

Exceptionality via underspecification

Exceptionality (EGG 2025, Zagreb)

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1 Introduction

- One approach to apparent exceptionality preserves the Rule Principle by constructing grammars with relatively “abstract” underlying representations and “deep” phonology.
- For example, *SPE* (234) posits that *night* is underlyingly /nixt/—with a never-surfacing velar fricative—to derive the fact that *nightingale* [ˈnaɪt.ŋ.ɡeɪl] does not undergo the rule of TRISYLLABIC LAXING.
- Much subsequent work uses featural and/or prosodic underspecification and/or prespecification to accomplish similar ends.
- Today we’ll consider one such approach, the theory of *Logical Phonology* (e.g., Bale et al. 2014, 2020, Bale and Reiss 2018, Dabbous et al. 2021, 2025, Gorman 2025, Gorman and Reiss 2024, 2025, Reiss 2021, 2025), henceforth LP.

2 Features, segments, and natural classes

2.1 Features

- We assume UG provides $W = \{+, -\}$ and universal, innate, finite feature set \mathcal{F} (Chomsky and Halle 1968, Reiss and Volenec 2022).
- A valued feature is an element of $W \times \mathcal{F} = \{+, -\} \times \{F_1, \dots, F_n\}$; e.g., $+F_1$ or $-F_2$.

2.2 Segments

- A feature specification is a set of zero or more valued features.
- Segments are feature specifications, denoted here using curly brackets.¹
- A set of valued features defining a segment must be *consistent*.

(1) CONSISTENCY: If a segment is $+F$, it cannot also be $-F$ and vice versa.

- Feature specifications need not be *complete*: underspecification is permitted.

¹While not relevant to today’s lecture, feature specifications are assumed to also be linked to X-slots.

(2) Segments as sets of features:

$$/i/ = \left\{ \begin{array}{l} +\text{SYLLABIC} \\ -\text{BACK} \\ -\text{ROUND} \\ +\text{HIGH} \\ -\text{LOW} \\ +\text{ATR} \end{array} \right\} \quad /e/ = \left\{ \begin{array}{l} +\text{SYLLABIC} \\ -\text{BACK} \\ -\text{ROUND} \\ -\text{HIGH} \\ -\text{LOW} \\ +\text{ATR} \end{array} \right\} \quad /I/ = \left\{ \begin{array}{l} +\text{SYLLABIC} \\ -\text{BACK} \\ -\text{ROUND} \\ -\text{LOW} \\ +\text{ATR} \end{array} \right\}$$

2.3 Natural classes

- Natural classes are sets of sets of valued features, denoted here using square brackets.

$$(3) \{+\text{HIGH}\} = /Y/$$

$$(4) [+HIGH] = \{x : x \supseteq \{+\text{HIGH}\}\} = \{i, y, i, \mathfrak{u}, \mathfrak{u}, u, Y, \dots\}$$

$$(5) \left[\begin{array}{l} +\text{SYLLABIC} \\ -\text{BACK} \\ -\text{ROUND} \\ -\text{LOW} \\ +\text{ATR} \end{array} \right] = \{i, e, I\}$$

- Thus—as noted long ago (e.g., Lees 1961:12–14, Lightner 1971:236)—it is impossible to specify a natural class which matches an underspecified segment ζ without also matching any segment γ such that $\gamma \supset \zeta$.

3 Unification and deletion

- Following Inkelas and Cho (1993), Poser (1982), and Siptár and Törkenczy (2000), among others, so-called feature-changing rules (e.g., voice assimilation) are decomposed into two steps:

- A *subtraction* operation (denoted \setminus), essentially set difference, removes one or more valued features from a segment.

$$(6) \text{ SUBTRACTION: } A \setminus B = \{cF \mid cF \in A \wedge cF \notin B\}.$$

- A *unification* operation (denoted \sqcup), loosely based on a similar operation from syntactic theory (e.g., Shieber 1986), adds one or more specified features to a segment.

$$(7) \text{ UNIFICATION: } A \sqcup B = A \cup B \text{ if } A \cup B \text{ is consistent; otherwise, } A \sqcup B = A.$$

- Descriptively, there are three possible outcomes for unification (at the segmental level):

- *feature-filling*: if $+F \notin A$, $-F \notin A$, and $B = \{+F\}$ then $A \sqcup B = A \cup B$.
- *vacuous unification*: if $+F \in A$ and $B = \{+F\}$, then $A \sqcup B = A \cup B = A$.
- *unification failure*: if $+F \in A$ and $B = \{-F\}$, then $A \sqcup B = A$.

- Thus unification by itself can—indirectly!—target underspecified segments.
- Note that this does not exhaust the set of phonological operations in LP (see, e.g., Dabous et al. 2021, Gorman 2025, Reiss 2025).

4 Underspecified targets are mutable; specified targets are inalterable

- Unification can be used to model so-called *feature-filling* processes (e.g., Inkelas and Cho 1993, Inkelas 1995, Inkelas and Orgun 1995, Inkelas et al. 1997).
- Suppose that rule R unifies certain segments with $\{+F\}$. Then:
 - If ζ is not specified for F , R adds this specification (ζ is *mutable* w.r.t. R).
 - However, if ζ is specified for F , R is vacuous (ζ is *inalterable* w.r.t. R).

4.1 Spanish

- Recall from yesterday that Embick (2012) proposed the following morphophonological rule to account for verb stem alternations such as *pedir* ‘to ask’ vs. *pido* ‘I ask’.

(8) LOWERING (to be revised): $i \rightarrow e / _ C_0 i$ (condition: certain roots)

- LP allows us to go one step further and reduce all idiosyncrasies to the phonological representation of individual morphemes, one level of grammar already characterized by Saussurean *arbitrariness*.
- Gorman and Reiss (2024:§4) instead propose the alternating vowel in raising stems is underlyingly /I/, a vowel underspecified for HIGH (2).

(9) LOWERING (revised): $\left[\begin{array}{c} -\text{BACK} \\ -\text{Low} \end{array} \right] \sqcup \{-\text{HIGH}\} / _ C_0 \left[\begin{array}{c} -\text{BACK} \\ +\text{HIGH} \end{array} \right]$

(10) $[-\text{Low}] \sqcup \{+\text{HIGH}\}$

(11) Critical ordering: (9) \ll (10)

(12) Spanish sample derivations:

UR	elido	elidimos	pIdo	pIdimos
Rule (9):				pedimos
Rule (10):			pido	
SR	elido	elidimos	pido	pedimos

- Under this analysis, LOWERING is thus an exceptionless phonological rule.

4.2 Kashaya

- In Kashaya (Buckley 1994a,b), there are processes backing *i* after *d* and lowering *i* before *m*, as stated informally below.

(13) *d*-backing (to be revised): $i \rightarrow u / d _$

(14) *m*-lowering (to be revised): $i \rightarrow a / m _$

- These rules appear to be quite productive, but some *i*-initial suffixes—e.g., the inchoative *-ibic* and reflexives *-iyic'* and *-ic'*—do not undergo the expected alternations:
 - The reflexive [cahno·díʔ] ‘talk to oneself’, seems to meet the conditions for (13) but *i* does not back to *u*.
 - The inchoative [caq^hamíbiʔ] ‘start to cut with a knife’ seems to meet the conditions for (14) but *i* does not lower to *a*.
- Rather than treating these suffixes as negative exceptions, I propose:
 - *i*'s which undergo lowering and/or backing contain “mutable” *i*'s, which are denoted /I/ and are not specified for place.
 - *i*'s which do not contain *inalterable*, fully-specified /i/'s.

(15) Partial feature specification for Kashaya (Buckley 1994a:24):

	/I/	/i/	/e/	/a/	/o/	/u/
SYLLABIC	+	+	+	+	+	+
HIGH		+	–	–	–	+
LOW		–	–	+	+	+
BACK		–	–	+	–	–

- Then rules (16–18) derive the correct surface forms.

(16) *d*-backing: $[+SYLLABIC] \sqcup \left\{ \begin{array}{l} +HIGH \\ -LOW \\ +BACK \end{array} \right\} / \left[\begin{array}{l} +CORONAL \\ +ALVEOLAR \\ +VOICE \\ \dots \end{array} \right] _$

(17) *m*-lowering: $[+SYLLABIC] \sqcup \left\{ \begin{array}{l} -HIGH \\ +LOW \\ +BACK \end{array} \right\} / \left[\begin{array}{l} +LABIAL \\ +NASAL \\ -CONTIN \\ \dots \end{array} \right] _$

(18) $[+SYLLABIC] \sqcup \left\{ \begin{array}{l} +HIGH \\ -LOW \\ -BACK \end{array} \right\}$

(19) Critical ordering: (16–17) \ll (18)

- The technical innovation here is that unification eliminates the need for diacritics distinguishing between feature-filling and feature-changing rules in earlier work.

4.3 Briefly noted

- Gorman and Reiss (2024:§3) give a similar analysis of low vowel assimilation in the Baztan dialect of Basque.
- Gorman (2025) gives a similar analysis of three “minor rules” of Polish.
- Gorman and Reiss (forthcoming @ NELS) give a similar analysis of *k*-deletion in Turkish without reference to non-derived environment blocking.

5 Specified targets are catalytic; underspecified triggers are quiescent

- Inkelas and Cho (55, fn. 26) claim underspecification cannot handle cases in which “exceptionality takes the form of failure to trigger, rather than failure to undergo, a rule”.
- LP can handle such cases with ease:
 - Prespecification makes triggers *catalytic*.
 - Underspecification makes “exceptional” non-triggers *quiescent*.
- The technical innovation here is LP’s formalization of the interpretative procedure for natural classes implicitly assumed in much prior work.

5.1 Barrow Inupiaq

- Barrow Inupiaq has three surface vowels: [i, a, u].
- As discussed by Archangeli and Pulleyblank (1994:§2.2.2), Buckley (1994a), Drescher (2009:§7.2.1), and Compton and Drescher (2011), among others:
 - “strong” *i*’s are catalytic and trigger palatalization of a following coronal, whereas
 - “weak” *i*’s (< Eskimo-Aleut *ə) do not.

(20) Palatalization in Barrow Inupiaq (Kaplan 1981:§3.22):

- iki ‘wound’ iki-**ɬ**u ‘and a wound’ iki-**ɲ**ik ‘wounds’
- ini ‘place’ ini-**ɬ**u ‘and a place’ ini-**ɲ**ik ‘places’

(21) Partial feature specification for Barrow Inupiaq:

	/I/	/i/	/a/	/u/
HIGH	+	+	–	+
BACK		–	+	+

- I then derive palatalization as follows.

$$(22) [+CORONAL] \setminus \{+ANTERIOR\} / \left[\begin{array}{c} +HIGH \\ -BACK \end{array} \right] \text{ —}$$

(23) [+CORONAL] ⊆ {−ANTERIOR}

(24) [] ⊆ {−BACK}

(25) Critical ordering: (22) ≪ (23–24)

(26) Barrow Inupiaq sample derivations:

	‘wound’	‘wounds’	‘place’	‘places’
UR	/iki/	/iki-nik/	/inI/	/inI-nik/
Rule (22):		ikiNik		
Rule (23):		ikiɲik		
Rule (24):			ini	ininik
SR	iki	ikiɲik	ini	ininik

5.2 Czech

- A rather similar pattern is found in the “literary” register of Czech (Anderson and Browne 1973, henceforth A&B).
- The surface front vowels are [i, i:, ε, ε:], but only “strong” front vowels trigger palatalization of the preceding consonant.
- In Czech orthography:
 - strong front vowels are written *i, í*, and *ě*, and,
 - “weak” front vowels are written *y, ý*, *e*, and *é*.

(27) Partial paradigm for *sestřin* ‘sister’s’ in Czech (A&B:453):

a.	sestřini	[sɛstr̩ɲi]	masc.anim. nom.pl.	(“strong” palatalizing [-i])
b.	sestřiny	[sɛstr̩ni]	fem. nom.pl.	(“weak” non-palatalizing [-i])
c.	sestřinix	[sɛstr̩nix]	gen.pl.	(“weak” non-palatalizing [-ix])

- A&B propose weak *y* and *ý* are underlyingly /i(:)/, even though high mid vowels are never found on the surface.
- I instead propose:
 - “quiescent” non-palatalizing front vowels are not specified for the BACK, whereas
 - “catalytic” front vowels are specified −BACK and thus trigger palatalization.

(28) [+CORONAL] ∖ {+ANTERIOR} / — [−BACK]

- I don’t list the latter redundancy rules here because they are identical to Barrow redundancy rules (23–24) and critically ordered after (28).

5.3 Briefly noted

- Compton and Dresher (2011) report several other Inuit dialects with a similar pattern to that of Barrow.
- Dabbous et al. (2025) give a similar analysis of Hungarian “antiharmonic” stems.

6 Mutability plus catalysis is non-vacuous unification

- Imagine a unification rule of the following form:

$$(29) [+F] \sqcup \{-G\} / _ [+H]$$

- Then, for (29) to perform non-vacuous unification to some segment ζ , all of the following must be true:
 - ζ must be +F,
 - ζ must not be specified w.r.t. G (and thus *mutable*), and
 - ζ must be followed by a trigger which is +H (and thus *catalytic*).
- This conjunction of conditions has a certain similarity to Kisseberth (1970)’s exceptionality conventions, repeated below.

(30) Kisseberth conventions:

Rule R applies just in the case where all of following obtain:

- R ’s structural description is met,
 - the target morpheme is + R TARGET, and
 - the trigger morpheme is + R TRIGGER.
- The technical innovation here is that LP operates at the segment level, eliminating the need for target and trigger rule features.

6.1 Blackfoot

- Recall that in Blackfoot (Frantz 2017), k “breaks”—i.e., is realized as the affricate ks —when followed by i , as in *kitáaksipii* ‘you will enter’.
- But not all k ’s undergo breaking; e.g., the second person prefix $k-$ is “always impervious to breaking”.
- And not all i ’s trigger breaking; e.g., the initial vowel of *itsiniki* ‘tell a story’ never does.
- Rather than using Kisseberth rule features, I propose that:
 - mutable k ’s, which undergo breaking, are underspecified / K ’s, and
 - catalytic i ’s, which trigger breaking, are fully-specified / i ’s.

(31) Partial feature specification for Blackfoot:

	/i/	/I/	/k/	/K/	/ks̄/
SYLLABIC	+	+	-	-	-
HIGH	+	+	-	-	-
BACK	-	-	-	-	-
VELAR	-	-	+	+	+
DELREL	-	-	-	-	+

- (32) a. mutable /K/ \subset inalterable /k/
 b. quiescent /I/ \subset catalytic /i/

- The following rules generate breaking.

(33) [+VELAR] \sqcup {+DELREL} / $__$ [-BACK]

(34) [+VELAR] \sqcup {-DELREL}

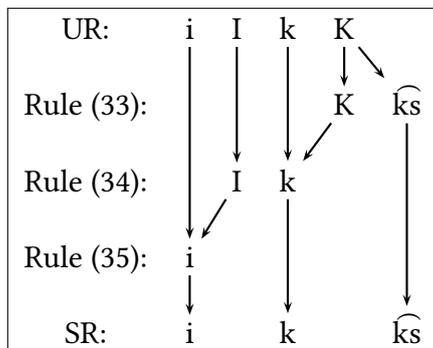
(35) [+SYLLABIC] \sqcup {-BACK}

(36) Critical ordering: (33) \ll (34–35)

(37) Blackfoot sample derivations:

UR	ki	kI	Ki	KI
Rule (33):			ks̄i	
Rule (34):			kI	kI
Rule (35):		ki		ki
SR	ki	ki	ks̄i	ki

(38) Blackfoot segment mapping diagram:



6.2 Briefly noted

- Gorman and Reiss (2024:§5) give a similar analysis of metaphony in Cervara.
- It should be straightforward to use this pattern to derive velar softening in English.

7 Further reading

- Read Inkelas et al. (1997) for a critique of *cophonology* approaches to exceptionality.

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