Phonetic comparison, varieties, and networks: Swadesh’s influence lives on here too.

Jennifer Sullivan and April McMahon,
University of Edinburgh
Outline of presentation

1) The perhaps unexpected relevance of Swadesh here

2) Small-scale comparison of methods measuring phonetic similarity among English/Germanic varieties

3) Implications of results for how we measure phonetic similarity in a synchronic context

4) Begin to tackle question of Chance Phonetic Similarity
Swadesh’s Legacy

- **Lexicon**: Ubiquitous 100/200 word lists of basic vocabulary

- Measurement of *Language* Distance (**Lexicostatistics**) 

- Estimation of dates of *Language* splits (**Glottochronology**) 

- **Phonetics**: Papers on *English varieties* and other languages

- Lexicostatistics and Glottochronology equally applied by Swadesh to **Varieties**

- Threshold scores from these techniques for separating Languages from **Varieties** (Swadesh 1950, 1972)
Swadesh’s Insights

- Swadesh did **not quantify** phonetic similarity in the manner of Lexicostatistics but interested in English variety **vowel variability** (1947) and explores **isogloss tradition** (1972: 16).


- Broached the issue of **chance** in assessing whether languages were related or not.
Lexicostatistics

‘Phonostatistics’ (within cognates)

Cognacy Score 1.0

Phonetic identity score 1.0

Edit Distance (Whole phone)

Graded phonetic measurements

Phonetic feature methods
<table>
<thead>
<tr>
<th>Swadesh 100 list</th>
<th>Swadesh 200 list</th>
<th>Gmc Cognates only</th>
</tr>
</thead>
<tbody>
<tr>
<td>cold</td>
<td>five</td>
<td>brother</td>
</tr>
<tr>
<td>eye</td>
<td>four</td>
<td>daughter</td>
</tr>
<tr>
<td>foot</td>
<td>ice</td>
<td>eight</td>
</tr>
<tr>
<td>heart</td>
<td>mother</td>
<td>holy</td>
</tr>
<tr>
<td>horn</td>
<td>right</td>
<td>home</td>
</tr>
<tr>
<td>long</td>
<td>three</td>
<td>nine</td>
</tr>
<tr>
<td>mouth</td>
<td></td>
<td>north</td>
</tr>
<tr>
<td>one</td>
<td></td>
<td>over</td>
</tr>
<tr>
<td>two</td>
<td></td>
<td>six</td>
</tr>
<tr>
<td>white</td>
<td></td>
<td>seven</td>
</tr>
<tr>
<td></td>
<td></td>
<td>storm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>swear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ten</td>
</tr>
<tr>
<td></td>
<td></td>
<td>word</td>
</tr>
</tbody>
</table>

**30 word subset**

(McMahon et al 2005-07)
Phonetic comparison in Varieties

- **2 Languages**: English, German (Hochdeutsch)
- **4 Varieties** of English: Std American, RP, Std Scottish, Buckie
Questions

Do feature methods behave differently or is important information lost?

How much phonetic detail should there be?

Detailed e.g. Heggarty (2000)
Distances not transparent

Sparse e.g. Kessler & Lehtonen (2006)

Chance issue unexplored outside historical context

Edit Distance

Phonetic features
Results-Networks

- Large convergence between Whole Phone and Phonetic Feature methods (especially when aggregate scores used)

- Splitstree-NeighborNet (Huson & Bryant 2006)

- Edit Distance (Whole Phone)

  Phonetic feature method (Almeida & Braun (1986) original method)
Std American vs RP: Similarity/Distance Chasm

**Similarity**
- Vowel distances extremely slight overall.
- Always the most similar pair of varieties
- **BUT**
- Std Dev scores always higher than the mean-aggregate mean score inappropriate.
- Why?

**Distance**
- **Rhoticity** divide in English varieties (commented on by Swadesh)
- Two-Sample t-test, $t = -2.599$ p<0.02
- Heavy weighting of rhoticity-affects impact of subtle phonetic differences e.g. slight vowel differences.
These words also show greatest distances in comparison with Std Am and RP.

Overall aggregate score of these two word groups inappropriate.

Cold, mouth, over, right, two, eight.
Separate study: Links with Historical Varieties

Acknowledgements: April McMahon, Warren Maguire and Paul Heggarty
Differences between systems cancelled out

Original Almeida & Braun system
Weights roundness Higher.

Heeringa system
Weights rhoticity Higher.

Artificial Dialect Pairs (CV, CVC syllables)

Both systems Converge.

Feature Contrast in 25% of 'Words'

% Phonetic Distance

roundness
rhoticity
both
Interim Summary

- Convergence of Different methods:
  - Subtle **phonetic feature** differences do not make much impact when alongside heavily weighted elements (e.g. rhoticity).
  - Differences between systems can be cancelled out when features are combined.
- Data may not be **phonetically** unified enough for simple aggregation-Analogy with Borrowed vs Non-borrowed words in the lexicon.
Previous Studies

- Initial **consonant**- Historically stable
- Counting consonant ‘Matches’
- Testing **putative** language relationships

Present Work

- Initial **vowel**-suitable for varieties
- **Sums of distances**
- Known **relationships** but unknown levels of phonetic similarity when cognates are not paired

Chance Phonetic Similarity

Actual score: 65
z score -3.11
p<0.007
(Bonferroni correction)
Bonferroni correction applied in all cases.

Scottish vs Buckie
p<0.007

English variety pairs
(except Buckie)
p<0.001

Buckie vs Am/RP/German p=0.1
(n.s.)

German and English Pairs (except Buckie)
n.s.

Similar picture emerges for individual vowels and diphthongs as a unit

BUT Problems with this method… (especially in the context of varieties)
Alternative approaches (under exploration)

- Is the difference between varieties greater than a baseline of vowel variability modelled on Drift?
- Is it surprising that two varieties should share particular vowels given their frequency and occurrence typologically?
- Are between-variety vowel differences greater than known levels of acoustic variability within a single variety?
Conclusion

- Methods and ideas of Swadesh very relevant to contemporary work on Synchronic Phonetic Comparison
  - ‘Phonostatistics’-some current ways of measuring do not maximise subtlety of feature methods.
  - Single overall score of phonetic similarity may be inappropriate
  - Assessing chance needs to be approached from many angles.
References

- Oswalt