GOAL OF PROJECT

- Document and describe pitch excursion or “accent curves” of Blackfoot at the word level
  - Provide instrumental support for impressionistic descriptions (Taylor 1969; Frantz 2009)
- Enrich Blackfoot linguistics and application
PRESENTATION OUTLINE

• Blackfoot Background
  • Language
  • Documentation (existing materials)
  • Pitch study

• Present research
  • Data (recording & processing)
  • Description of pitch excursion

• Implications
  • Linguistics
  • Application
BACKGROUNDs
BLACKFOOT

- Algonquian
- Spoken in Alberta & Montana
- Speaker estimation
  - 3,250 in Canada (Census 2011)
  - 50 or less in US (p.c. Kipp 2009)

- The language is spoken by the members of the Four Bands

<table>
<thead>
<tr>
<th>Bands</th>
<th>Translation</th>
<th>English Name</th>
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<tbody>
<tr>
<td>A. Siksika</td>
<td>‘Blackfoot’</td>
<td>Blackfoot</td>
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<tr>
<td>B. Apatohsipiikani</td>
<td>‘North Spotted Robe’</td>
<td>Piikanii</td>
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<td>C. Kainai</td>
<td>‘Many Chiefs’</td>
<td>Blood</td>
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<tr>
<td>D. Amsskaapiipiikani</td>
<td>‘South Spotted Robe’</td>
<td>Blackfeet</td>
</tr>
</tbody>
</table>
DOCUMENTATION: EXISTING MATERIALS

Grammar
Uhlenbeck (1938), Taylor (1969), Frantz (2009)

Dictionary and Wordlists
Tims (1889); Lanning, C. M. (1882); Uhlenbeck and Van de Gulik (1930); Frantz and Russell (1995)

Pedagogical materials
Print: Russell, Ayongman, Kainai Board of Education, Miyashita (Blackfoot Language Group 2007~)
Technology: Native Teaching Aids, Blackfeet Community College, Piegan Institute

Linguistic journal articles & theses
Morphosyntax, semantics, phonetics, phonology
Blackfoot Pitch Study

- Blackfoot has pitch accent (Frantz 2009)
  - Accent is realized as high pitch
  - There is at least one pitch accented syllable in a word
  - Based on the claim, pitch in Blackfoot has been examined in terms of phonetics and phonology.
**Phonetics**

- Phonetic correlates are F0 with intensity (Van der Mark 2002)

**Issue:**

- The measurements focus only on accented (or prominent) syllables.
- However… accented syllables are realized in contrast with unaccented syllables
- The examination should also include pitch measurements of unaccented syllables.
Blackfoot Pitch Study - Phonology

Phonology

- Accent is unpredictable (Uhlenbeck 1938; Frantz 2009)
- Recent studies claim that it is largely predictable
  - Quantity sensitive, interacting with culminativity and alignment (Kaneko 1999); iambic foot type (Weber in press)

Issue:

- The analysis treats counter examples as words with inherent pitch accents
- However...counter examples include frequently occurring words (e.g., boy, man, baby)
- Inclusion of these words is important for conservation.
WHAT WE WANT TO KNOW...

- How the pitch begins, continues, and ends a word:
  Melody of Blackfoot words or **Pitch Excursion**
Word Melody Documentation
WORD MELODY: LOCAL PITCH EXCURSION

- Local Pitch Excursion
  Pitch movement at word level (Jie Liang 2006)
  - One may also refer to intonational tune, accent curve, or pitch contour of a word
**Impressionistic Studies of Word Melody**

- Taylor (1969) briefly describes pitch contours
  - Type I: Prominent syllable is located near the beginning of a word & is high pitched
    - Uses terms ‘crescendo/decrecendo’ for rising-falling pitch
  - Type II: Prominent syllable is final or penultimate & is high in intensity. Pitch is low; contour is steady.

- Frantz (2009)
  - An accented syllable is high pitched
  - Pitch gradually lowers throughout the word
  - Pitch movement on long vowels are not always the same (some stable; some drop in the middle)

- We aim to provide instrumental support
DATA COLLECTION: RECORDING

- Used recordings from word pronunciation project capturing phonemes in Blackfoot. (2013)
  - Pronunciation of 196 words in isolation were recorded
- Selected 2, 3 and 4 syllable words
  - 35 out of 196 met the criteria

- Pronunciation provider
  - Blackfeet tribal member
  - Elderly native speaker
  - Male; 80s

with Chief Earl Old Person
DATA PROCESSING

- Measured F0 of all vowels
- Identified accented syllable by locating the highest F0.
- Made graphs to show extracted pitch movement

**Observed four characteristics**

*saahkomaapi [saxkumaːpi]* ‘boy’
Accent Location
Where in a word an accent is located
**Two Syllable Words: óṣ & σó**

- *nínaa* ‘man’
- *kiisto* ‘you’
THREE SYLLABLE WORDS: ソソ；ソソ；ソソ

- áóttaki ‘bartender’
- makóyi ‘wolf’
- ponoká ‘elk’
**Four Syllable Words:**  ámb ámb ámb ámb

- **nikso’kowai** ‘my relative’
- **nitomitaam** ‘my dog’
- **napayini** ‘bread’
**Generalization 1: Accent Location**

- Accent falls on first, second, or third syllable

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<td>nottoána</td>
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<td></td>
<td>áákiipaskaan</td>
<td>saahkómaapi</td>
<td>napayíni</td>
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</table>
**Pitch Excursion Boundaries: Initial**

F0 of the initial vowel when not accented ranges from 80-90Hz
**Pitch Excursion Boundaries: Final**

F0 of the last vowel when not accented is approx. 60Hz
GENERALIZATION 2: PITCH AT EXCURSION BOUNDARIES

- When not accented, F0 of the initial vowel ranges from 80-90Hz; ending is approx. 60Hz
- Probably capturing Downdrift
- We call this hypothetical line downdrift basic pitch
Pitch at Accent
Pitch at Accent

1\textsuperscript{st} 90-115 Hz

2\textsuperscript{nd} 85-107 Hz

3\textsuperscript{rd} 88-94 Hz
GENERALIZATION 3: PITCH AT ACCENTED SYLLABLES

- Pitch of accented syllables are higher word-initially and it shifts down.
- and...
Pitch excursion may be realized by the interaction between accent and downdrift basic pitch.
PITCH IN LONG VOWEL
**GENERALIZATION 4: LONG VOWELS**

- Raised toward the end of the syllable
  - *miini* ‘berry’

  ![Waveform](image)

  - 95Hz
  - 87Hz

- Steep drop
  - *taakitaapoo* ‘I will go there’

  ![Waveform](image)

  - 113Hz
  - 90Hz
GENERALIZATIONS (2, 3, 4 SYLLABLE WORDS)

1. Accent location
   Accent falls on first, second, or third syllable.

2. Pitch at excursion boundaries
   F0 of the initial release ranges from 80-90Hz; ending is approximately 60Hz when neither is accented, showing downdrift.

3. Pitch at accent
   Pitch of accented syllables are higher word-initially and it shifts down. (Possibility of interaction with downdrift)

4. Pitch in long vowels
   When the accented syllable has a long vowel, the pitch is raised toward the end or it drops in the middle of the vowel.
SIGNIFICANCE
SIGNIFICANCE

The study contributes to
1. Phonetics and Phonology
2. Applied Linguistics
3. Language Documentation and Conservation
Prosody: Instrumental Support

Frantz’s (2009) Impressionistic Description

- An accented syllable is high pitched
- Pitch gradually lowers throughout the word
- Pitch movement on long vowels are not always the same (some stable; some drops in the middle)
  - Stable: slight pitch rise toward the end
  - Pitch drop: wide range of pitch contour - audible
**Prosody: Instrumental Support**

**Taylor’s (1969) Impressionistic Description**

- Type I: Prominent syllable is located near the beginning & is high pitched (crescendo/decrescendo)
- Type II: Prominent syllable is final or penultimate & high intensity, contour is steady low pitch.

- We are able to further understand what the description meant
- These two types are result of one pitch excursion mechanism.
- Interaction of downdrift basic pitch + higher pitch at accented syllable
Implication: Phonology

- Counter examples to the quantity sensitive analysis (Kaneko 1999; Weber in press) were treated as words with inherent pitch marking
  - e.g., ñínaa ‘man’, saahkómaapi ‘boy’, and issitsímaan ‘infant’
  - These words occur frequently and most likely to be included in teaching materials; they should also be examined.

- In addition, the term pitch accent has been interpreted in various ways (Hyman 2009); it is important to conduct detailed pitch examinations.
IMPLICATION: PHONOLOGY

- Raises the issue of finding an appropriate theoretical framework for a language involving pitch in prominence, especially for an under-researched language.

- It is significant to consider pitch excursion documentation as well as or even before conducting theoretical pitch analysis.
FUTURE WORK

- Look at pitch excursion in
  - Polysynthetic words
  - Words with multiple accents
  - Sentences
  - Connected speech

- Perception study
  - Where speakers hear accents
  - How native speakers perceive pitch excursion

- Second Language Acquisition
  - How learners acquire Blackfoot pitch excursion
IMPLICATION

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SIGNIFICANCE: APPLICATION

- Description of pitch excursion tells us how the pitch begins, continues, and ends a word.
  - Melody of Blackfoot words informs whether or not the speakers are first language speakers
  - Most learners are member of the tribes; they want to sound “right.”

- The pitch excursion description provides teachers and learners with the information they need
  - Such as how they should pronounce Blackfoot words regarding intonation
    e.g. Pitch gradually goes down
    Pitch is flat if third syllable is accented...
Pitch Art – example application

- Pitch Art is a graph visualizing pitch excursion
- “Pitch Art” can be used for teacher training & learners’ pronunciation practice
- It is an adaptation of Tone Art: used in Cherokee to illustrate the rise-fall tone patterns (Herrick et al. forthcoming; Hirata-Edds and Herrick 2015).
- We used Praat to create Pitch Art
  Showing phonetic image is a technique for teaching L2 sounds (Liu et al. 2011).
Take these two as examples.

- Pronunciation is the same except for their pitch accents
- But values of accented and unaccented syllables’ pitch are NOT the same - Not a mirror image
- Use of pitch art help learners acquire the word melody of Blackfoot
FUTURE APPLICATION PROJECT

- Use Pitch Art in
  - Teacher training seminar (Summer 2015)
  - Language instruction for children (Fall 2015)
  - Adult learners (U of Montana)

Cuts Wood Academy
Blackfeet Nation
SIGNIFICANCE: DOCUMENTATION & CONSERVATION

- The theme of the ICLDC4 “Enriching Theory, Practice, and Application”
- Our project bridges two fields, language documentation and conservation regarding the Blackfoot local pitch excursion.
- This provides the base for more projects that connect these two fields.
REFERENCES

- Weber, N. Forthcoming.
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