

# A Crash Course in Foot Structure

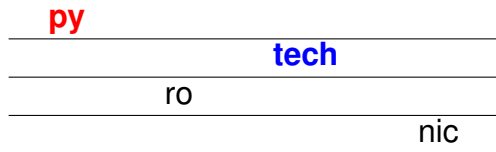
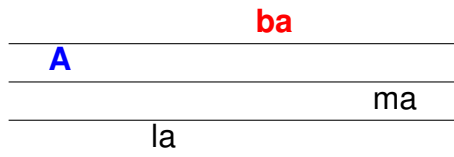
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Concatenative Approaches to  
Nonconcatenative Morphology  
EGG 2008

# Not all syllables are created equal



# Word Stress

Metrical prominence of syllables

in (phonological) words

# Phonetic Correlates of Word Stress

- ▶ Length
- ▶ Loudness
- ▶ Pitch contour

# Consequences of Word Stress for Vowel Reduction

**ɛɪ**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 təm  
 \_\_\_\_\_

**ɪ**  
 \_\_\_\_\_  
 \_\_\_\_\_ **mɪk**  
 \_\_\_\_\_  
 ə  
 \_\_\_\_\_

- ▶ Vowels are maintained under stress
- ▶ and reduced to [ə] if unstressed

# Word Stress in the IPA

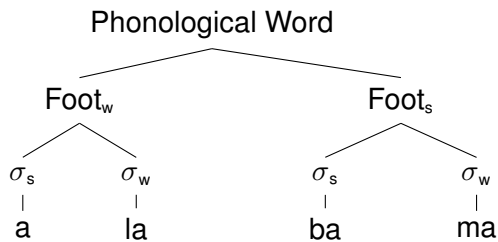
[,man.da.'ri:.nə]

[.'ʔy:.bə.,mɔə.gən]

# Overview

## Foot Parsing

# Word Stress in Prosodic Phonology (Selkirk, 1980)

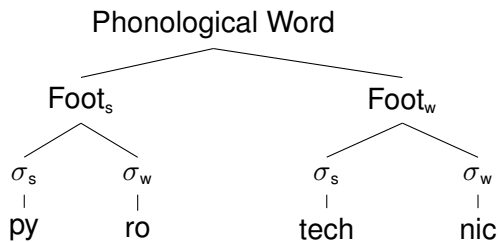


s = strong

w = weak



# Word Stress in Prosodic Phonology (Selkirk, 1980)



s = strong

w = weak

## Foot Types: Iambs and Trochees

<b>Trochee:</b>	First syllable in the foot is strong
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(**ra**<sub>s</sub>.Zor)

<b>Iamb:</b>	Last syllable in the foot is strong
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(e.**rase**<sub>s</sub>)

# Binary Syllabic Iamb and Trochee

<b>Trochee:</b>	First syllable in the foot is strong
-----------------	--------------------------------------

(**ra**<sub>s</sub>.Zor)

<b>Iamb:</b>	last syllable in the foot is strong
--------------	-------------------------------------

(e.**rase**<sub>s</sub>)

# Monosyllabic Iamb and Trochees

<b>Trochee:</b>	First syllable in the foot is strong
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(**rat**<sub>s</sub>)

<b>Iamb:</b>	Last syllable in the foot is strong
--------------	-------------------------------------

(**rat**<sub>s</sub>)

# Problematic Foot Types

**Feet**  $> 2 \sigma$ :

(**flat**<sub>s</sub>.te.rer)

**Unparsed syllables:**

e(**rase**<sub>s</sub>)

# Common Assumption

- ▶ Every language has only a specific foot type (either trochees or iambs)
- ▶ The structure of erase must therefore be  $e(\text{rase}_S)$ , not  $(e.\text{rase}_S)$   
(since English generally has trochees)

## Types of Trochees in Hayes (1995)

**Syllabic Trochee:** ( $\acute{\sigma}$   $\sigma$ )

**Moraic Trochee:** ( $\acute{\sigma}_{\mu}$   $\sigma_{\mu}$ ) or ( $\acute{\sigma}_{\mu\mu}$ )

$\sigma_{\mu}$  = light syllable     $\sigma_{\mu\mu}$  = light syllable     $\sigma$  = heavy or light syllable

## Types of lambs in Hayes (1995)

**Unmarked lamb:**  $(\sigma_{\mu} \acute{\sigma}_{\mu\mu})$

**Else:**  $(\sigma_{\mu} \acute{\sigma})$  **oder**  $(\acute{\sigma}_{\mu\mu})$

$\sigma_{\mu}$  = light syllable     $\sigma_{\mu\mu}$  = light syllable     $\sigma$  = heavy or light syllable



# The Syllabic Trochee: Pintupi

<b>mu.</b> ŋu	“orphan”
<b>ka.</b> pa.li	“mother of mother”
<b>ŋal.</b> ku. <b>nin.</b> pa	“eating”
<b>pu.</b> [iŋ. <b>ka.</b> la.t <sup>h</sup> u	“we (sat) on the hill”
<b>t<sup>h</sup>a.</b> mu. <b>lim.</b> pa. <b>t<sup>h</sup>uŋ.</b> ku	“our relation”

# The Syllabic Trochee by Feet: Pintupi

**mu.**ŋu

( $\acute{\sigma}\sigma$ )

**ka.**pa.li

( $\acute{\sigma}\sigma$ )  $\sigma$

**ŋal.**ku.**nin.**pa

( $\acute{\sigma}\sigma$ ) ( $\grave{\sigma}\sigma$ )

**pu.**[iŋ.**ka.**la.t̪u

( $\acute{\sigma}\sigma$ ) ( $\grave{\sigma}\sigma$ )  $\sigma$

**t̪a.**mu.**lim.**pa.**t̪uŋ.**ku

( $\acute{\sigma}\sigma$ ) ( $\grave{\sigma}\sigma$ ) ( $\grave{\sigma}\sigma$ )

## The Moraic Trochee: Latin

- a. [i.ni.mi:kus] “Feind”  
[re:k.sis.tis] “ihr herrschtet”
- b. [i:n.su.la] “Insel”  
[fa.bu.la] “kleine Bohne”

In a word of at least 3 syllables  
the penultimate syllable is stressed, if it is heavy

If the penultimate syllable is light  
the antepenultimate syllable is stressed

# The Moraic Trochee in Latin: Extrametricality

The last syllable has no influence  
on stress position

- a. [i.ni.mi:.<kus>] “enemy”  
[re:k.sis.<tis>] “you governed”
- b. [i:n.su.<la>] “island”  
[fa.bu.<la>] “small bean”

# The Moraic Trochee in Latin: Foot Structures

a. [i.ni.mi:kus]      ( $\dot{\sigma}_\mu \sigma_\mu$ ) ( $\acute{\sigma}_{\mu\mu}$ ) < $\sigma$ >

[re:k.sis.tis]      ( $\dot{\sigma}_{\mu\mu}$ ) ( $\acute{\sigma}_{\mu\mu}$ ) < $\sigma$ >

b. [i:n.su.la]      ( $\acute{\sigma}_{\mu\mu}$ )  $\sigma_\mu$  < $\sigma$ >

[fa.bu.la]      ( $\acute{\sigma}_\mu \sigma_\mu$ ) < $\sigma$ >

# Bisyllabic Iambbs: Creek

co.**ko** “house”

a.**mi**.fa “my dog”

a.pa.ta.**ka** “pancake”

a.no.ki.**i**.ta “love”

i.si.ma.hi.ci.**ta** “see somebody at it”

## Bisyllabic Iambs: Creek in Feet

co. <b>ko</b>	$(\sigma\acute{\sigma})$
a. <b>mi</b> .fa	$(\sigma\acute{\sigma}) \sigma$
a.pa.ta. <b>ka</b>	$(\sigma\grave{\sigma}) (\sigma\acute{\sigma})$
a.no.ki. <b>ci</b> .ta	$(\sigma\grave{\sigma}) (\sigma\acute{\sigma}) \sigma$
i.si.ma.hi. <b>ci</b> .ta	$(\sigma\grave{\sigma}) (\sigma\grave{\sigma}) (\sigma\acute{\sigma})$

# Monosyllabic Iamb: Creek

**ca:**.lo '??'

**sok**.ca '??'

wa:.ko.**ci** '??'

hok.ta.**ki** '??'

al.pa.**to**.ci '??'



# Monosyllabic Iambics: Creek in Feet

<b>ca</b> :.lo	'??'	$(\acute{\sigma}_{\mu\mu})\sigma$
<b>sok</b> .ca	'??'	$(\acute{\sigma}_{\mu\mu})\sigma$
wa:. <b>ko.ci</b>	'??'	$(\grave{\sigma}_{\mu\mu})(\sigma\acute{\sigma})$
hok.ta. <b>ki</b>	'??'	$(\grave{\sigma}_{\mu\mu})(\sigma\acute{\sigma})$
al.pa. <b>to.ci</b>	'??'	$(\grave{\sigma}_{\mu\mu})(\sigma\acute{\sigma})\sigma$

# Foot Parsing Algorithm

- ▶ Depart from the **designated word edge** and
- ▶ Scan sequentially through all the syllables until you reach the opposite word edge
- ▶ At any point Construct **the optimal foot type the language allows**

# Parameters of Foot Parsing

**Designated Word Edge:** left or right

**Foot Type:**  
iamb  
or Syllabic Trochee  
or Moraic Trochee

## Trochee from the Left: Pintupi

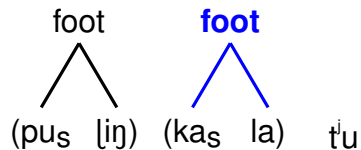
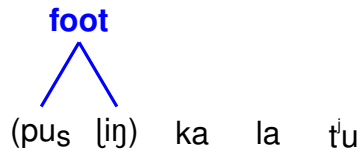
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<b>t<sup>h</sup>a.</b> mu. <b>lim.</b> pa. <b>t<sup>h</sup>uŋ.</b> ku	“our relation”

## Trochee from the Left: Pintupi in Feet

**mu.**ŋu $(\acute{\sigma}\sigma)$ **ka.**pa.li $(\acute{\sigma}\sigma) \sigma$ **ŋal.**ku.**nin.**pa $(\acute{\sigma}\sigma) (\grave{\sigma}\sigma)$ **pu.**[iŋ.**ka.**la.t̪u $(\acute{\sigma}\sigma) (\grave{\sigma}\sigma) \sigma$ **t̪a.**mu.**lim.**pa.**t̪uŋ.**ku $(\acute{\sigma}\sigma) (\grave{\sigma}\sigma) (\grave{\sigma}\sigma)$

## Pintupi: Derivation

pu [iŋ] ka la t'u



## Trochee from the Right: Warao

<b>ti</b> .ra	“woman”
ko. <b>ra</b> .nu	“drink it!”
<b>ru</b> .hu. <b>na</b> .e	“he sat down”
yi. <b>wa</b> .ra. <b>na</b> .e	“he finished it”
<b>ya</b> .pu. <b>ru</b> .ki. <b>ta</b> .ne. <b>ha</b> .se	“difficult to climb”

## Trochee from the Right: Warao in Feet

<b>ti</b> .ra	$(\acute{\sigma}\sigma)$
ko. <b>ra</b> .nu	$\sigma(\acute{\sigma}\sigma)$
<b>ru</b> .hu. <b>na</b> .e	$(\grave{\sigma}\sigma) (\acute{\sigma}\sigma)$
yi. <b>wa</b> .ra. <b>na</b> .e	$\sigma(\grave{\sigma}\sigma) (\acute{\sigma}\sigma)$
<b>ya</b> .pu. <b>ru</b> .ki. <b>ta</b> .ne. <b>ha</b> .se	$(\grave{\sigma}\sigma) (\grave{\sigma}\sigma) (\grave{\sigma}\sigma) (\acute{\sigma}\sigma)$



# Warao: Derivation

yi wa ra na e

