Acoustic-phonetic modelling of historical and prehistoric sound change

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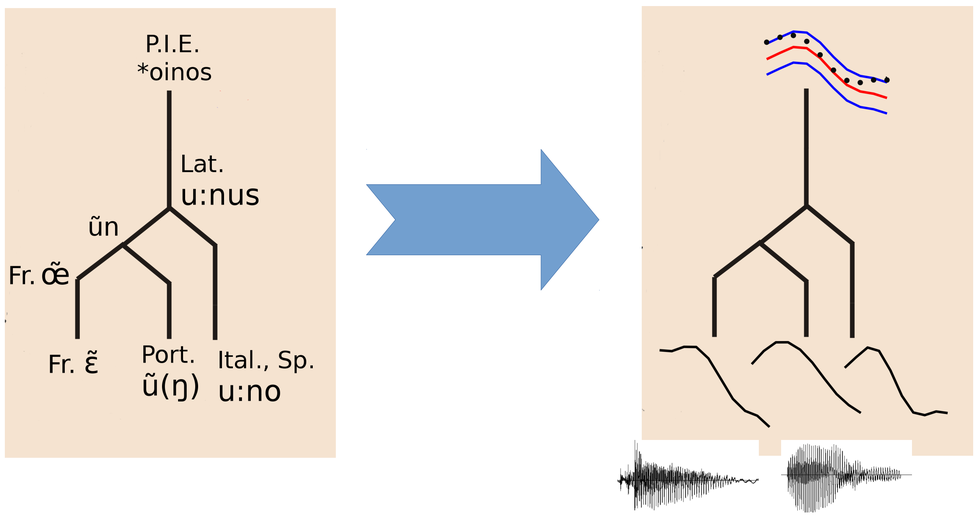
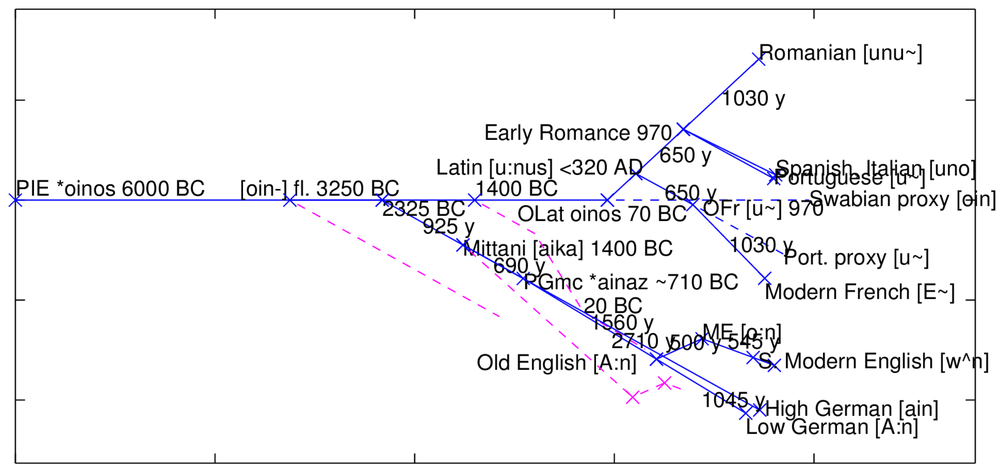
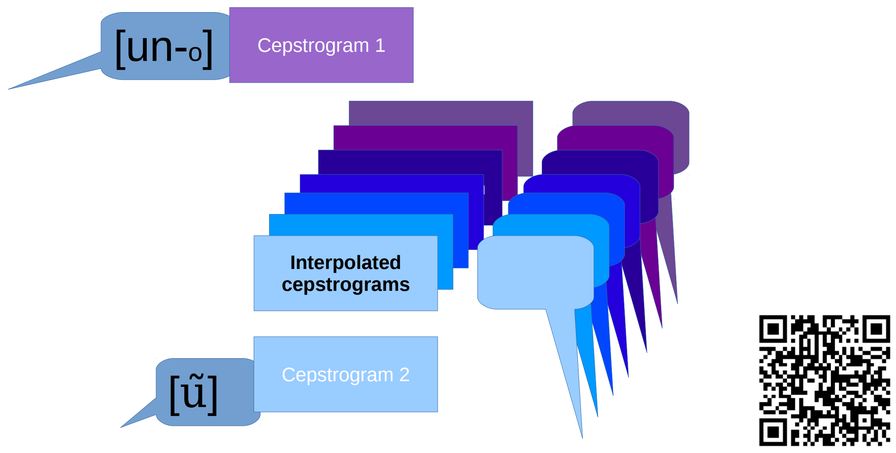
Reinventing comparative philology



From **oinos* to *one*



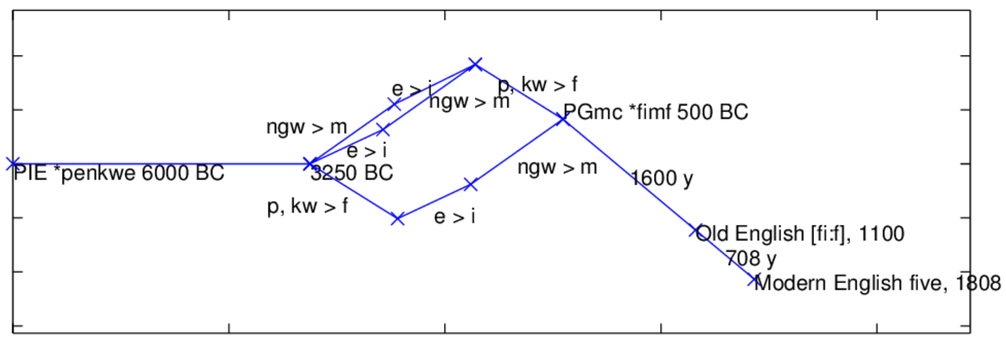
Synthesizing sound changes by "voice morphing" interpolation



Sound clips at http://tinyurl.com/sounds-ancient

From **penkwe* to *five*

We don't know whether [e] > [i] came first, or [ŋ] > [m], or [p] > [f] but it doesn't matter, because vector addition is associative



Extrapolating to past forms:

PIE *dwoH ?

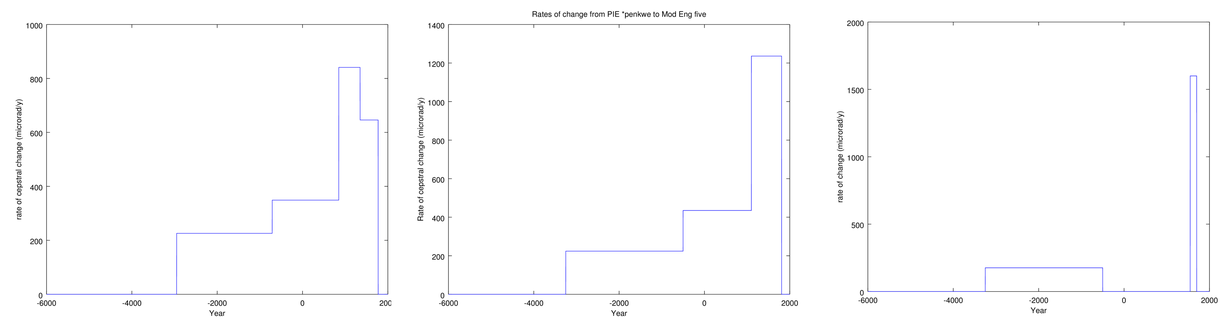
Use *conservative* modern forms as *proxies* for ancestors

Interpolated mid-points can combine features of both endpoints

Elfdalian [two]

Russ [dva]

Accelerating sound change?

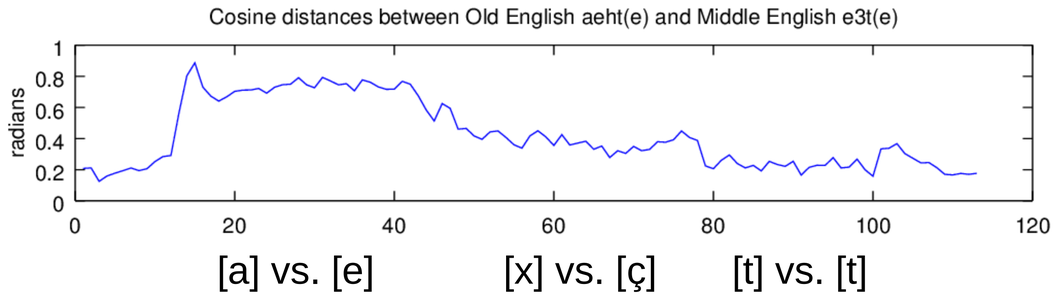


*oinos *penkwe *trejes

Cosine dissimilarity of vectors

$$D = 1 - \frac{A \cdot B}{|A||B|} = 1 - \frac{A \cdot B}{\sqrt{A_n^2}\sqrt{B_n^2}}$$

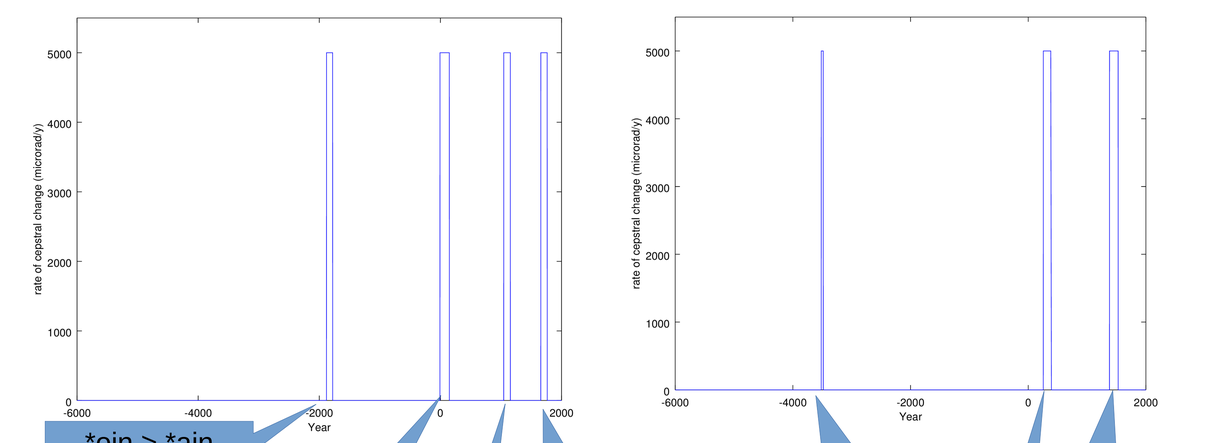
Since *D* is a cosine, you can calculate the angle by which two spectral vectors differ, where 0 = no difference, 90° (π/2 radians) = completely orthogonal. Since most acoustic spectra are more or less similar, expect values in between.



[a] vs. [e] [x] vs. [ç] [t] vs. [t]

Punctuated equilibrium

Assuming a fixed, fast rate of change (5000 μrad/y) over short periods:



@sounds_ancient

Thanks to collaborators John Aston and Davide Pigoli
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