LSA 2019, Special session "Inside the segment"
Jan 3-6, 2018

SUBFEATURAL REPRESENTATIONS: ENCODING COARTICULATORY STRENGTH

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1. Introduction

- Main claim:
  - Coarticulation (gradient) is relevant to phonological computation (categorical)
  - Coarticulation must be represented in the phonological grammar
  - Proposal: enrich phonology with scalar representations of the effects of coarticulation = **SUBFEATURES** (Lionnet 2017)

1. Introduction

- Empirical support: Laal doubly triggered rounding harmony
  - Categorical process
  - Driven by coarticulatory effect
- + 52 cases of subphonemic teamwork = "coarticulatory gang effect" (Lionnet 2016)

2. Laal doubly triggered rounding harmony

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- V1 is rounded if
  - V2 is [+rd]
  - AND there is a labial C near V1

1) /ɓìr-ú/ → **[ɓ̲ùrú]** ‘fish.hook-PL’

2) /sìm-ú/ → **[sù̲mú]** ‘fishing.net-PL’

2. Laal doubly triggered rounding harmony

- If only one trigger → no rounding

1) /ɓìr-à/ → [ɓìrà] ‘fish.hook-SG’

2) /gɨ́n-ù/ → [gɨ́nù] ‘hunting.net-PL’

3. Phonetic underpinnings

[-round] [+round]

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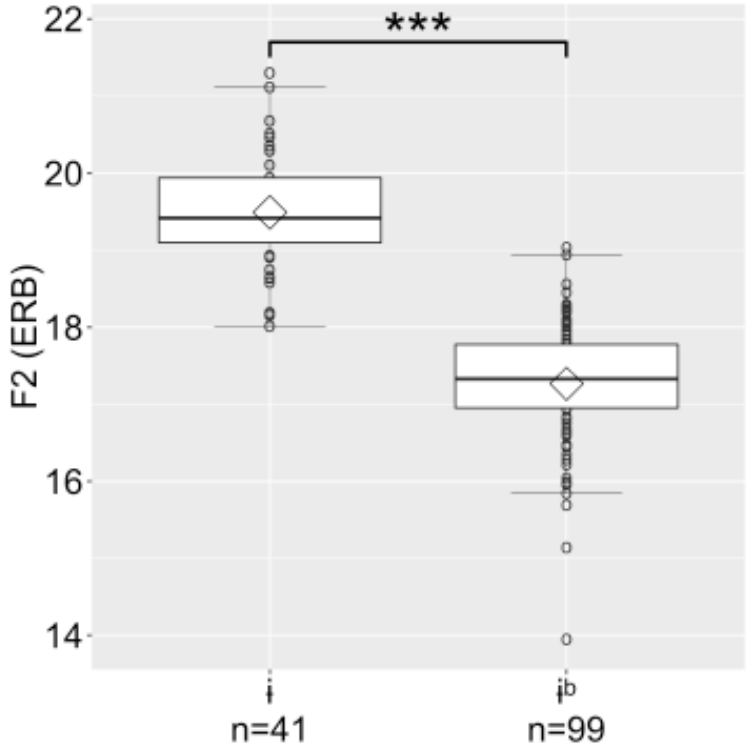
[-round] [+round]

ɓ ɨᴮ r u

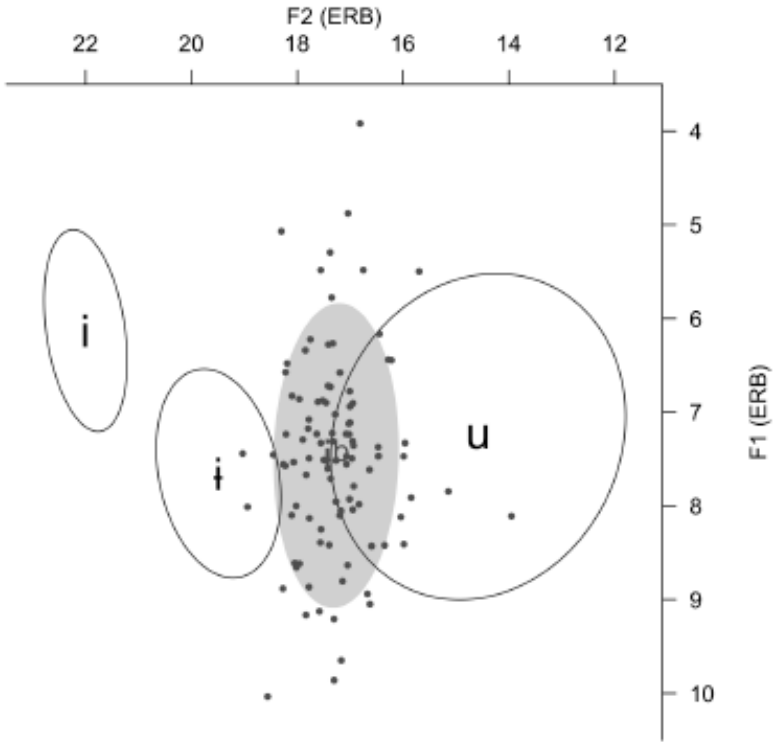


	ΔF2	*p (T-test)*	
ɨ ~ ɨᴮ	-402 Hz (-2.25 ERB)	$2.20e^{-16}$	***

3. Phonetic underpinnings

[-round] [+round]

ɓ ɨᴮ r u



	ΔF2	*p (T-test)*	
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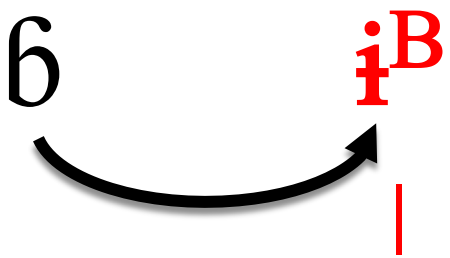
4. Subfeatural representations

[-round] [+round]



r u

[[*x* round]]

"SUBFEATURE"

- Not contrastive (allophonic)
- But perceptually distinctive

4. Subfeatural representations

Two-tiered featural system:

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Two-tiered featural system:

Featural level

[+ round]

[-round]

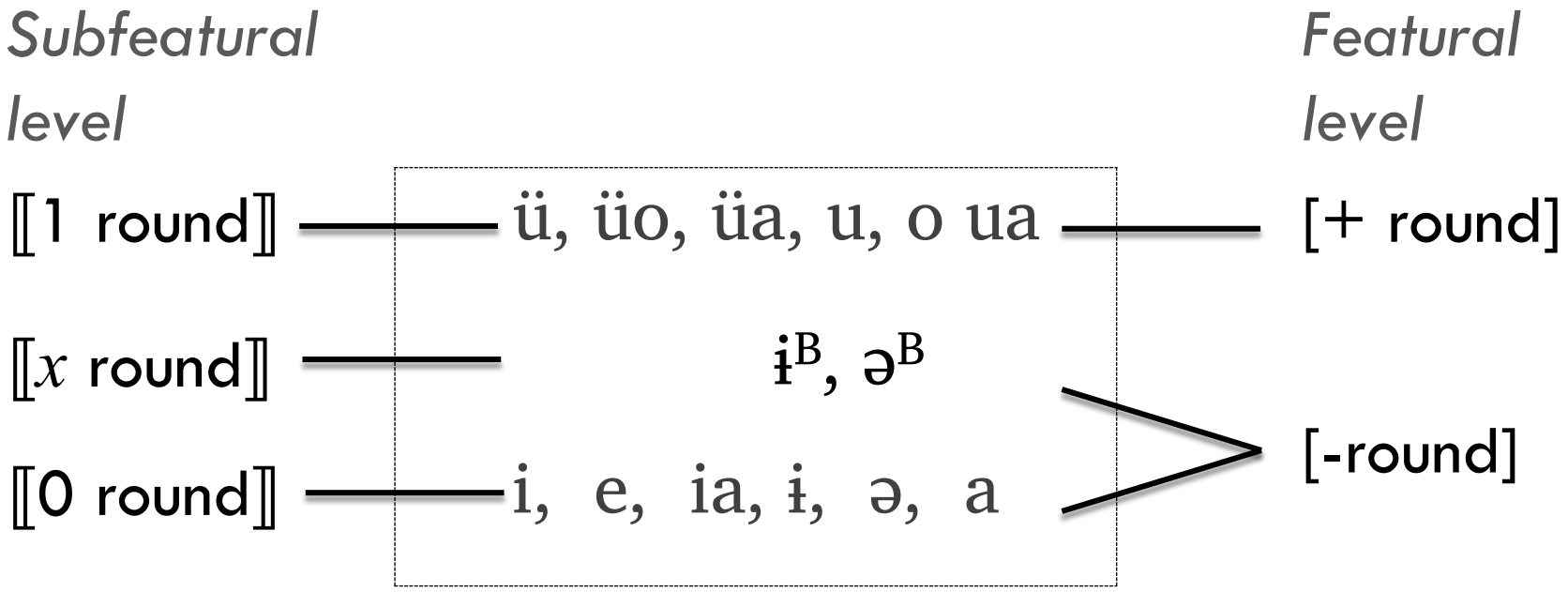
4. Subfeatural representations

Two-tiered featural system:

Subfeatural level	*Featural level*
⟦1 round⟧	[+ round]
⟦x round⟧	
⟦0 round⟧	[-round]

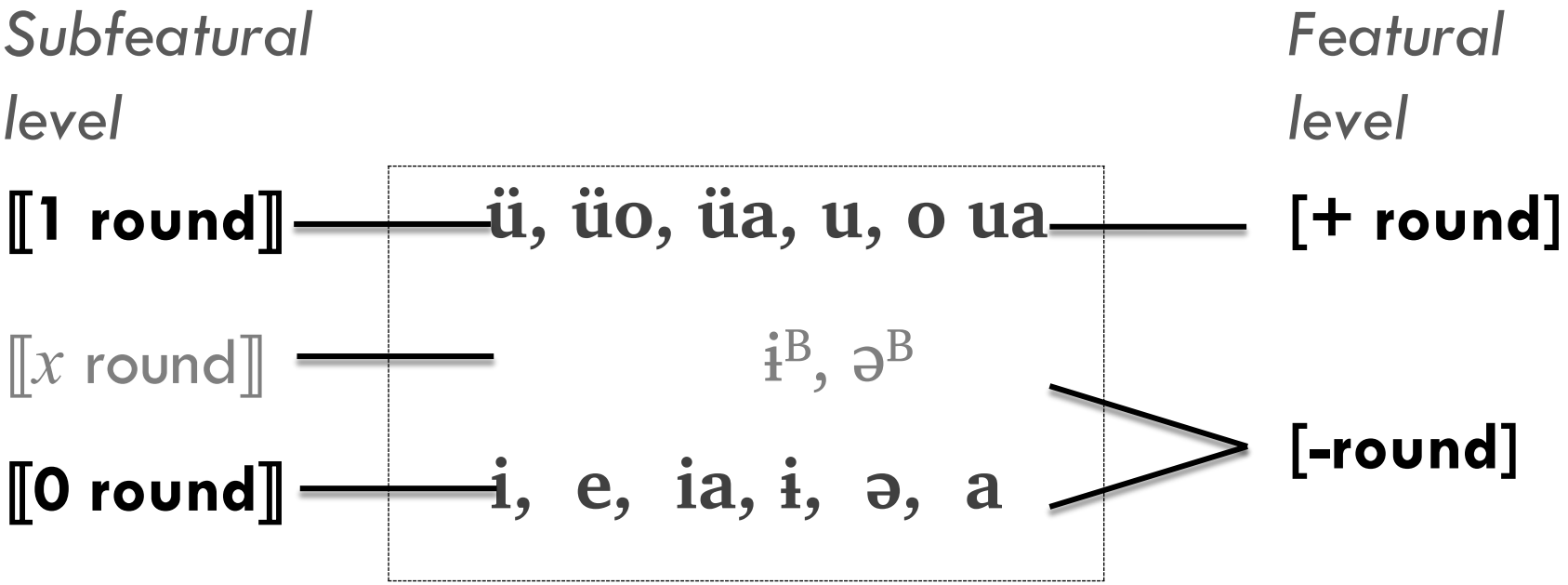
4. Subfeatural representations

Two-tiered featural system:



4. Subfeatural representations

Two-tiered featural system:

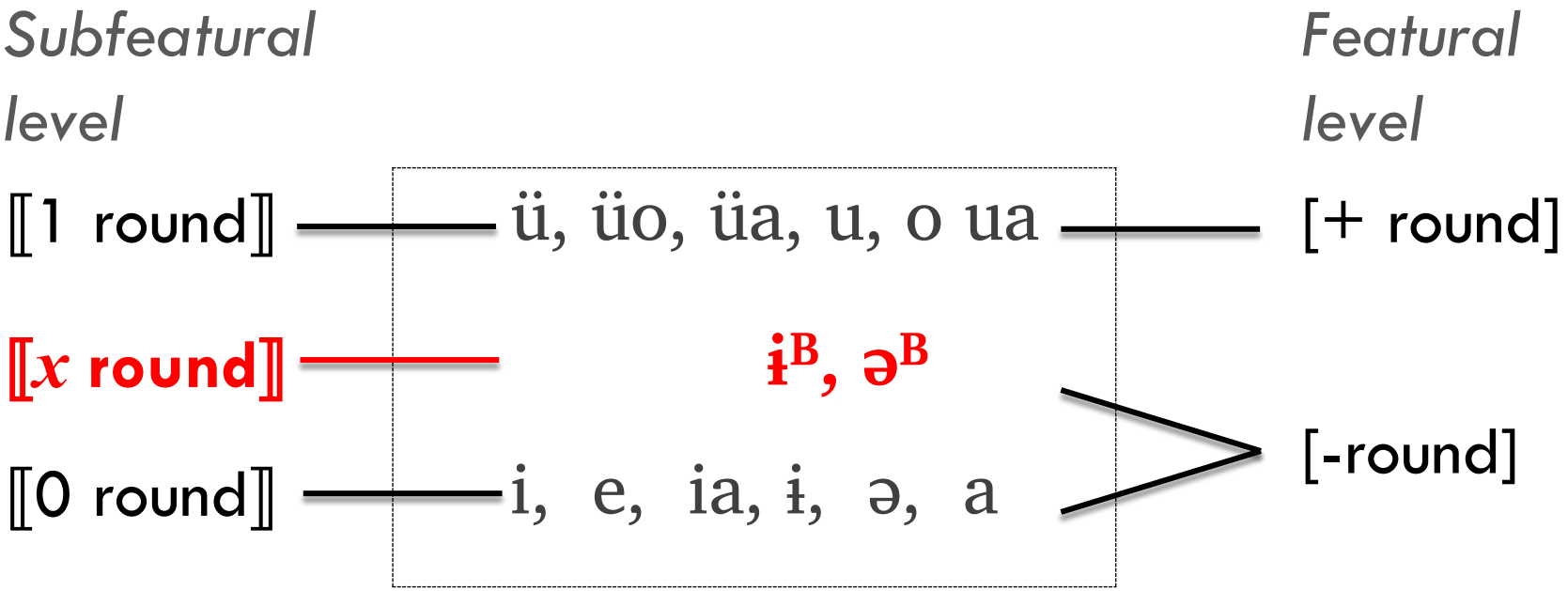


All else being equal (no coarticulation): ⟦1 F⟧ ⟷ [+F]

⟦0 F⟧ ⟷ [-F]

4. Subfeatural representations

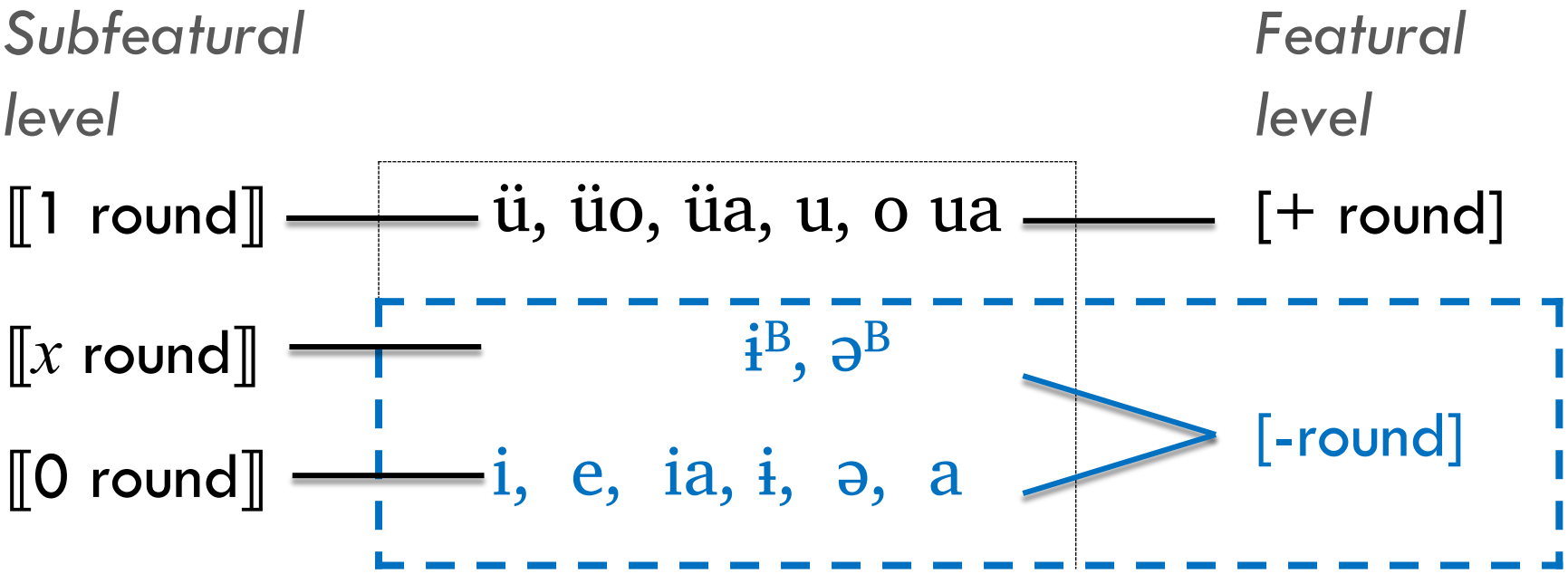
Two-tiered featural system:



Coarticulation changes the expected subfeatural value to an intermediate value x : ⟦x F⟧ (0 < x < 1)

4. Subfeatural representations

Two-tiered featural system:



4. Subfeatural representations

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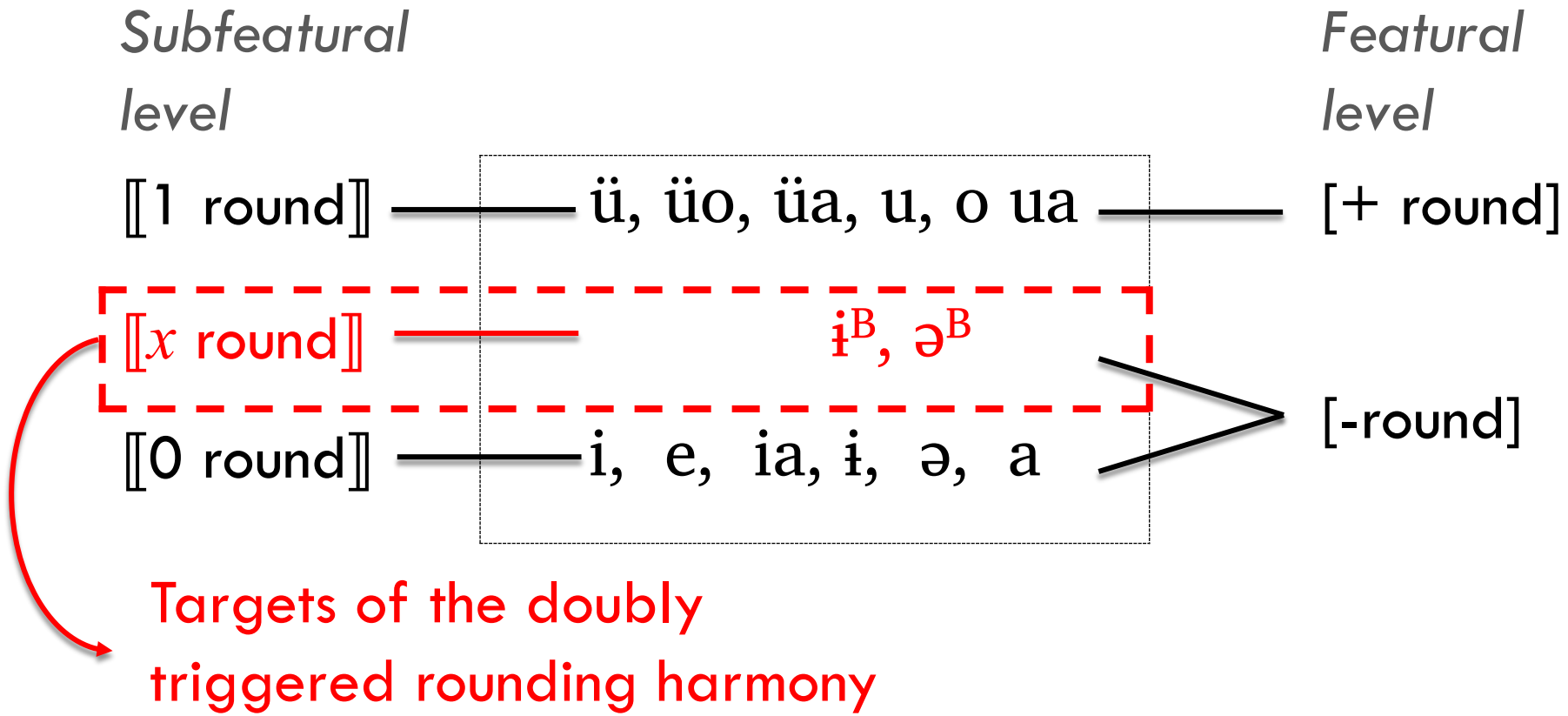

4. Subfeatural representations

- Calculating proportion of ⟦*x* round⟧ increase in Laal
  - = Proportion of F2 decrease

	[i^{B}]
AK	⟦.47 round⟧
KD	⟦.40 round⟧

  - Subfeatural representations easily accommodate inter-speaker variation

4. Subfeatural representations

- Any theory of vowel harmony can account for this harmony, if it is granted access to subfeatural representations.

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Nature of “subfeatures”

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Nature of "subfeatures"

- Subfeatures = representation of "phonetic knowledge" (Kingston & Diehl 1994)

> *"the speaker's partial understanding of the physical conditions under which speech is produced and perceived"*
>
> (Hayes & Steriade 2004:1)

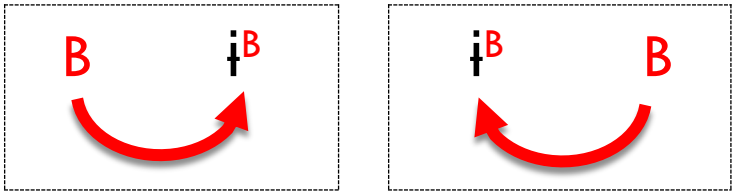
4. Subfeatural representations

Nature of "subfeatures"

- Subfeatures = representation of "phonetic knowledge" (Kingston & Diehl 1994)

  > *"the speaker's partial understanding of the physical conditions under which speech is produced and perceived"*
  >
  > (Hayes & Steriade 2004:1)

- ⟦*x* round⟧ = Laal speakers' knowledge of labial coarticulation



4. Subfeatural representations

- Subfeatures = abstract categories

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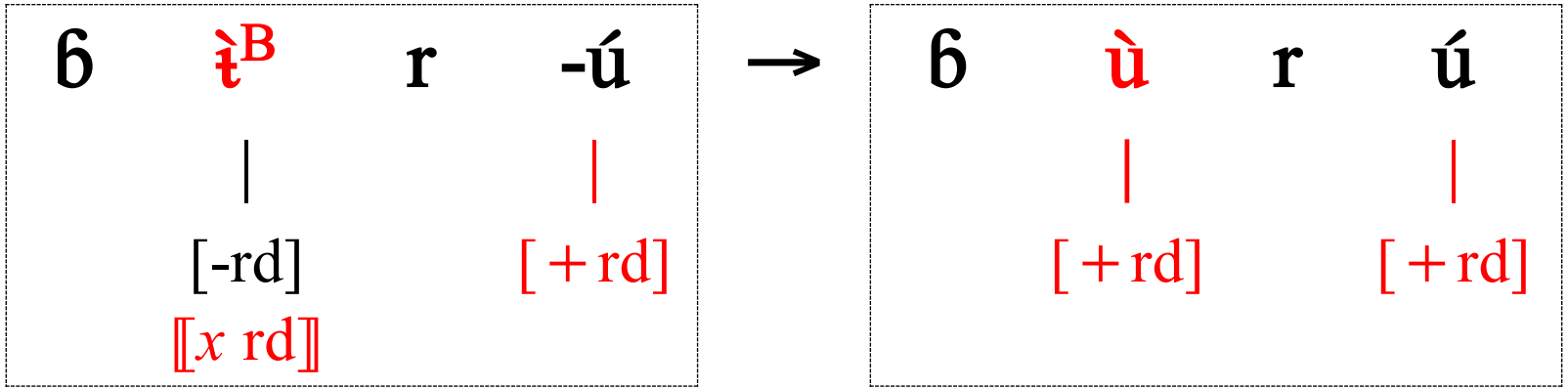

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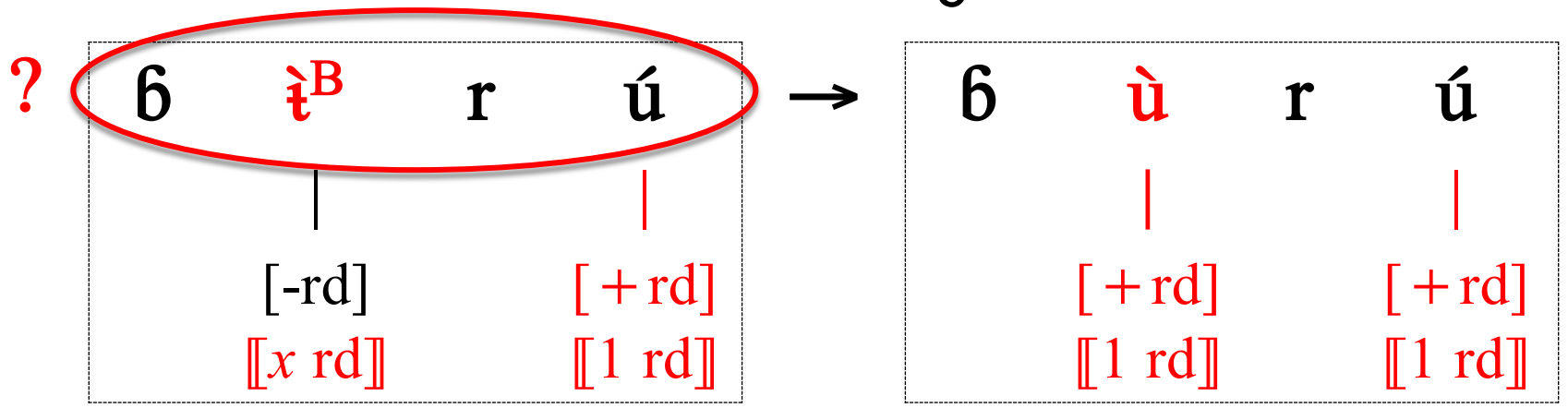

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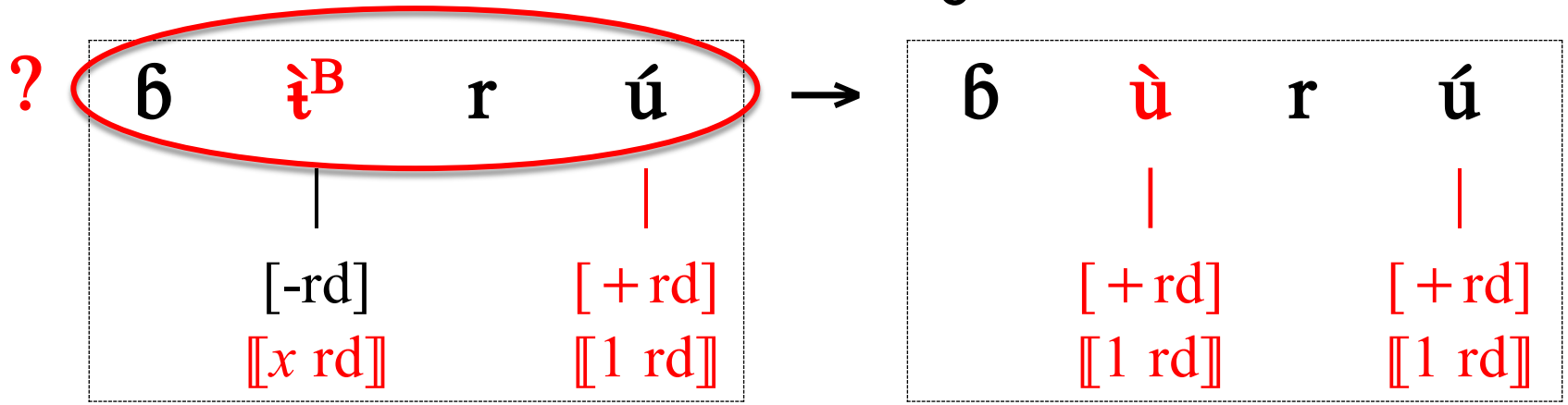

- Underlying form: /ɓ ɨ̀ r - ú/ no [[x rd]] [ɨb]
- Surface form: [ɓ ù r ú] no [[x rd]] [ɨb]

4. Subfeatural representations

- Subfeatures = abstract categories

Underlying form	Surface form
/ɓt̀r-à/	[ɓt̀^{B}rà]
/pt́r/	[pt́^{B}r]

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Underlying form	Surface form
/ɓt̀r-à/	[ɓt̀^{B}rà]
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Underlying form	
/ɓt̀r-ú/	

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Underlying form	Surface form
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ABSTRACTION

Underlying form	Inferred surface form
/ɓt̀r-ú/	[ɓt̀^{B}rú]

4. Subfeatural representations

- Subfeatures = abstract categories

Underlying form	Surface form
/ɓɨr-à/	[ɓɨ^{B}rà]
/pɨ́r/	[pɨ́^{B}r]

ABSTRACTION

Underlying form	Inferred surface form	Application of rounding harmony
/ɓɨr-ú/	*[ɓɨ^{B}rú]	[ɓùrú]

4. Subfeatural representations

- Subfeatures = abstract categories

Underlying form	Surface form
/ɓt̀r-à/	[ɓt̀^{B}rà]
/ɓt́r/	[ɓt́^{B}r]

ABSTRACTION

Underlying form	Inferred surface form	Application of rounding harmony
/ɓt̀r-ú/	*[ɓt̀^{B}rú]	[ɓùrú]

Cf.
- "Inferred input" (Steriade 1997, Jun 2002)
- "Realized input" (Flemming 2008)

Conclusion

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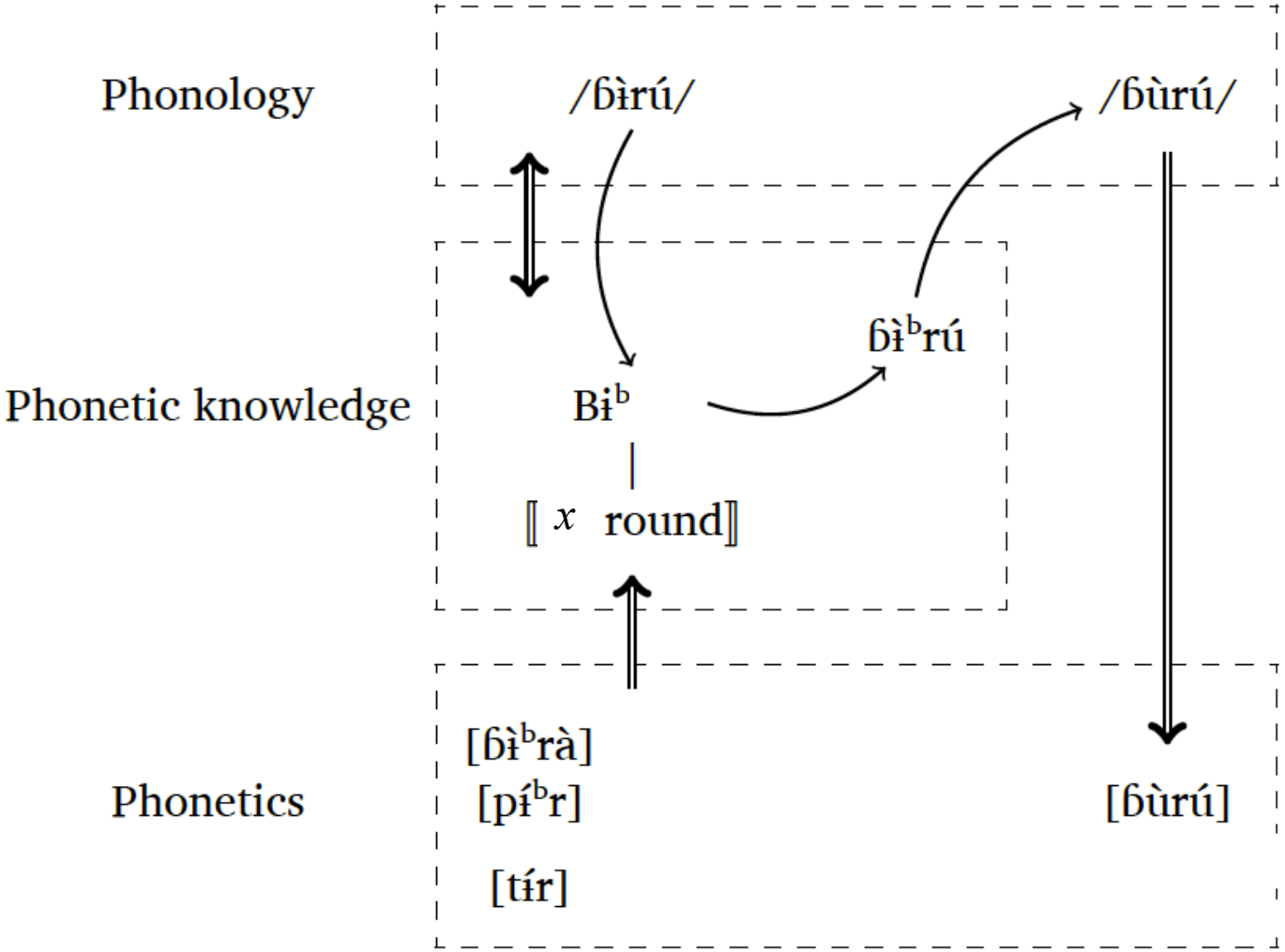
- Coarticulation is relevant to phonological processes, in particular cumulative effects driving subphonemic teamwork
- Argument in favor of gradient representations
- Argument in favor of a phonetically grounded approach

Conclusion

- Solution: enriching phonology with quantal subfeatural representations:
  - fine-grained representation of phonetic knowledge
  - represent perceptually distinctive categories
  - but not contrastive
- In keeping with phonetically grounded approaches
- But keeps phonology and phonetics separated (only mediated by phonetic knowledge)
  - Not limited to perception: cf. articulatory implementation of subfeatural representations by Hayeun Jang (2019)

4. Subfeatural representations



THANK YOU!

Thank you to:

- - my Laal consultants in Chad
- - Will Bennett, Larry Hyman, Sharon Inkelas, Donca Steriade

My research on Laal is funded by the DoBeS program of the Volkswagen Foundation