The limits of the free ride in UR discovery[*]
Clàudia Pons-Moll (claudia.pons@ub.edu), Universitat de Barcelona

> **Claim**: The free ride strategy (McCarthy 2005) is challenged when the input-output mapping(s) derived from morphophonemic dynamic alternations and which are potentially generalized to nonalternating items are *not univocal*, that is, when the alternating [B]s derive from more than one underlying representation.

1. Empirical background

(1) Eastern Catalan vowel reduction

a. Alternating cases   certain URs
   c[ə]*seta* 'house dim.' ~ c[á]*sa* 'house'   →   /a/
   m[ə]*lós* 'honey-like' ~ m[ɛ́]*l* 'honey'   →   /ɛ/
   p[ə]*saré* 'I will weigh' ~ p[é]*sa* 's/he weighs'   →   /e/

b. Nonalternating cases   uncertain URs
   c[ə]*vall*   'horse'   →   /ə/ or /a/, /ɛ/, /e/, /ə/ or /?/
   c[ə]*rvell*   'brain'   →   /ə/ or /a/, /ɛ/, /e/, /ə/ or /?/
   p[ə]rsona   'person'   →   /ə/ or /a/, /ɛ/, /e/, /ə/ or /?/
   f[ə]licitat   'happyness'   →   /ə/ or /a/, /ɛ/, /e/, /ə/ or /?/

2. Theoretical background

2.1. Theories about the UR of nonalternating items in OT, and the like

2.1.1 *Richness of the Base and Lexicon Optimization*

- Richness of the Base (RoTB) (Prince & Smolensky 1993/2004). The analyst must project all possible URs for every surface form (Prince & Smolensky 1993/2004: 205, 225). The grammar, that is, the constraint hierarchy, is ultimately responsible for selecting the actual surface form in a given language, no matter which UR is taken.

- Lexicon Optimization (LO) (Prince & Smolensky 1993/2004). In the process of storage and access to URs, the principle Lexicon Optimization is assumed to be at play (Prince & Smolensky 1993/2004: 205, 225). This principle establishes that when there is no morphophonemic evidence bearing on the choice of URs, phonological representations are stored identically to their surface form, leading to a direct economization of input-output mappings (given that the map from underlying to surface representations is accomplished more faithfully).

"[...] in strictly parallel versions of OT, once the phonologist has satisfied himself (i) that the constraint hierarchy generates wellformed outputs for every possible input and (ii) that there is a viable input for every output, he has little incentive to ask what input

representation is actually selected by the learner and how crucial though these questions are to the psycholinguist and to the historical linguist." (Bermúdez-Otero 2006: 10 [ms.])
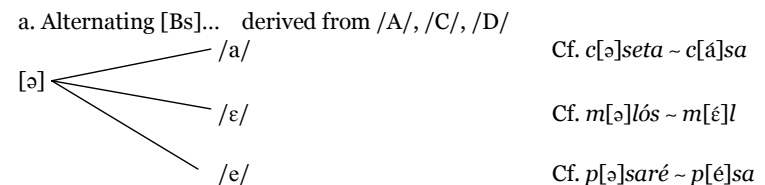
2.1.2 *The free ride in morphophonemic learning and Archiphonemic Prudence*

- The free-ride in morphophonemic learning (McCarthy 2005). 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» McCarthy 2005: 32). Key: restrictiveness, ranking M >> F (See also Bermúdez-Otero 2006; cf. Appendix).

- Archiphonemic Prudence and Pareto-optimal representations (Bermúdez-Otero 2003, 2006, forthcoming). Bermúdez-Otero (2003, 2006) proposes the principle of Archiphonemic Prudence, «designed to deal with possible instances of neutralization in nonalternating environments» (Bermúdez-Otero 2003: 7) and a specific version of input optimization which requires input representations to be Pareto-optimal. An input representation is Pareto-optimal «if, and only if, it has no competitor that (i) generates *all* output alternants no less efficiently and (ii) generates *some* output alternant more efficiently.» (Bermúdez-Otero 2006: 12). In this case, unlike restrictiveness in the FRML, efficiency is measured in terms of the violation of ranked faithfulness constraints. Key: efficiency, ranked F

- 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).

3. Our claim
Our claim, though, is that the free ride strategy is challenged when the input-output mapping(s) derived from dynamic alternations and which are potentially generalized to nonalternating items are *not univocal*, that is, when the alternating [B]s derive from more than one underlying representation.

(2) Eastern Catalan vowel reduction

a. Alternating [Bs]...   derived from /A/, /C/, /D/

[ə]   /a/   Cf. c[ə]*seta* ~ c[á]*sa*

           /ɛ/   Cf. m[ə]*lós* ~ m[ɛ́]*l*

           /e/   Cf. p[ə]*saré* ~ p[é]*sa*

b. Nonalternating [Bs]…

c[ə]*vall*   'horse'
c[ə]*rvell*   'brain'
p[ə]rsona   'person'
f[ə]licitat   'happyness'

- Leaving aside the RoTB hypothesis, which would posit URs with all four vowels (i.e. /a/~/ɛ/~/e/~/ə/) in nonalternating cases (2b), and LO, which would posit the UR that entails a faithful mapping (i.e. /ə/), an immediate question is <u>whether the learner has the chance to take a *complete free ride* in these kinds of situations, and, if this is the case, which of the vowels is selected as the UR</u>.
- As shown in (3) and (4), by taking a first free ride and following the r-measure, it is possible to abandon the identity map /ə/ → [ə], but there is no mechanism to discriminate between the remaining mappings (/a/ → [ə], /ɛ/ → [ə], /e/ → [ə]): all them equally imply the ranking of a M constraint above a F constraint (4); therefore, the free ride is not fully consummated.

(3) <u>First stage</u>: alternations not discovered yet, identity map stage

/fəlisitat/	*Unstressed/a	*Unstressed/ɛ	*Unstressed/e	Faithfulness
☞ a. [fəlisitat]				
b. [falisitat]	*!			*
c. [fɛlisitat]		*!		*
d. [felisitat]			*!	*

(*Phonotactic learning. The learner just discovers that* [a], [ɛ] *and* [e] *are not allowed in unstressed position, and that* [ə] *is allowed in this position.*)

(4) <u>Second stage (first depuration of the URs)</u>: alternations discovered [see (1) and (2)] → input surgery → restrictiveness achieved → identity map stage abandoned → first free ride accomplished

/fa~e~ɛlisitat/	*Unstressed/a	*Unstressed/ɛ	*Unstressed/e	Faithfulness
☞ a. [fəlisitat]				***
b. [falisitat]	*!			**
c. [fɛlisitat]		*!		**
d. [felisitat]			*!	**

(*The learner has discovered the alternations of* [ə] *and has generalized them to nonalternating items. The learner has enough information to rank M >> F.*)

Restrictiveness achieved by…

*Unstressed/a >> Faithfulness

*Unstressed/ɛ >> Faithfulness

*Unstressed/e >> Faithfulness

BUT: We have a rich base: /a/~/ɛ/~/e/…   Does the free-ride have a second chance?

- In these kinds of situations, it seems that what could come into play is <u>efficiency</u>, measured in terms of the violation of ranked faithfulness constraints, along the lines of the definition of efficiency found in Bermúdez-Otero (2003, 2006, forthcoming).

- We argue that, among the vowels that entail an unfaithful map (i.e. /a/~/ɛ/~/e/) once a more restrictive grammar has been achieved and the identity map stage has been abandoned, the one selected for the UR would be the less offensive (the least costful) in terms of ranked faithfulness constraints.

(5) Note on features for vowels in Catalan dialects:

Height Color	Palatal		Labial
High	i		u
Mid +close (+ATR)	e		o
−close (−ATR)	ɛ	ə	ɔ
Low		a	

(Adapted from Wheeler 2005: 56)

(6) Note on rankings for Catalan dialects:

— *Ranking for Eastern Catalan* (dialect with [ə]):
   Ident(height) >> Ident(palatal) (Wheeler 2005: 59)
— *Ranking for Majorcan Catalan* (dialect with [ə]):
   Ident(high), Ident(low) >> Ident(close) >> Ident(pal) (Wheeler 2005: 61)
— *Ranking for Western Catalan* (dialect without [ə]):
   Ident(high), Ident(low), Ident(colour) >> Ident(close) (Wheeler 2005: 57)

→ Among the dialects with [ə], we take the one with the most informative ranking for faithfulness:

(7) <u>Third stage (second depuration of the URs)</u>: looking for efficiency…

less efficient	/falisitat/	Ident(low)	Ident(close)	Ident(pal)
	[fəlisitat]	*		
	/felisitat/			
	[fəlisitat]		*	*
	/fɛlisitat/			
more efficient	[fəlisitat]			*

- Given the constraint ranking in (7), the mapping /ɛ/ → [ə] is the less offending in terms of violations of ranked faithfulness constraints, so that this one is the selected in the second free ride round, once restrictiveness cannot be conclusive anymore.

- The connection between [ɛ] ~ [ə] is independently supported by patterns related to sound change in some Eastern Catalan varieties (where the stressed /ɔ́/ has evolved to /ɛ́/) and by data relative to the quality of the epenthesis in situations of stress shift in verb+enclitic sequences of Minorcan Catalan (where the unstressed [ə] alternates with a stressed [ɛ́]; see Moll 1934, Torres-Tamarit & Pons-Moll 2015).

- Markedness cannot explain the change /ɔ́/ → /ɛ́/ or the quality of the epenthetic vowel under stress shift. Cf. (partial) universal ranking:

   (8) Constraint ranking for vowels in stressed position
   *STRESSED/e>> **STRESSED/ɛ>> *STRESSED/a**

   (According to this universal hierarchy, [a] would be preferred to [ɛ] in stressed position.)

4. Conclusion

When *restrictiveness* (M >> F) leads to a non-consummated free ride and it is no longer exploitable, *efficiency* (F >> F, etc.) comes into play to consummate, conclusively, the free ride.

5. References and bibliography

Albright, Adam (submitted). A Restricted Model of UR Discovery: Evidence from Lakhota.

Bermúdez-Otero, Ricardo (2003). The acquisition of phonological opacity. In: Jennifer Spenader, Anders Eriksson & Östen Dahl (ed.), *Variation within Optimality Theory: Proceedings of the Stockholm Workshop on Variation within Optimality Theory*, 25-36. Stockholm: Department of Linguistics, Stockholm University.

Bermúdez-Otero, Ricardo (2006). Phonological change in Optimality Theory. In: Keith Brown (ed.), *Encyclopedia of language and linguistics*, 2nd ed., vol. 9, 497-505. Oxford: Elsevier.

Krämer, Martin (2012). *Underlying representations*. Cambridge: Cambridge University Press.

Lloret, Maria-Rosa, and Clàudia Pons-Moll (2016). Catalan vowel epenthesis as evidence for the free ride approach to morphophonemic learning. *Linguistic Inquiry*, 47, 1 (Winter 2016): 147-157.

Moll, Francesc de B. (1934). Transcripció de cançons populars amb notes de fonètica sintàctica. Anuari de l'oficina romanica de llengua i literatura, 7: 9–39.

Pons-Moll, Clàudia, and Maria-Rosa Lloret (2014). The free ride procedure to morphophonemic learning is correct. Some evidence from Catalan vowel epenthesis. Talk presented at the 22 Manchester Phonology Meeting. (Also presented at the OCP 13, Budapest).

Prince, Alan, and Paul Smolensky (1993/2004). *Optimality Theory: Constraint interaction in generative grammar*. Oxford: Blackwell.

Prince, Alan, Bruce Tesar (2004). Learning phonotactic distributions. In: René Kager, Joe Pater, and Wim Zonneveld (ed.), *Fixing priorities: Constraints in phonological acquisition*, ed. by, 245–291. Cambridge: Cambridge University Press.

Torres-Tamarit, Francesc; Clàudia Pons-Moll (2015). Enclitic-triggered stress shift in Catalan. Talk presented at Going Romance, 29. Radboud University (Nijmegen, the Netherlands), December 10-12 (2015).

Wheeler, Max W. (2005). *The phonology of Catalan*. Oxford: Oxford University Press.

Appendix

"An interesting line of enquiry, however, concerns how learners may use evidence from alternations in order to detect unfaithful mappings in nonalternating items (Bermúdez-Otero 2003, forthcoming; McCarthy forthcoming). Exploiting the resources of Stratal OT, Bermúdez-Otero proposes a principle of Archiphonemic Prudence to deal with this problem. The basic idea is this: if the learner discovers an unfaithful mapping /α/→ [β] in alternating items at level l (e.g. the phrase level), then she is required to consider /α/ as a possible input representation for nonalternating tokens of [β] as well; if, given current constraint rankings, /α/ proves a viable input representation for some nonalternating token of [β], say [βi], then the form that contains [βi] is set aside; later in the acquisition process, the learner uses the constraint hierarchy of the next higher level (e.g. the word level) to choose among the various possible input representations for [βi]." (Bermúdez-Otero 2006: 11 [ms]).