Max
a. [spəɣéti]	*!			
b. [əspəɣéti]		*!		
☞ c. [pəɣéti]				*
d. [səpəɣéti]		*!	*	

Note that there are other combinations of constraints that would lead to the same result (see below). In fact, there is no ranking argument to rank SonIntr, Dep, Contig. From these data, with these data, we just have evidence for: SonIntr, Dep, Contig >> Max

(73) *Varieties 4 → Internal epenthesis (possible combination of constraints)*

/spagetti/	SonIntr	*Coda	Max	Dep	Contig
a. [spəɣéti]	*!				
b. [əspəɣéti]		*!		*	
c. [pəɣéti]			*!		
☞ d. [supəɣéti]				*	*

(In this last set of languages, *Coda, ranked very low in the rest of languages, is also active.)

Note that there are other combinations of constraints that would lead to the same result (see below).

IMPORTANT REMARK 1: Each combination of constraints does not necessary lead to a different strategy, to a different language (see below). → Why?

(74) A different combination than (70), but the same result

/spagetti/	DEP	MAX	CONTIG	SONINTR
☞ a. [spəgétʰi]				*
b. [əspəgétʰi]	*!			
c. [pəgétʰi]		*!		
d. [səpəgétʰi]	*!		*	

(75) A different combination than (71), but the same result

/spagetti/	CONTIG	SONINTR	MAX	DEP
a. [spəɣéti]		*!		
☞ b. [əspəɣéti]				*
c. [pəɣéti]			*!	
d. [səpəɣéti]	*!			*

2. IMPORTANT REMARK 2: In fact, when there is no evidence for a specific ranking → unranked constraints. → Related to Ranking Arguments (see 9).

3. The factorial typology is partially blocked when universal constraint hierarchies intervene. → Why?

8.3. *Variation across dialects*

(76)

UR	*a*) Eivissan	*b*) Central	*c*) Majorcan & Minorcan Catalan
pot petit /pɔt##pətit/	[ˌpɔt.pə.ˈtit]	[ˌpɔp.pə.ˈtit]	[ˌpɔp.pə.ˈtit]
poc tros /pɔk##trɔs/	[pɔk.ˈtrɔs]	[pɔk.ˈtrɔs]	[pɔt.ˈtrɔs]
cap tros /kap##trɔs/	[kap.ˈtrɔs]	[kap.ˈtrɔs]	[kat.ˈtrɔs]

(76)

a) Eivissan
IDENT(lab), IDENT(dor), IDENT(cor) >> AGREE(PA)

b) Central
IDENT(lab), IDENT(dor) >> AGREE(PA) >> IDENT(cor)

c) Majorcan and Minorcan
AGREE(PA) >> IDENT(lab), IDENT(dor), IDENT(cor)

(77)

a) Eivissan

/pɔt##pətit/	IDENT(lab)	IDENT(dor)	IDENT(cor)	AGREE(PA)
a. [ˌpɔp.pə.ˈtit]			*!	
b. ☞ [ˌpɔt.pə.ˈtit]				*

b) Central

/pɔt##pətit/	IDENT(lab)	IDENT(dor)	AGREE(PA)	IDENT(cor)
a. ☞ [ˌpɔp.pə.ˈtit]				*
b. [pɔt.pə.ˈtit]			*!	

c) Majorcan and Minorcan

/pɔt##pətit/	AGREE(PA)	IDENT(lab)	IDENT(dor)	IDENT(cor)
a. ☞ [ˌpɔp.pə.ˈtit]				*
b. [ˌpɔt.pə.ˈtit]	*!			

(78)

a) Eivissan

/pɔk##trɔs/	IDENT(lab)	IDENT(dor)	IDENT(cor)	AGREE(PA)
a. [pɔt.ˈtrɔs]		*!		
b. ☞ [pɔk.ˈtrɔs]				*

b) Central

/pɔk##trɔs/	IDENT(lab)	IDENT(dor)	COMP(PA)	IDENT(cor)
a. [pɔt.ˈtrɔs]		*!		
b. ☞ [pɔk.ˈtrɔs]			*	

c) *Majorcan and Minorcan*

/pɔk##trɔs/	COMP(PA)	IDENT(lab)	IDENT(dor)	IDENT(cor)
a. ☞ [pɔt.ˈtrɔs]			*	
b. [pɔk.ˈtrɔs]	*!			

8.4. *Variation across dialects*

(79)
— *Formal register in Central Catalan*
IDENT(Cor) >> AGREE(PA)
→ No assimilation of CORONALS
fet curiós [fèt.ku.ɾjós]

(80)

— *Informal / colloquial register*
AGREE(PA) >> IDENT(Cor)
→ Assimilation of CORONALS
fet curiós [fèk.ku.ɾjós]

8.5. *Ranking arguments*

(81)

/spagetti/	MAX	DEP	CONTIG	SONINTR
☞a. [spəgét^{h}i]				*
b. [əspəgét^{h}i]		*!		
c. [pəgét^{h}i]	*!			
d. [səpəgét^{h}i]		*	*!	

(Ranking Argument: MAX, DEP, CONTIG >> SONINTR)

(82)

/spagetti/	SONINTR	CONTIG	MAX	DEP
a. [spəɣéti]	*!			
☞ b. [əspəɣéti]				*
c. [pəɣéti]			*!	
d. [səpəɣéti]		*!		

(Ranking Argument: SONINTR, CONTIG, MAX >> DEP)

(83)

/spagetti/	SONINTR	DEP	CONTIG	MAX
a. [spəɣéti]	*!			
b. [əspəɣéti]		*!		
☞ c. [pəɣéti]				*
d. [səpəɣéti]			*!	

(Ranking Argument: SONINTR, DEP, CONTIG >> MAX)

EXERCISES

1. In Optimality Theory, can we account for phonological differences across varieties through different constraints? In case your answer is negative, how do we account for these differences? Can a single language or a single variety have a different ranking of the same set of constraints?

2. What do classic classic generative phonology and Optimality Theory have in common? In what do they differ?

3. Which type of process typically implies a violation of the following faithfulness constraints? Could you illustrate each process with a real example from your language?

MAX-IO _____
DEP-IO _____
IDENT-IO _____
CONTIG-IO _____
CONTIG-OI _____
UNIFORM-IO _____
INTEGR-IO _____

4. From the hypothetical input and the hypothetical constraints below, generate all possible candidates for the input and assign the necessary violations in each case. In this language, a sequence of two adjacent sibilant consonants is not allowed (*ss).

/passa/	*SS	MAX-IO	DEP-IO	IDENT-IO	INTEGR-IO	UNIFORM-IO	CONTIG	LINEAR-IO
[passa]	*!							

5. Indicate the (fatal and non-fatal) violations which the following candidates, generated for the input /ton$_1$k$_2$/, incur. Which is the most faithful candidate? Which candidate is selected as optimal?

/ton$_1$k$_2$/	* COMPLEX-CODA	AGREE(PA)	MAX-IO	DEP-IO	IDENT-IO	CONTIG-IO	UNIFORM-IO
[tón$_1$k$_2$]	*!	*					
[tóŋ$_1$k$_2$]							
[tón$_1$]							
[tók$_2$]							
[tóŋ$_{1,2}$]							
[tón$_1$.k$_2$ə]							
[tó.n$_1$.ək$_2$]							
[tok$_2$n$_1$]							

6. How are underlying representations established? Establish the underlying representation of the following forms from Dutch. Which process is responsible for the changes that operate in these forms? How would you express them in Optimality Theory?

Dutch
[bét]
[bé.dən]
[bét]
[bé.tən]

7. How are underlying representations established? Establish the underlying representation of the following forms of Catalan. Which process explains the changes that operate in these forms? How would you express them within Optimality Theory?

cas	[kás]	*llop*	[ʎóp]
casos	[kázus]	*lloba*	[ʎóβə]
gos	[gós]	*cap*	[káp]
gossos	[gósus]	*capet*	[kəpét]

8. In Catalan, any obstruent consonant must have the same voicing specification as the following consonant, a circumstance that explains a process of assimilation of obstruents:

cap dia	[kab.ɗiə]	(cf. *cap* [káp])
dos dies	[doz.ðiəs]	(cf. *dos* [dós])

Taking this observation into account, determine what would be the underlying representation corresponding to the following surface forms, following *a*) richness of the base and *b*) optimization of the lexicon.

examen	[əg.zá.mən]
esglai	[əz.ɣláj]
afgà	[əv.ɣá]
apte	[áp.tə]

9. Observe the following data drawn from Spanish, and determine:

a. Which type of features are modified?
b. Which type of process does apply?
c. Which markedness constraint could account for the process?
d. Which faithfulness constraint is at play, taking into account the modified features?
e. Which ranking is established between these two constraints?

Un árbol	[un árβol]
Un burro	[um búro]
Un fuego	[uŋ fwéɣo]
Un diente	[uɲ djéɲte]
Un lomo	[un lómo]
Un yeso	[uɲ jéso]
Un cuento	[uŋ kwéɲto]
Un juego	[uɴ χwéɣo]

10. Observe the following forms from Spanish and Catalan varieties, and determine:

a. Which type of features are modified in (1), (2) y (3)?
b. Which type of process applies in (1), (2) y (3)?
c. Which type of *context-free markedness* constraints could account for the process?
d. With which type of *faithfulness constraints* do these markedness constraints interact?
e. Which ranking is established between these constraints?

f. Which type of *contextual markedness constraints* could account for the process? Which faithfulness constraint should interact with?
g. Which ranking is established between these constraints?
h. Which variety shows a different behavior?
i. Which ranking receive the established constraints in this variety?

(1) *Spanish*
doncella [don.θé.ʎa] ~ *doncel* [don.θél]
desdeñar [dez.ðe.ɲár] ~ *desdén* [dez.ðén]
adámico [aðámiko] ~ *Adán* [aðán]

(2) *Alghero Catalan*
aquella [a.ké.ʎa] ~ *aquell* [a.kél]
anyet [a.ɲét] ~ *any* [án]

(3) *Occitan*
vièlhet [bjeʎét] ~ *vièlh* [bjél]
banhèra [baɲéɾa] ~ *bahn* [bán]

(4) *Most Catalan varieties*
vella [bé.ʎə] ~ *vell* [béʎ]
abonyegat [ə.βu.ɲə.ɣát] ~ *bony* [bóɲ]

12. Observe the following forms from *Rioplatense* Spanish ("vesre talk"), and determine which type of inversion patterns apply. Which phonological unity remains unaltered? To which type of unit does the inversion affect? To which general (phonological) process these inversion patterns belong? Which family of faithfulness constraints could regulate these inversions? (Note that, as there is no underlying syllabification, the faithfulness constraints apply at the surface level: Output-Output).

(1)
a. ca-fé → fe-ca
a. calle → lleca
b. país → ispa
c. tango → gotán

(2)
a. pa-be-llón → be-llom-pa
b. cabaret → bareca
c. canchero → cheronca
d. pasada → sadapa

(3)
a. tra-ba-jo → jo-tra-ba
b. asado → doasa
c. boliche → cheboli
d. borracho → choborra

(4)
a. a-mi-go → go-mí-a
b. caballo → llobaca
c. camisa → samica
d. maestro → troesma

(5)
cal-zon-ci-llo → sol-si-llon-ca

(6)
com-pa-ñe-ro → ño-re-com-pa

(7)
con-ven-ti-llo → yo-ti-ben-co

(8)
u-ru-gua-yo → yo-ru-gua-∅

(Data from Bohrn 2010)

13. Observe the following data from Spanish varieties, and try to establish the conditions for /s/ aspiration in each variety. In which varieties the process is more transparent? Which constraints are at play in these varieties? How could we account for the behavior of the other two set of varieties?

	(1) Granada Spanish	(2) Negro Argentinian & Caribbean (I)
mes	[méh]	[méh]
meses	[mé.seh]	[mé.seh]
deshecho	[de.hé.t͡ʃo]	[de.sé.t͡ʃo]
dioses-héroes	[djò.se.hé.ɾo.eh]	[djò.se.hé.ɾo.eh]
mes azul	[mè.ha.súl]	[mè.ha.súl]

	(3) Buenos Aires Argentinian & Caribbean (II)
mes	[méh]
meses	[mé.seh]
deshecho	[de.sé.t͡ʃo]
dioses-héroes	[djò.se.hé.ɾo.eh]
mes azul	[mè.sa.súl]

14. Observe the following data from Dominican Spanish, and determine which type of plurals are found in this variety. What type of markedness constraint would explain the realizations in (1)? How does this constraint interact with faithfulness? What type of faithfulness constraint could explain the realizations in (2)? Which other markedness constraint is at play, though? Can you think of an alternative analysis?

	(1)	(2)
gallinas	gallina[∅]	gallina[se]
latas	lata[∅]	lata[se]
pinturas	pintura[∅]	pintura[se]
muchacho	muchacho[∅]	muchacho[se]
mujeres	mujere[∅]	mujere[se]
panes	pane[∅]	pane[se]
papeles	papele[∅]	papele[se]
vudús	vudú[∅]	vudú[se]

OPTIMALITY THEORY (2): APPLICATIONS TO THE PHONOLOGY OF ROMANCE LANGUAGES

Summary

1 INTERSYLLABIC CONDITIONS AND PHONOLOGICAL PROCESSES

1.1 THE SYLLABLE CONTACT LAW

1.1.1 Precedents

(1) *Syllable Contact Law* (segmental strength)

«A syllable contact A.B is preferable the less the consonantal strength of the offset A and the more the consonantal strength of the onset B». (Vennemann 1988: 40)

(2) *Syllable Contact Law* (sonority)

«A syllable contact A.B is preferable the more the sonority of the offset A and the less the sonority of the onset B». (Vennemann 1988: 40)

Recall: *Sonority scale*

OBSTRUENTS		SONORANTS			
stops, affricates <	fricatives <	nasals <	liquids <	glides <	vowels
[p], [t], [k], [b], [t͡s]...	[s], [z], [f]...	[m], [n]...	[l], [ʎ], [r], [ɾ]...	[j], [w]	
1	2	3	4	5	6

[– sonority] → [+sonority]

1.1.2 The Syllable Contact Law in OT

INTERSYLLABIC SONORITY (→ *markedness constraint*)
«The sonority across adjacent successive heterosyllabic segments should be the same or falling.» (See Clements 1990, Alderete 1995, Bat-El 1996, Shin 1997, Davis & Shin 1999, Rose 2000, Gouskova 2005, among others.)

1.1.3 Diachronic and synchronic effects

(3) *Diachronic effects*

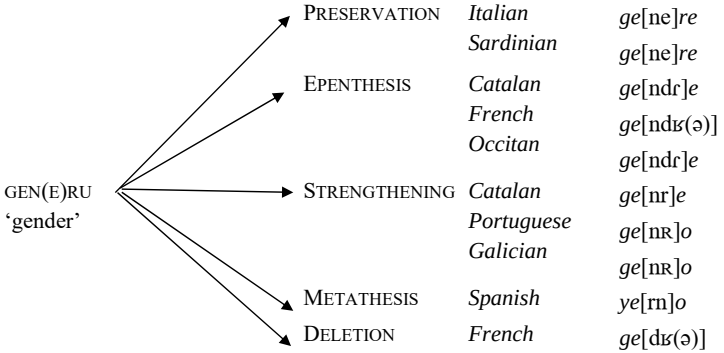
Gemination			*Epenthesis*
SAP.IAT	→	*sappia*	DIE VEN(E)RIS → *divendres*
‘(s)he knew’			‘Friday’
LAB.RUM	→	*labbro*	TEN(E)RUM → *tendre*
‘lip’			‘tender’
FEB.REM	→	*febbre*	*Strengthening*
‘fever’			‘Friday’
OC(U).LUM	→	*occhio*	DIE VEN(E)RIS → *divenres*
‘eye’			TEN(E)RUM → *tenre*

(Vennemann 1988: 40)

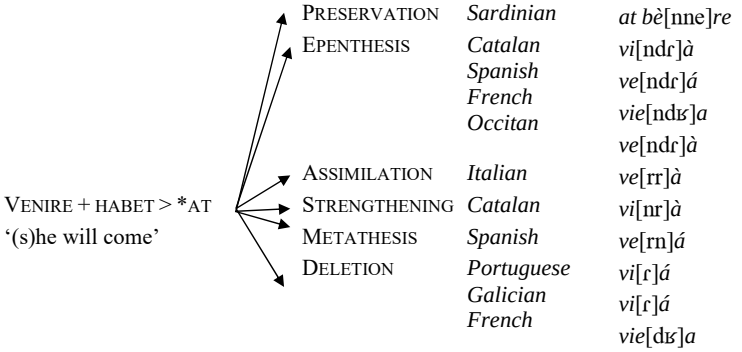
Metathesis			*Assimilation*		
SPAT(U)LA	→	*espalda*	SPAT(U)LA	→	*espa*[ll]*a*
‘back’			‘back’		
TIT(U)LUM	→	*tilde*	BAJ(U)LUM	→	*ba*[ll]*e*
‘title’			‘mayor’		
DIE VEN(E)RIS	→	*viernes*			
‘Friday’					
TEN(E)RUM	→	*tierno*			
‘tender’					

(Holt 2004: 44) ...

(4) *Diachronic effects and linguistic variation*



(5) *Diachronic effects and linguistic variation*



(6) *Synchronic effects*

(a) *Epenthesis* (Alderete 1995)
/hipres/ [hip̲eres] (*[hip.res]; *[hi.pres]) ‘to know’
(Epenthesis in Winnebago)

(b) *Epenthesis position* (Rose 2000, Gouskova 2001)
rtut (Russian) [u̲r.tut] ‘mercury’
trupka (Russian) [tu̲.rup.ke] (*u̲t.rup.ke) ‘pipa’
(Adaptation of Russian words in Kirguíz)

(c) *Consonant strengthening* (Shin 1997, Davis & Shin 1999, Gouskova 2002, 2005)
/mandaj+lar/ [mandaj.lar] ‘foreheads’
/murin+l̲ar/ [murin.d̲ar] ‘noses’
(Onset obstruentization in Kazakh)

(d) *Syncope blocking* (Urbanczyk 1996, Miglio 1998, Gouskova 2002)
/tʃaka̲ra+on/ [tʃaka̲rón] (*[tʃak.rón])
/sura̲g+on/ [sur.gón]
(Vowel preservation in Mantuan)

(e) Metathesis (Gouskova 2001)
/gud+nonni/ [gun.donni] ‘they finished’
(Metathesis en Sidamo)

1.2 Effects in the phonology of Romance languages

This law (or constraint) is also responsible for the application, in Romance languages, of a variety of processes that are apparently unrelated.

- Manner assimilation in Majorcan and Minorcan Catalan
- Manner assimilation in Occitan
- Manner assimilation in Central Catalan
- Rhotacism in Majorcan Catalan
- Rhotacism in Sardinian
- Rhotacism in Galician
- Gliding in Occitan
- Epenthesis and strengthening in Catalan

Stripes indicate areas where bilingualism is common

Underlined languages are the one dealt with in the paper

1.2.1 Manner assimilation in Majorcan and Minorcan Catalan

(1)

a. Stop + non-sibilant consonant (→ total assimilation)

cap fet	/kap##fet/	[kaf.fét]	‘any fact’
cap mos	/kap##mɔs/	[kam.mɔ́s]	‘any bite’
cap llit	/kap##ʎit/	[kaʎ.ʎít]	‘any bet’
cap riu	/kap##ɾiw/	[kar.ɾíw]	‘any river’
cap iot	/kap##jɔt/	[kaj.jɔ́t]	‘any yacht’

b. Stop + sibilant consonant (→ PA assimilation)

cap so	/kap##sɔn/	[kat.t͡sɔ́]	‘any sound’
cap joc	/kap##ʒɔg/	[kad.d͡ʒɔ́k]	‘any game’

c. Stop + stop (→ asimilación de PA)

pot caure	/pɔd##kawɾ/	[pɔk.káw.ɾə]	‘(s)he can fall’

cap tros	/kap##trɔs/	[kat.trɔ́s]	‘any piece’

(2)

a. Alveolar fricative + lateral, rhotic, glide (→ total assimilation)

dos llits	/doz##ʎitz/	[doʎ.ʎít͡s]	‘two beds’
dos rius	/doz##ɾiwz/	[dor.ɾíws]	‘two rivers’
dos iots	/doz##jɔtz/	[doj.jɔ́t͡s]	‘two yachts’

b. Alveolar fricative + alveolar fricative (→ manner dissimilation)

dos sons	/doz##sɔnz/	[dot.t͡sɔ́ns]	‘two sounds’
dos jocs	/doz##ʒɔgz/	[dod.d͡ʒɔ́t͡s]	‘two yachts’

c. Alveolar fricative + stop, non-sibilant fricative, nasal (→ preservation)

dos peus	/doz##pɛwz/	[dos.pɛ́ws]	‘two feet’
dos fils	/doz##filz/	[dos.fils]	‘two threads’
dos nius	/doz##niwz/	[doz.níws]	‘two nests’

(3)

a. Nasal + lateral, glide (→ total assimilation)

volen llum	/vɔlən##ʎum/	[vɔ.ləʎ.ʎúm]	‘(they) want light’
volen làmines	/vɔlən##laminəz/	[vɔ.ləl.lá.mi.nəs]	‘(they) want layers’
volen iots	/vɔlən##jɔtz/	[vɔ.ləj.jɔ́t͡s]	‘(they) want yachts’

b. Nasal + stop, fricative, rhotic (→ manner preservation)

un peu	/un#pɛw/	[um.pɛ́w]	‘one foot’
un foc	/un#fɔg/	[uŋ.fɔ́k]	‘one fire’
un riu	/un#ɾiw/	[un.ɾíw]	‘one river’

(4)

a. Lateral, rhotic, glide + consonant (→ preservation)

vol dinar /vɔl##dinaɾ/ [vɔ̰l.di.ná]
‘(s)he wants to have lunch’
vol iogurts /vɔl##joɣurtz/ [vɔʎ.jo.ɣúɾs] ~ [vɔl.jo.ɣúɾs]
‘(s)he wants yogurts’
bar petit /baɾ##pətit/ [bàɾ.pə.tít]
‘little bar’
corr iardes /koɾɾ##jaɾdəz/ [kor.jáɾ.ðəs]
‘(I) run yards’
mai pot /maj##pɔd/ [maj.pɔ́t]
‘(s)he never can’

Emergent descriptive generalization

Hint:
cap mos [kam.mɔ́s] vs. *un peu* [um.pɛ́w]
dos llits [doʎ.ʎíts] vs. *dos peus* [dos.pɛ́ws]
un llum [uʎ.ʎúm] vs. *un peu* [um.pɛ́w]

.....
.....
.....

BUT!

dos nius	/doz##niwz/	[doz.níws]	*syllabic transitions with increasing sonority but without assimilation!*
un riu	/un#ɾiw/	[un.ɾíw]	
vol iogurts	/vɔl##joɣurtz/	[vɔ̀l.jo.ɣúɾs]	
mir iots	/miɾ##jɔtz/	[miɾ.jɔ́ts]	
corr iardes	/koɾr##jaɾdəz/	[koɾ.jár.ðəs]	

1.2.2 Manner assimilation in Occitan

(1) *Heterosyllabic clusters with an obstruent in coda position*

ròc mòl	/rɔk##mɔl/	[rɔm.mɔ́l]	'soft rock'	(cf. *ròc* [rɔ́k] 'rock')
tot l'argent	/tut##l#arʤent/	[tùl.laɾ.ʤén]	'all the silver'	(cf. *tot* [tút] 'all')
estat normal	/estat##nuɾmal/	[es.tàn.nur.mál]	'normal state'	(cf. *estat* [estát] 'state')
dètz minutas	/dɛts##minytoz/	[dèm.mi.ný.tos]	'ten minutes'	(cf. *dètz* [dɛ́ts] 'ten')
mièg nud	/mjɛdʒ##nyt/	[mjɛn.nýt]	'half naked'	(cf. *mièg* [mjétʃ] 'half')

(2) *Heterosyllabic clusters with a sonorant in coda position*

mòstran castèls	/mɔstɾon##kastɛlz/	[mɔ̀s.tɾoŋ.kas.tɛ́ls]	'(they) show castles'
mòstran sacs	/mɔstɾon##sakz/	[mɔ̀s.tɾon.sáts]	'(they) show bags'
mòstran rams	/mɔstɾon##ɾanz/	[mɔ̀s.tɾon.ráns]	'(they) show bunches'
chaval san	/tʃabal##san/	[tʃa.βal.sá]	'healthy horse'
chaval rossèl	/tʃabal##rɔsɛl/	[tʃa.βàl.ru.sɛ́l]	'palomino horse'

Emergent descriptive generalization

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……..

1.2.3 Manner assimilation in Central Catalan

(1)

a. Stop + homorganic nasal, lateral (→ manner assimilation)

cap mos	/kap##mɔs/	[kam.mɔ́s]	'any bite'
pot limitar	/pɔd##limitaɾ/	[pɔ̀l.li.mi.tá]	'(s)he can limit'
pot nedar	/pɔd##nedaɾ/	[pɔ̀n.nə.ðá]	'(s)he can swim'

b. Stop + heterorganic nasal, lateral (→ preservation)

cap nas	/kap##nas/	[kab.nás]	'any nose'
sac negre	/sak##nɛgɾ/	[sag.né.ɣɾə]	'black bag'
cap límit	/kap##limit/	[kab.lí.mit]	'any limit'

c. Dental stop + labial nasal (→ total assimilation)

pot mirar	/pɔd##miɾaɾ/	[pɔ̀m.mi.ɾá]	'(s)he can look at'

d. Non-stop consonant + consonant (→ preservation)

puf negre	/puf##nɛgɾ/	[puv.né.ɣɾə]	'black pouffe'
dos músics	/doz##muzikz/	[doz.mú.ziks]	'two musicians'
dos llits	/doz##ʎitz/	[doz.ʎítz]	'two beds'
vol riure	/bɔl##ɾiwɾ/	[bɔl.ɾíw.ɾə]	'(s)he wants to laugh'
bar ianqui	/baɾ##janki/	[bar.jáŋ.ki]	'Yankee bar'
mai riu	/maj##ɾiw/	[maj.ɾíw]	'(s)he never laughs'

Emergent descriptive generalization

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1.2.4 Rhotacism in Majorcan Catalan

(1) Alveolar sibilant + non-sibilant voiced obstruent, nasal or *f*

dos bous	/doz##bɔwz/	[doɹ.bɔ́ws]	'two oxen'
dos dits	/doz##ditz/	[doɹ.díts]	'two fingers'
dos gots	/doz##gɔtz/	[doɹ.gɔ́ts]	'two glasses'
dos vins	/doz##vinz/	[doɹ.víns]	'two wines'
dos mesos	/doz##mezz/	[doɹ.mé.zus]	'two months'
dos nius	/doz##niwz/	[doɹ.níws]	'two nests'

(2) Alveolar sibilant + voiceless stop

dos pans	/doz##panz/	[dos.páns]	'two loaves of bread'
dos tocs	/doz##tɔkz/	[dos.tɔ́ts]	'two knocks'

dos cans /doz##kanz/ [dos.káns] 'two dogs'

Emergent descriptive generalization

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BUT!

1.2.5 Rhotacism in Sardinian

(1) Alveolar sibilant + voiced consonant (except for alveolar sonorant) and *f*

tres boes	/trɛs##bɔɛs/	[treɹ.bɔ́.ɛs]~[treɹ.bɔ́.ɛ.zɛ]	'three oxen'
tres domos	/trɛs##dɔmɔs/	[treɹ.dɔ́.mɔs]~[treɹ.dɔ́.mɔ.zɔ]	'three houses'
tres gattos	/trɛs##gattɔs/	[treɹ.gát.tɔs]~[treɹ.gát.tɔ.zɔ]	'three cats'
tres manos	/trɛs##manɔs/	[treɹ.má.nɔs]~[treɹ.má.nɔ.zɔ]	'three hands'
tres yannas	/trɛs##jannas/	[treɹ.ján.nas]~[treɹ.ján.na.za]	'three doors'
tres ziros	/trɛs##zirɔs/	[treɹ.d͡zí.ɾɔs]~[treɹ.d͡zí.ɾɔ.zɔ]	'three turns'
tres tzeccos	/trɛs##zɛkɔs/	[treɹ.d͡zék.kɔs]~[treɹ.d͡zék.kɔ.zɔ]	'three blinds'
tres zentes	/trɛs##zɛntɛs/	[treɹ.d͡zén.tɛs]~[treɹ.d͡zén.tɛ.zɛ]	'three people'
tres fizos	/trɛs##fizɔs/	[treɹ.fí.d͡zɔs]~[treɹ.fí.d͡zɔ.zɔ]	'three sons'

(2) Alveolar sibilant + voiceless obstruent (except for labiodental fricative)

tres panes	/trɛs##panɛs/	[trɛs.pá.nɛs]~[trɛs.pá.nɛ.zɛ]	'three loaves of bread'
tres táulas	/trɛs##tawlas/	[trɛs.táw.las]~[trɛs.táw.la.za]	'three tables'
tres canes	/trɛs##kanɛs/	[trɛs.ká.nɛs]~[trɛs.ká.nɛ.zɛ]	'three dogs'
tres santos	/trɛs##santɔs/	[trɛs.sán.tɔs]~[trɛs.sán.tɔ.zɔ]	'three saints'
tres sorres	/trɛs##sorɛs/	[trɛs.sɔ́r.rɛs]~[trɛs.sɔ́r.rɛ.zɛ]	'three sisters'

(3) Alveolar sibilant + alveolar sonorant

tres nuces	/trɛs##nukɛs/	[trɛn.nú.kɛs]~[trɛn.nú.kɛ.zɛ]	'three nuts'
tres litros	/trɛs##litrɔs/	[trɛl.lít.trɔs]~[trɛl.lít.trɔ.zɔ]	'three litres'
tres rosas	/trɛs##rɔsas/	[trɛr.rɔ́.zas]~[trɛr.rɔ́.za.za]	'three roses'

Emergent descriptive generalization

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1.2.6 Rhotacism in Galician

(1) Alveolar sibilant + voiced consonant, non-sibilant fricative

estás mal	/stas##mal/	[es.taɹ.mál]	'you feel bad'
estás doente	/stas##doente/	[es.taɹ.do.én.te]	'you are ill'
estás facendo	/stas##faθendo/	[es.taɹ.fa.θén.do]	'you are doing'
dous cintos	/dows##θintos/	[dowɹ.θín.tos]	'two belts'

(2) Alveolar sibilant + voiceless stop

estás parvo	/stas##parbo/	[es.tas.pár.βo]	'you are stupid'
estás tolo	/stas##tolo/	[es.tas.tó.lo]	'you are mad'

Emergent descriptive generalization

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1.2.7 Gliding in Occitan

(1) Alveolar sibilant + voiced consonant or *f*

las filhas	/laz#fiʎoz/	[laj.fí.ʎos]	'the daughters'
las femmas	/laj##fennos/	[laj.fén.nos]	'the women'
los buòus	/luz#bjɔwz/	[luj.bjɔ́ws]	'the oxen'
bonis vins	/bɔniz#binz/	[bɔnij.bíns]	'good wines'
cos nud	/kɔs#nyt/	[kɔj.nýt]	'naked body'
es mòrt	/es##mɔɾt/	[ej.mɔ́ɾt]	'(s)he is dead'

(2) Alveolar fricative + voiceless consonant

las claus	/las#klaws/	[las.kláws]	'the keys'
las pòrtas	/las#pɔɾtas/	[las.pɔ́ɾ.tɔs]	'the doors'
bonas taulas	/bɔnas#tawlas/	[bɔ.nos.táw.lɔs]	'good tables'

Emergent descriptive generalization

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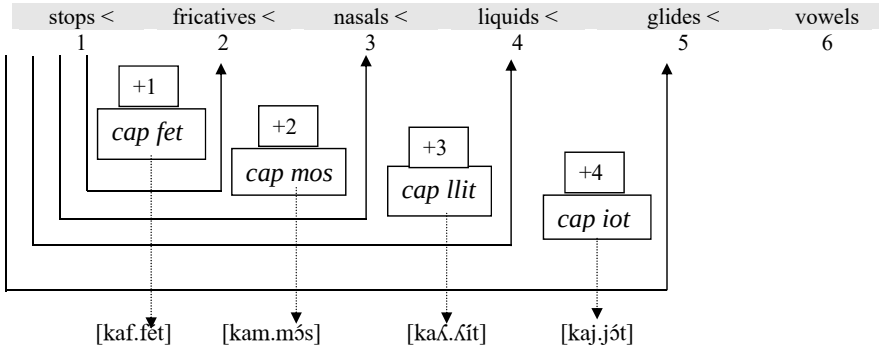
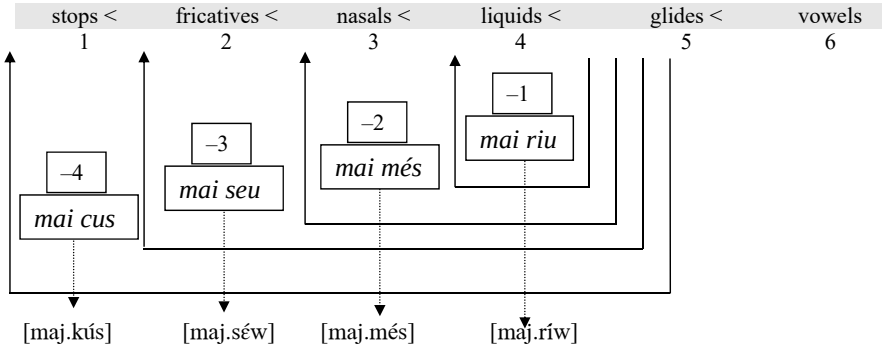
Compare:





EXERCISES

1. Observe the following data and determine which forms the prefix *in-* adopts in Catalan and Spanish. Which forms can be explained by the regular processes of Spanish and Catalan? Which forms do not? Why? How many phonological representations does the prefix *in-* have, therefore? What might explain the selection of each form? Which one has priority? Why?

		CATALAN	SPANISH
a.	*inestable~inestable*	[inəstábblə]	[inestáβle]
	insegur~inseguro	[insəɣú]	[inseɣúro]
b.	*intranquil~intranquilo*	[iⁿtrəŋkíl]	[iⁿtraŋkílo]
c.	*impossible~imposible*	[impusíbblə]	[imposíβle]
d.	*infalible~infalible*	[iɱfəlíbblə]	[iɱfalíβle]
e.	*injust~injusto*	[iⁿʒúst]	[iɴχústo]
f.	*inconscient~inconsciente*	[iŋkunsjén]	[iŋkonsθjéⁿte]
g.	*il·legítim~ilegítimo*	[iləʒítim]	[ilexítimo]

il·limitat~ilimitado	[ilimitát]	[ilimitáðo]
irresponsable~irresponsable	[irəspunsábblə]	[iresponsáβle]
irresoluble~irresoluble	[irəzulúbblə]	[iresolúβle]

Basic references (first part)

Kager, René (1999). *Optimality Theory. A textbook*. Cambridge: Cambridge University Press.

McCarthy, John J. (2002). *A thematic guide to Optimality Theory*. Cambridge: Cambridge University Press.

McCarthy, John J. (2008). *Doing Optimality Theory. Applying theory to data*. Malden, Oxford, Victoria: Equinox.

Pons-Moll, Clàudia (2007). *La teoria de l'optimitat. Una introducció aplicada al català de les Illes Balears*. Barcelona: PAM.

Pons-Moll, Clàudia (2011). "Las bases de la teoría de la optimidad". Teaching material for the course of introduction to Optimality Theory given in U Freiburg (2007-2012).

Pons-Moll, Clàudia (2011). "Variación, diacronía, adquisición y aprendizaje en teoría de la optimidad". Teaching material for the course of introduction to Optimality Theory given in U Freiburg (2007-2012).

Prince, Alan; Smolensky, Paul (1993 / 2004). *Optimality Theory. Constraint Interaction in Generative Grammar*. Oxford: Blackwell.

Smolensky, Paul; Legendre, Géraldine (2006). *The harmonic mind: From neural computation to Optimality-Theoretic grammar*. Cambridge, MA: MIT Press.

Basic references (second part)

Alderete, J. (1995). «Winnebago accent and Dorsey's Law». IN: J. Beckmann (ed.). *Papers in Optimality Theory*: pàg. 21-52. Amherst, MIN: GLSA Publications.

Alibèrt, L. (1976). *Gramatica occitana segon los parlars lengadocians*. Montpeller: Centre d'Estudis Occitans.

Bat-El, O. (1996). Selecting the best of the worst: The grammar of Hebrew blends. *Phonology*, 13: pàg. 283-328.

Clements, G. N. (1990). «The role of the sonority cycle in core syllabification». In: Kingston, J.; Beckman, M. (ed.) *Papers in Laboratory of Phonology Y. Between the Grammar and Physics of Speech*. Cambridge: CUP.

Davis, S. (1990). «Italian onset structure and the distribution of *il* and *lo*», *Linguistics*, 28: p. 43-55.

Davis, S. & S.H. Shin (1999). «The syllable contact constraint in Korean: an optimality-theoretic analysis», *Journal of East Asian Linguistics*, 8: p. 285-312.

Davis, S.; Shin, S.H. (1999): «The syllable contact constraint in Korean: an optimality-theoretic analysis». *Journal of East Asian Linguistics* 8. p. 285-312.

Dubert, F. (1999). «Máis sobre o rotacismo de /s/ en galego». In: Álvarez; R.; Vilavedra, D. (coord.) *Cinguidos por unha arela común. Homenaxe ó profesor Xesús Alonso Montero*, Y. Santiago de Compostela. In: Universidade de Santiago de Compostela. pp. 367-387.

Frexeiro, X. R. (1998). *Gramática da lingua galega. Fonética e fonoloxía*. Vigo: Promocións Culturais Galegas; Edicions A Nosa Terra.

Gouskova, M. (2001). «Falling sonority onsets, loanwords, and Syllable Contact». *CLS* 37, 1: pàg. 175-186.

Gouskova, M. (2002). «Exceptions to sonority distance generalizations». *CLS* 38.

Gouskova, M. (2005). «Relational hierarchies in Optimality Theory». *Phonology*, 21: p. 201-250.
Haddad, G. F. (1984). «Epenthesis and sonority in Lebanese Arabic». *Studies in Linguistic Sciences*, 14: p. 57-88.
Hargus, S. & Siri G. Tuttle (1996). «Augmentation as Affixation in Athabaskan Languages». Ms.
Holt, E. (2004). «Optimization of Syllable Contact in Old Spanish via the sporadic sound change metathesis». *Probus*, 16: 43-61.
Miglio, V. (1998). «Epenthesis and deletion in Mantuan». *University of Maryland Working Papers in Linguistics*, 7. p. 88-108.
Murray, R.; Vennemann, T. (1983). «Sound change and syllable structure in Germanic Phonology». *Language* 59.
Pittau, M. (1972). *Grammatica del sardo-nuorese*. BolonyIn: Pàtron.
Rose, S. (2000). «Epenthesis positioning and syllable contact in Chaha», *Phonology*, 17: p. 397-425.
Shin, S.H. (1997). *Constraints within and between Syllables: Syllable Licensing and Contact in Optimality Theory*.
Urbanczyk, S. (1996). *Patterns of reduplication in Lushootseed*.
Vennemann, T. (1988). *Preference laws for syllable structure and the explanation of sound change*. Berlín: Mouton de Gruyter.

SPANISH AND CATALAN SOUNDS AND DESIGNATIONS

	Point of articulation / Manner of articulation		LABIALS		CORONALS				DORSALS	
			labials	labiodentals	dentals	alveolars	prepalatals	palatals	velars	uvulars
OBSTRUENTS	STOPS		[p] [b]		[t] [d]			[c] [ɟ]	[k] [g]	
	FRICATIVES			[f] [v]		[s] [z] *sibilants*	[ʃ] [ʒ] *sibilants*		[x]	[χ]
	AFFRICATES					[t͡s] [d͡z] *sibilants*	[t͡ʃ] [d͡ʒ] *sibilants*			
SONORANTS	NASALS		[m]	[ɱ]	[n̪]	[n]	[n̠]	[ɲ]	[ŋ]	[ɴ]
	LIQUIDS	LATERALS			[l̪]	[l]	[l̠]	[ʎ]		
		RHOTICS				[ɾ] [ɾ]				
	APPROXIMANTS	SPIRANTS	[β]		[ð]				[ɣ]	
		GLIDES						[j]	[w]	