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Putting memetic explanations to the test

The case of historical trends in English phonotactics

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Introduction

What questions might require memetic answers?

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Memetics as a theory of culture

One of the most perplexing properties of human culture and its constituents is how **complex and purposeful** they appear to be.

In the humanities this is widely acknowledged, but seems at the same time often (a) to be taken for granted and (b) attributed to the ingenuity of the human species, which figures both as an axiom and as a source of ‘miracles’.

Attempts to explain human culture in a way that is consistent with what we know about the rest of the physical universe are fairly recent, and, I would argue, not very advanced. So, there is a gap, which memetics might possibly fill.

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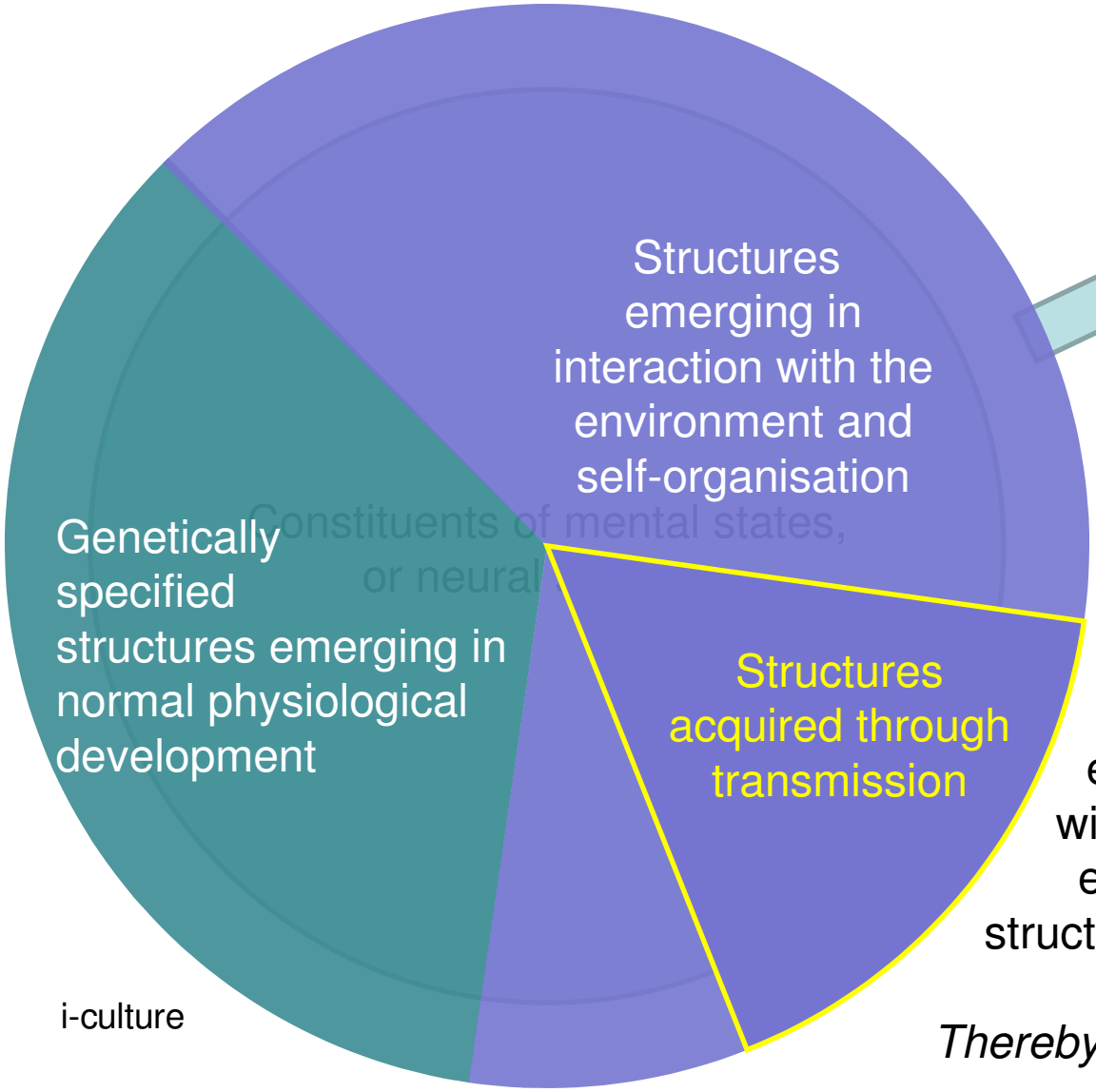
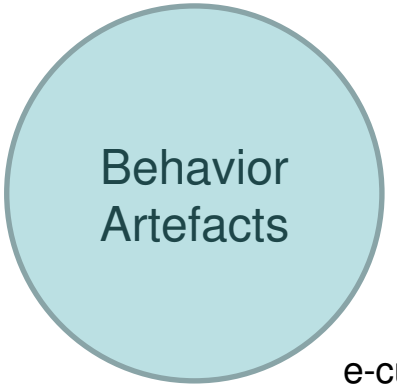
Memetics as a theory of culture





e-culture

Some structures emerge in interaction with the environmental effects of pre-existing structures in other brains.

Thereby they copy the latter.

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***Explanandum* (what is to be explained):**

Given that some constituents of mental structure owe their existence to transmission, why are they as they are?

Why does a specific subset of transmissable constituents of mental structure exist at a specific point in time and space?

Memetic *explanans*:

The transmission of constituents of mental structure follows the principles of Darwinian Evolution.

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DAWKINSIAN ORTHODOXY:

Some constituents of mental structure are '**memes**', i.e.

They are **replicators** in whose transmission errors may occur so that **variants get created**. Since variants compete for limited resources, they are subject to **automatic selection**.

Under specific environmental conditions, meme variants will be selected for which are (a) **more fecund**, (b) **more stable**, and (c) copy **more faithfully** than concurrent alternative variants.

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In principle the Darwinian algorithm relates variable replicators on the one hand to variable environmental conditions on the other. In prototypical adaptationist accounts, however, environmental conditions are treated as a constant background. Then the Darwinian Algorithm mindlessly exploits differences between the replicator variants which a population comes up with.

PREMISE 1: Snow and ice are white. (Environmental 'constant')
PREMISE 2: Predators will do the better, the more difficult it is for their prey to see them coming. (Reason for selective relevance)
PREMISE 3: Darwinian Algorithm.

CONCLUSION: Genes that make polar bears white get selected.

To the extent that evolution exploits properties of the replicator variants that are produced, replicators can be thought of as 'active'.

Note that many factors that may be – in another sense – actively involved in the replication process, do not figure in the account.

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1. Darwinian algorithm

2. Replicator variants

3. Aspect of their environment

4. Reason why the replicator variants are selective sensitive to that particular environmental factor

Note that in a particular adaptationist explanation all environmental factors that are NOT involved in the explanation are assumed to be neutral with regard to the competing variants. Will be crucial below.

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First Summary and Outlook

The most impressive achievement of Darwinian Evolutionary Theory is that it can explain purposeful complexity in a way that is clearly consistent with what we know about the rest of the physical universe.

I shall attempt to show how it there are aspects of human culture for which it can do exactly the same.

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Main Part

English phonotactics and utterance rhythm

A case study in memetic explanation

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The phenomenon: English utterance rhythm

- English utterance rhythm is stress timing, i.e. the intervals between stress peaks in neighbouring stretches of an English utterance tend to be constant.
- At the same time, English has fixed word stress, that is to say, English words tend to have their stress on the same syllable, no matter in which context they are uttered.

Cases of iambic reversal, such as *I'm thir'teen.* as opposed to *I'm 'thirteen years old*. are notable exceptions.

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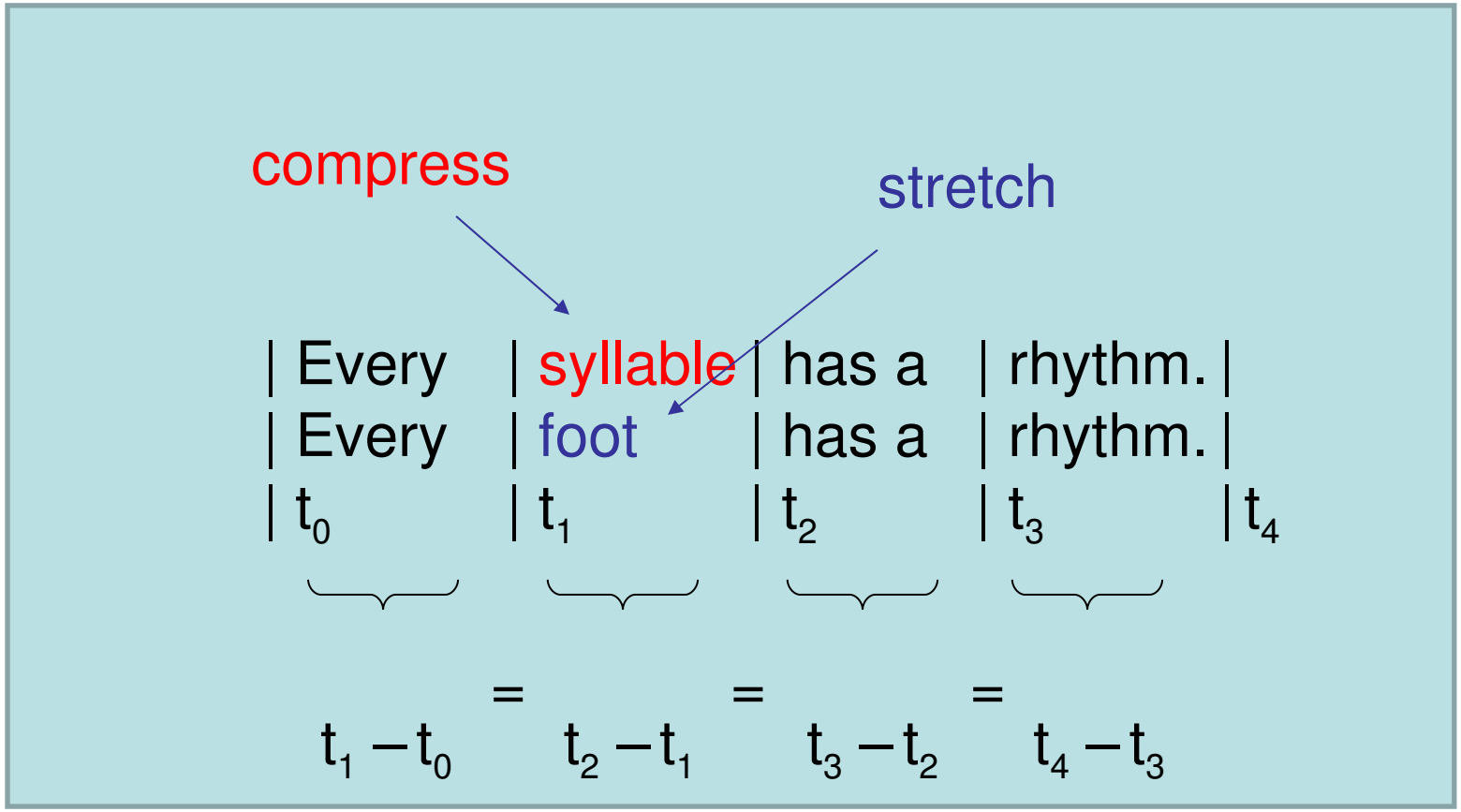
Rhythm and vowel duration



The duration of vowels is inherently more flexible than that of consonants.

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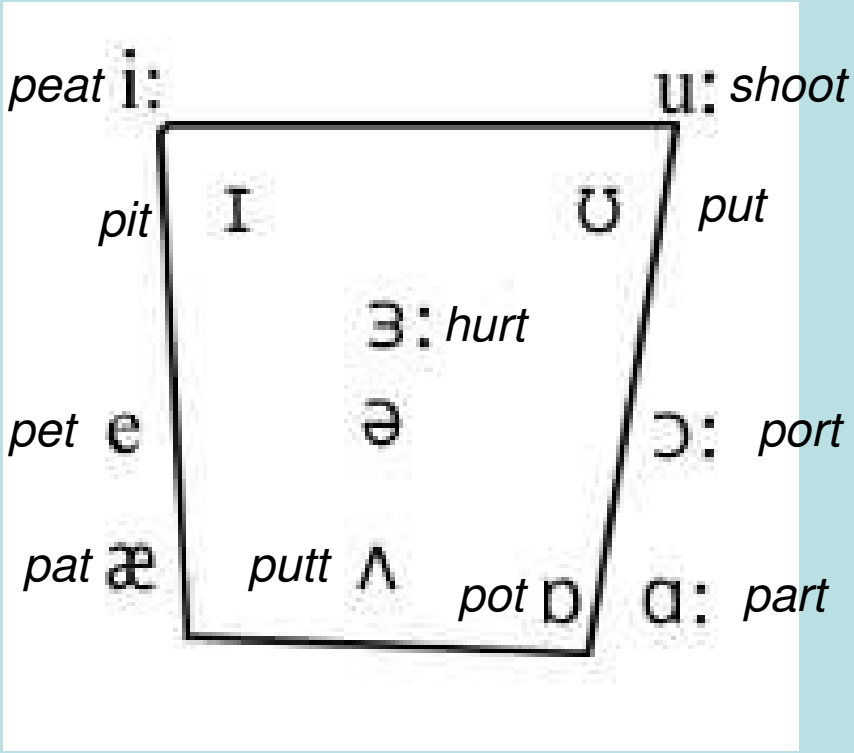
The English vowel system appears to be ‘just made’ for working well with English rhythm



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The present, and strikingly harmonic situation is the outcome of a set of many, superficially unrelated changes, which seem nevertheless to work towards the achievement of a common goal, and which might represent a case of ‘Sapirian Drift’.

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Stage 1: Quantity Adjustments:

In a first stage English words seem to have responded to rhythmic necessities by adjusting the quantities of their stressed vowels so that they would be least distorted in as many cases as possible.

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1. **Homorganic Lengthening**

V →+*long* /_{nd, mb, ng, ld, rd, rs, rð} [= Homorganic Clusters]

bind, *child*, *hound*

2. **Open Syllable Lengthening**

[non-high vowels in penultimate open syllables, ie. before single consonants or clusters that may start a syllable like *st*, *br*, etc. - but not before clusters such as *nt*, *rs*, etc.]

2. **Trisyllabic Shortening**

$$\begin{bmatrix} V \\ -high \end{bmatrix} \rightarrow +long / \_\$ s$$

make, eat, hope

[Vowels in antepenultimate syllables]

errand (< æ[:]rende), *southern* (< su[:]therne)

3. **Shortening before consonant clusters**

V →long / _ CC

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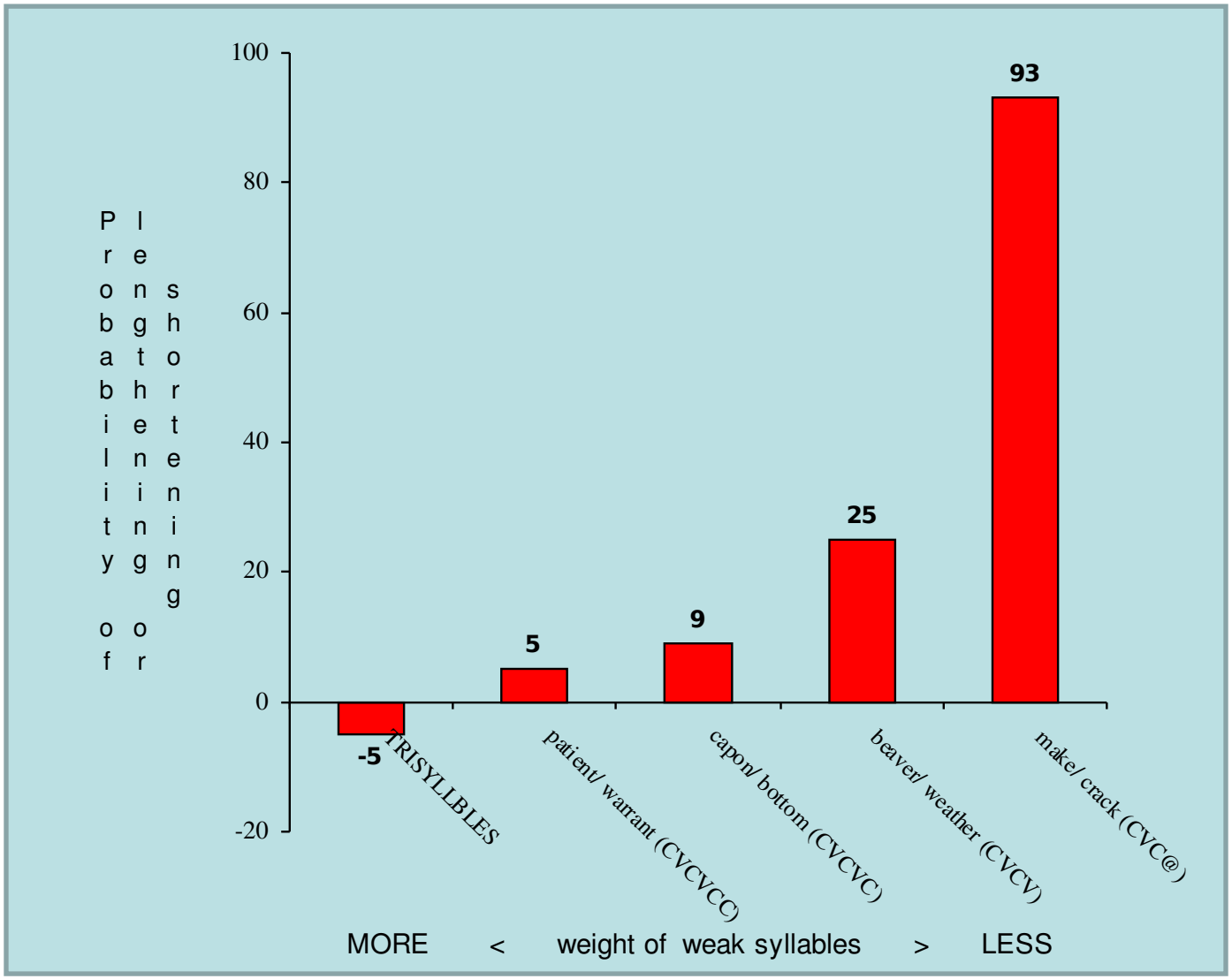

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I shall make the case that quantity adjustments can be construed as evolutionary developments, in which **memes for morph shapes** adapted to **memes coding for English utterance rhythm**.

First, I shall explain why the case for such memes can be made in the first place. The argument is that they can be conceived of in terms of neural constituents that have

(e)Identifiable internal structures, and

(f)Identifiable places in the global structure encoding linguistic competence.

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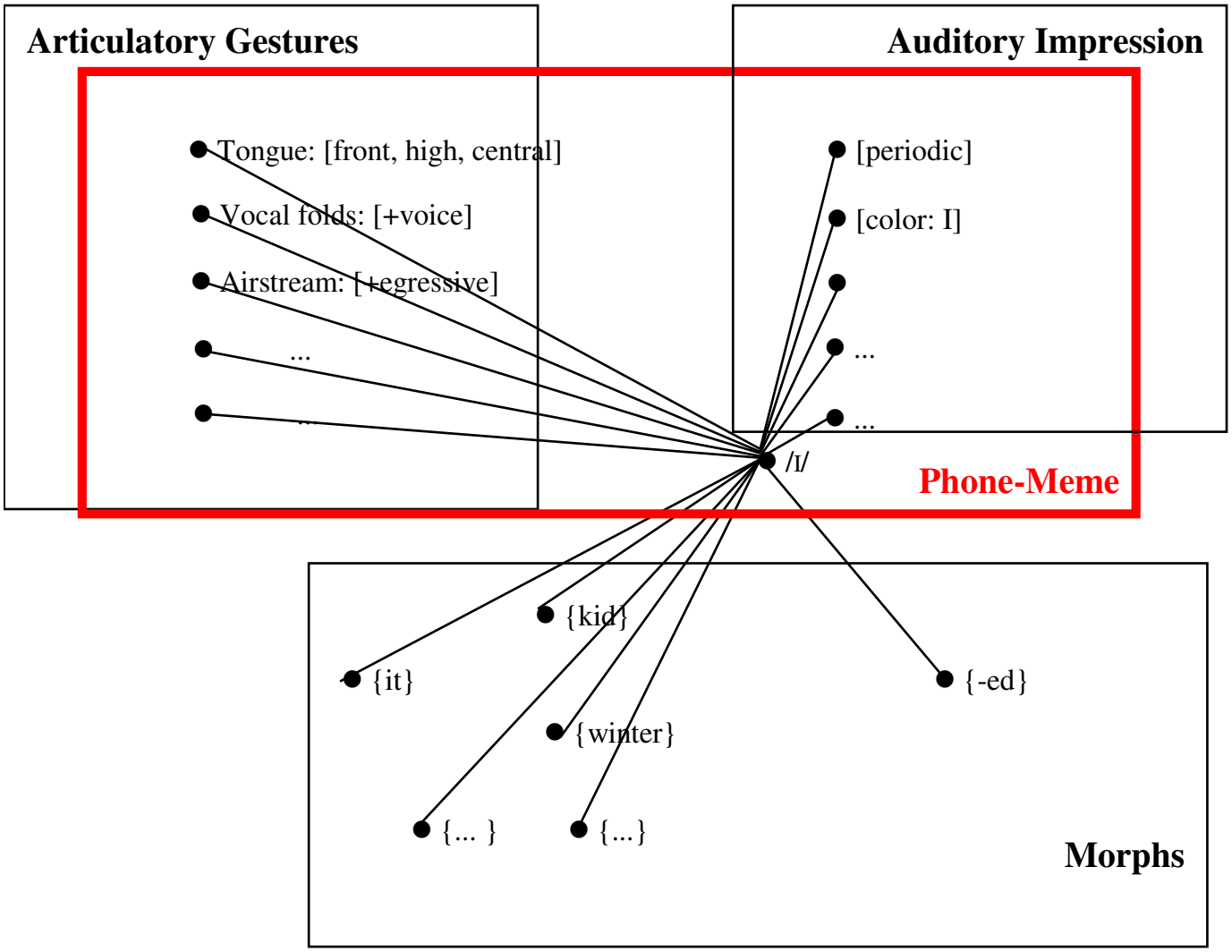
Possible structure of a ‘phone meme’



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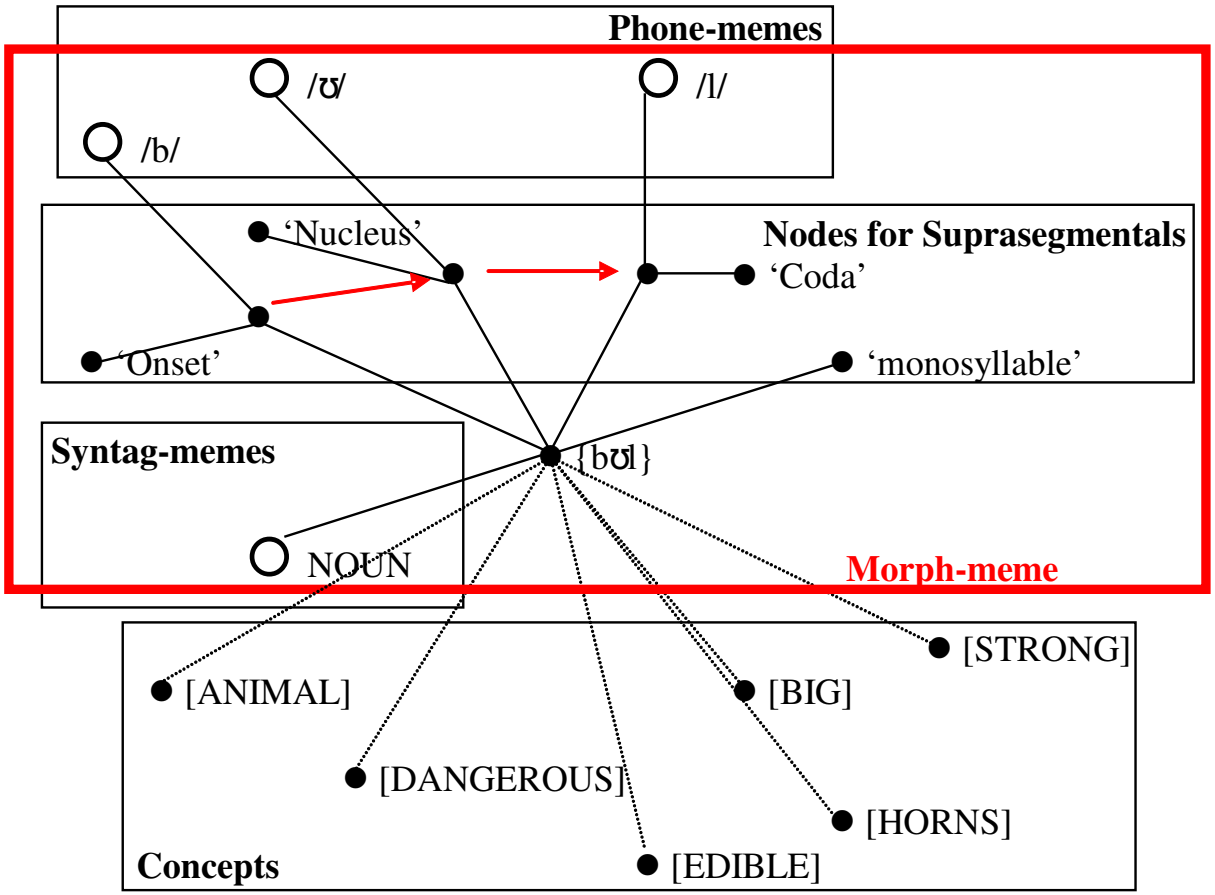
Possible structure of a 'morph meme'

The morph-meme {bʊl}



Legend: ○ stands for memes which are themselves complex but whose internal structure is not represented in the graph;

● stands for functionally simple nodes, or nodes whose internal structure is of no concern to the present discussion.

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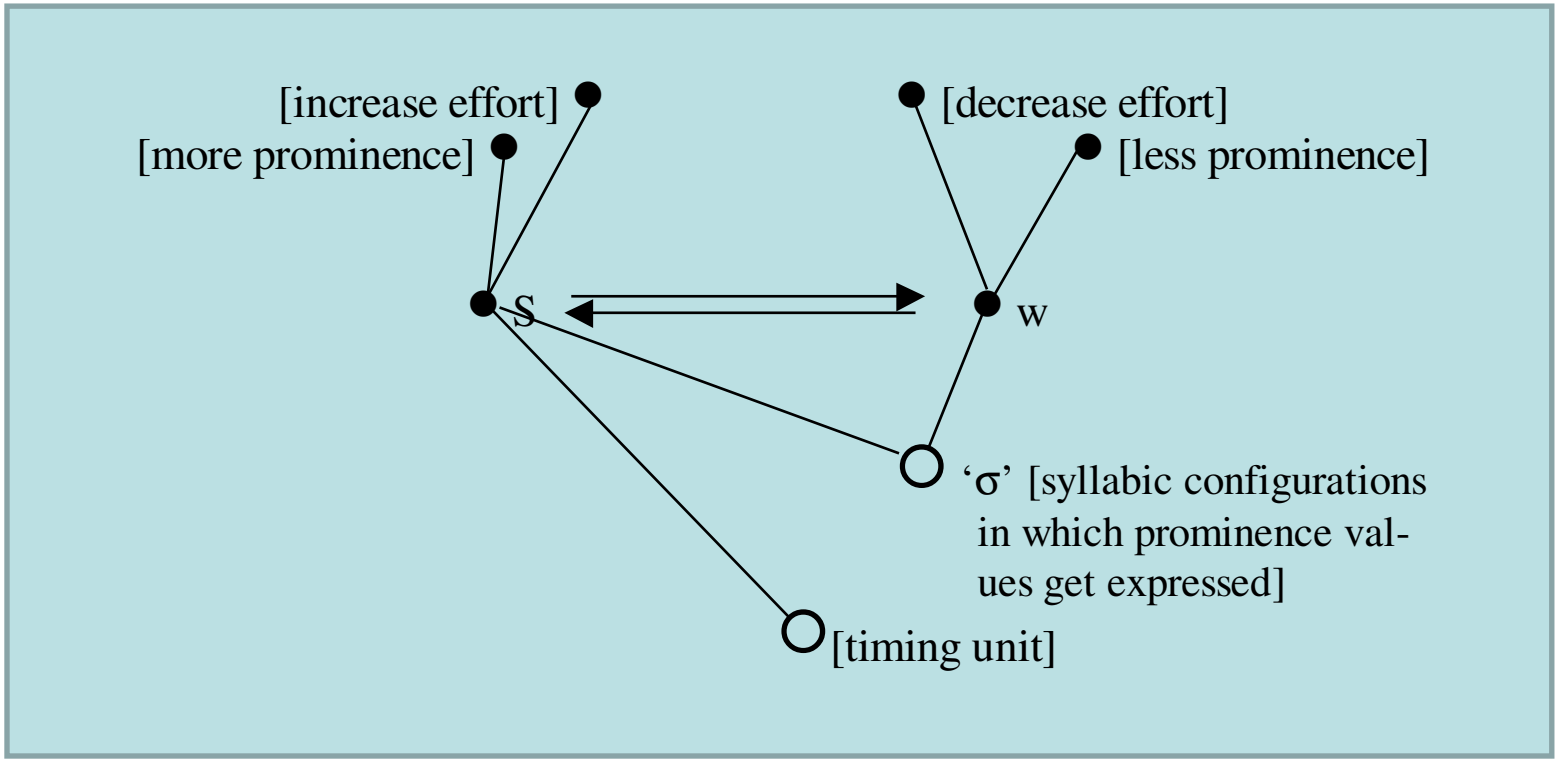
Possible structure of a ‘rhythm meme’



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Types of factors in meme selection

(a) The human mind-body
e.g. how human articulation and perception work.

(b) Human society
e.g. how well established its type is in a population.

(c) Other memes
because no meme expresses on its own.

→Obviously, we are dealing with a case of (c).

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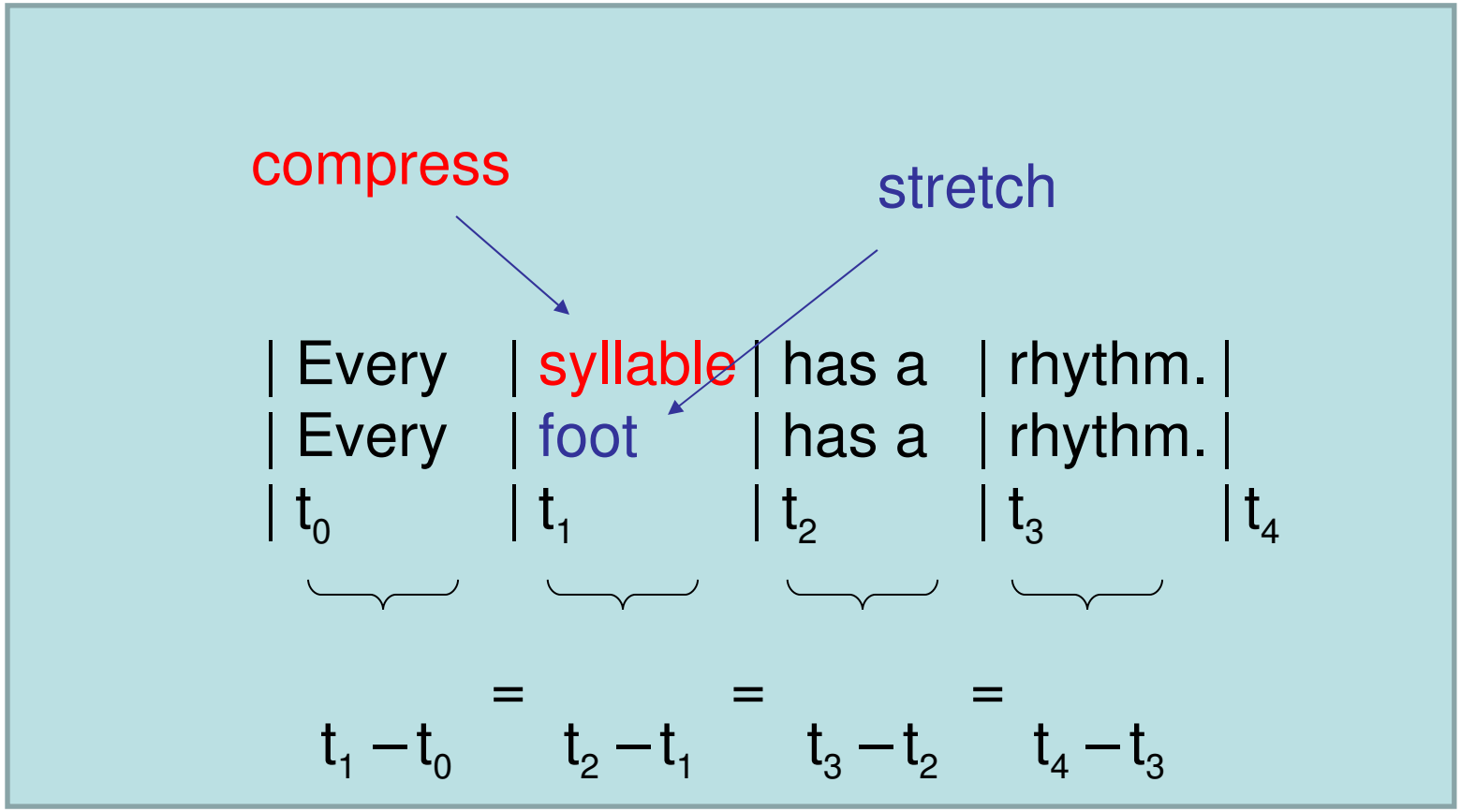
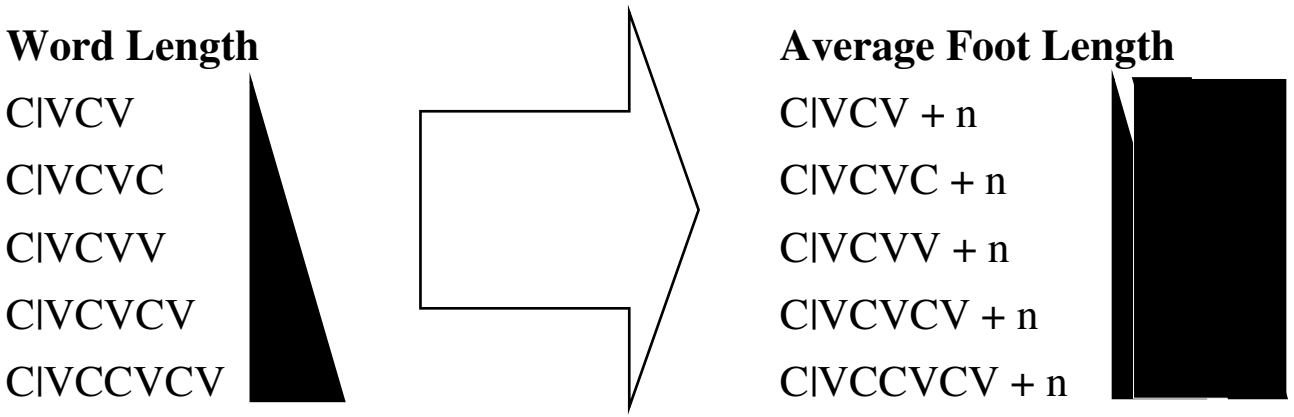
Rhythm and vowel duration



The duration of vowels is inherently more flexible than that of consonants.

If you are a morph-meme →

predict the most likely length of the foot you will be expressed in and adjust the quantity of your vowel accordingly



If you are *[æ:]rende* 'errand' → shorten your vowel
If you are *make* → lengthen your vowel

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The limits of quantity adjustment

Vowels can be certain about the segments they share a morph with, but they have to make guesses about the morphs whose expressions will follow theirs in actual utterances. Therefore, the extent to which they can meaningfully adapt their quantities is limited to what their morph-mates allow them to predict about the rhythmic configurations in which they will show up.

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Stage 2: Shifting

At some stage, quantity adjustment seems to have reached its limits, particularly when the prototypical English word form became monosyllabic. In a language with many monosyllables, the rhythmic role which words assume in utterances is highly context dependent.

This was semiotically (hence evolutionarily) suboptimal for morphs that were distinguished solely by the quantity of their vowels as

ME *bed* [bɛd] 'bed' vs. ME *bede* [bɛ:d]'bead'

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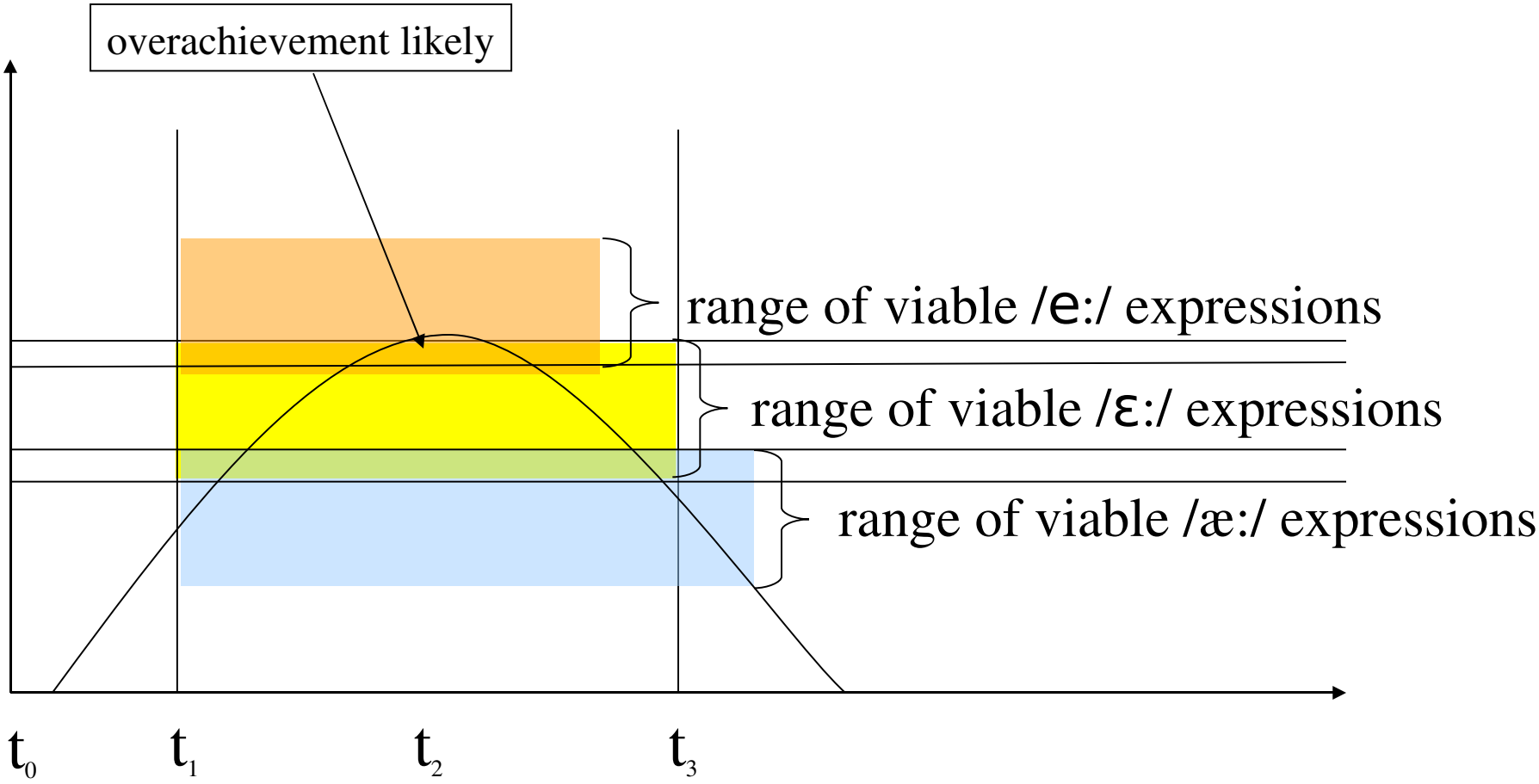

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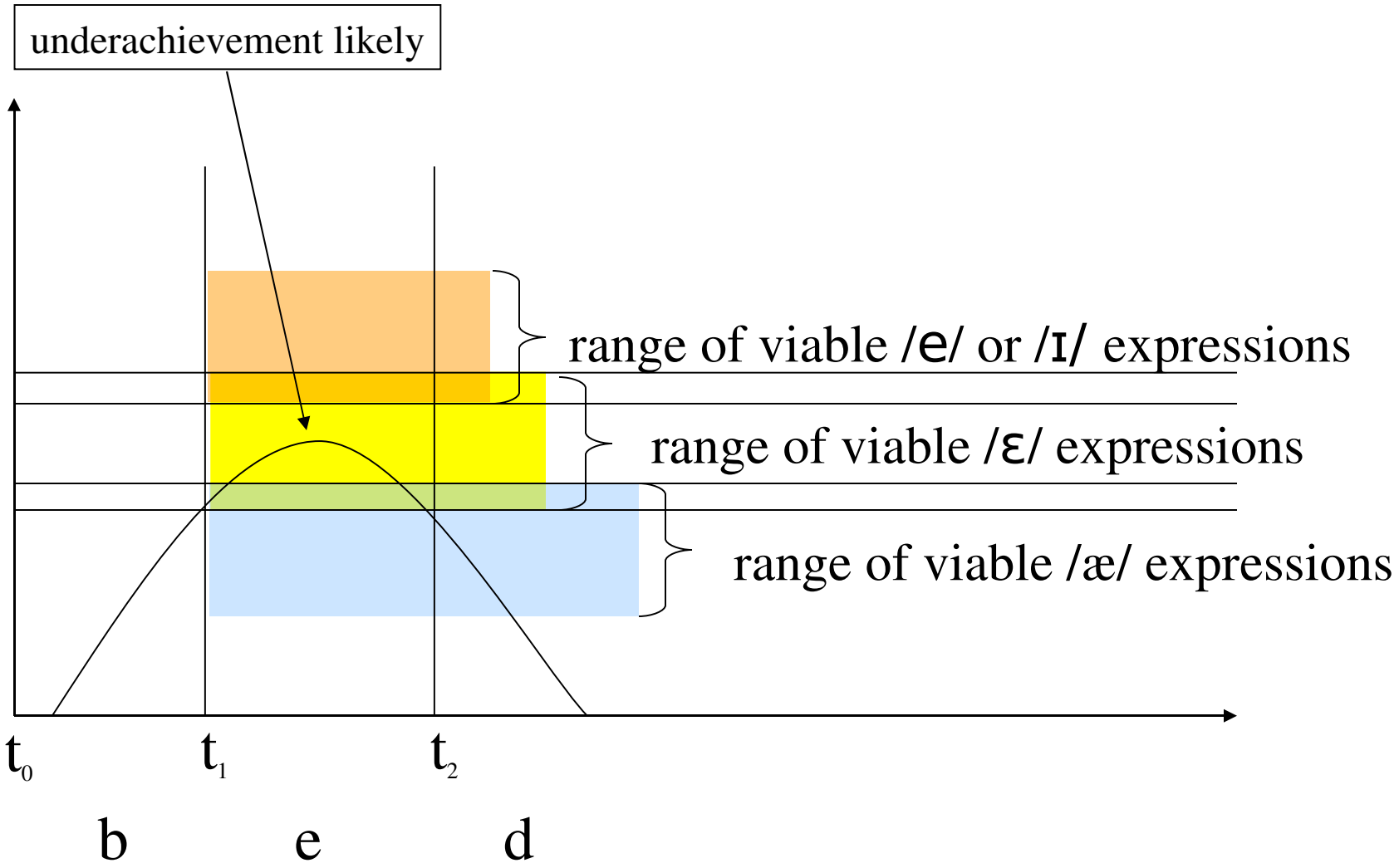

Vowel variants, which differentiated themselves from similar vowels in terms of quality rather than quantity would transmit more reliably than variants relying solely on quantity distinctions.

And by the same rationale this applies to morphs involving those vowels.

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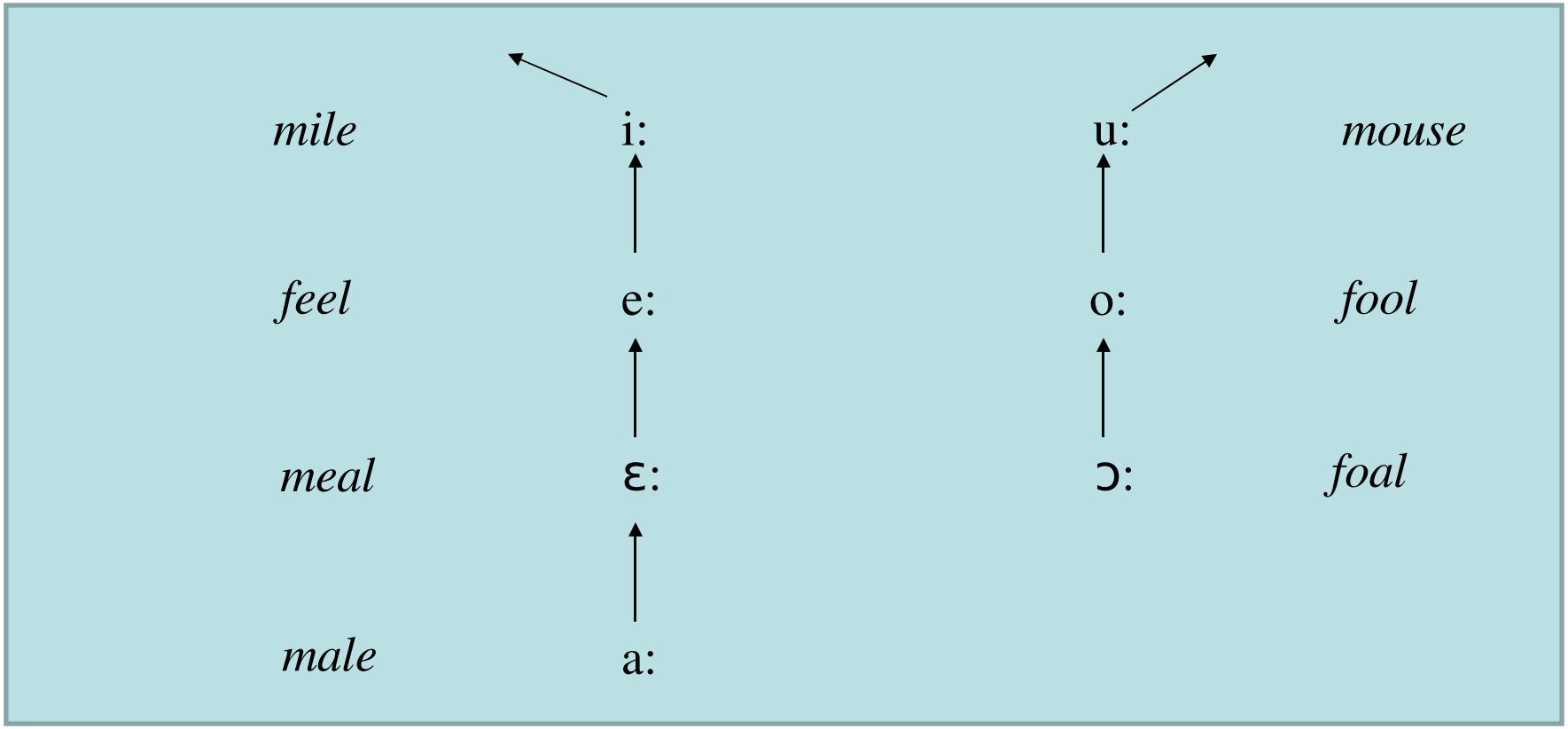
The Great Vowel Shift



Additionally, all long vowels underwent dipthongisation.

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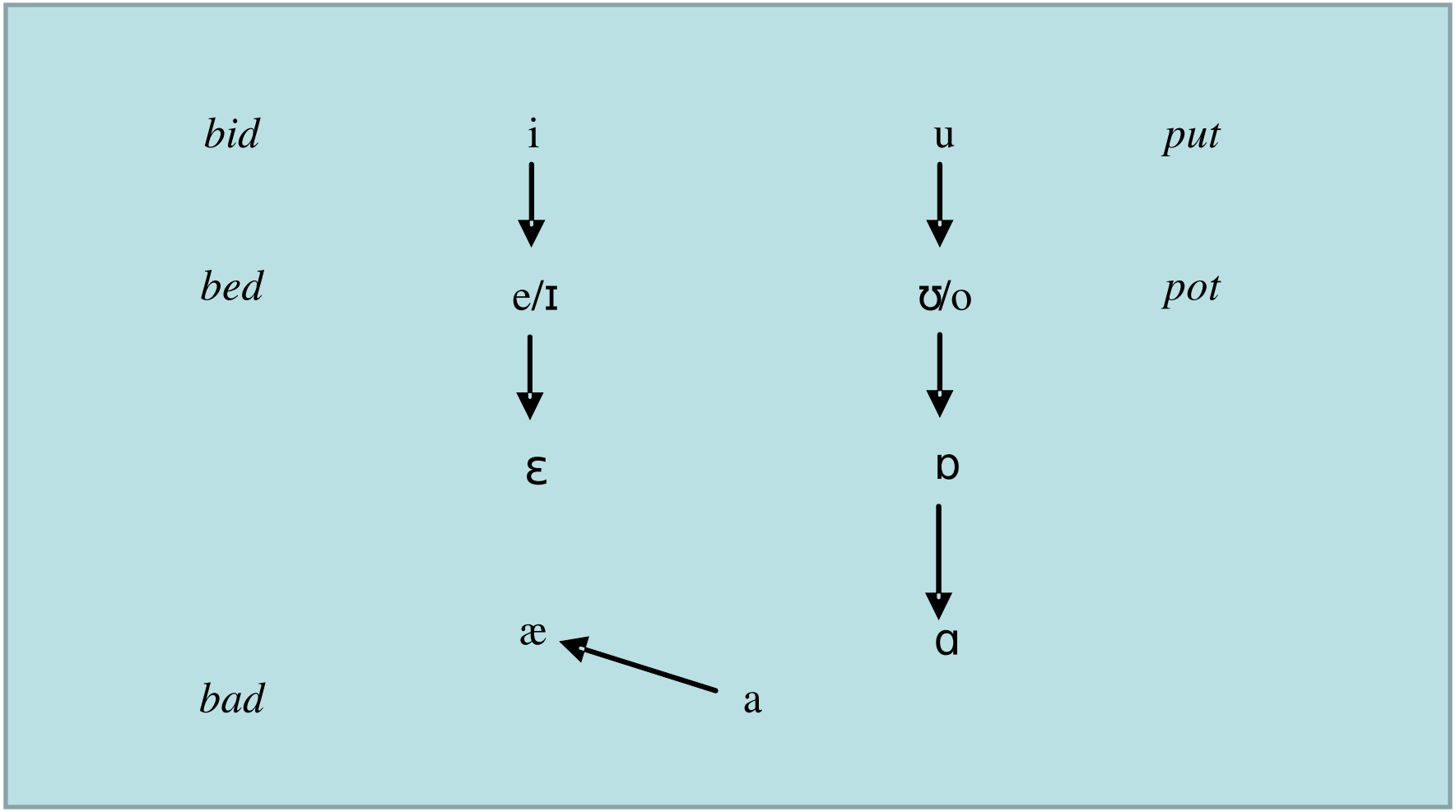
The EmodE Short Vowel Shift



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Summary

Thus both Middle English changes of vowel quantity and the advent of vowel shifting can be regarded as adaptive responses by memes coding for vowel phonemes and memes coding for the morphotactic shapes of words, to memes coding for the regularities of English utterance rhythm.

An set of independent but apparently goal-directed, conspiring changes can thereby be given a non-teleological, non-miraculous explanation, that strikes me as perfectly consistent, simple and elegant.

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A few words about consonants

The story I have told so far, already implies that the status of consonants and particularly consonant clusters in a language with a rhythmic system like that of English should be more precarious than the status of vowels, because the articulatory duration of consonants is less easily adjustable than that of vowels, if at all.

The steady reduction of the consonant inventory that English has witnessed during the last millennium, as well as the frequent reductions of consonant clusters is beautfully consistent with the account given so far.

A few examples will follow.

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Loss of geminates (EME)

CC → C — *bed*, *apple*

/X/-loss (LME)

X → f /_# (occasional) — *rough*, *tough*
X → Ø / elsewhere — *plough*, *through*, *knight*, *caught*

/l/-loss (LME)

V(V)l → VV / _ C
Short vowels get lengthened when [l] is lost; before dentals, the [l] is retained.

palm, *calm*, *folk*
(but: *gold*, *halt*)

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/r/-loss (EModE)

V(V)r → VV(r) / __ {C|#} for /r/-like vowels (ɜ, ɔ, ɑ) — *fur*, *for*, *far*

V(V)r → V↔(r) / __ {C|#} for non-/r/-like vowels (ɪ,ʊ,e) — *here*, *there*, *your*

Consonant Cluster Simplification (EModE)

(only in fast or casual speech for dentals)

$$\begin{bmatrix} +\text{stop} \\ +\text{voice} \end{bmatrix} \rightarrow 0 \ / \ \text{N} \_\_ \ \#$$

sing, *climb*, *find*

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The story of /h/

1. Ambisyllabically: *mear[h]as* ‘horses’
   ra[h]a ‘deer’
   pleo[h]lic ‘dangerous’

2. In codas of unstressed syllables:
   þeah ‘though’

3. In onsets before nasals:
   hnutu ‘nut’

4. Prevocalically in unstressed syllables:
   hit ‘it’

5. In codas of stressed syllables:
   [plu:X] ‘plough’

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The story of /h/ (continued)

6. In stressed onsets before /w/:
   hwat 'what'

7. In stressed onsets before /j/:
   hiw 'hue, colour'

8. In stressed onsets prevocalically:
   In *H*ertford, *H*ereford and *H*ampshire *h*urricanes *h*ardly *h*appen

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Conclusion

If one is willing to accept that the surprising fit between English utterance rhythm and the phonotactic shapes of English word form is non-accidental, and if one accepts that it is causally related to the sound changes that I have discussed, then I cannot think of any account that would be less far fetched, less teleological, more explicit, more consistent with what we know about the rest of the universe, or more economical then the memetic explanation which I have sketched.

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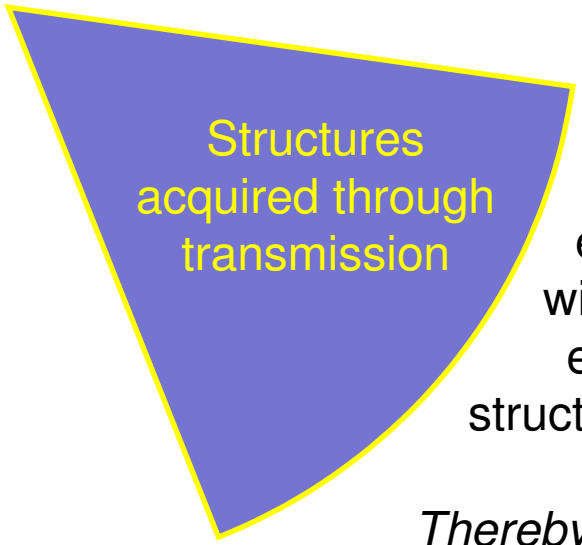
Thank you for your attention



Some structures emerge in interaction with the environmental effects of pre-existing structures in other brains.

Thereby they copy the latter.

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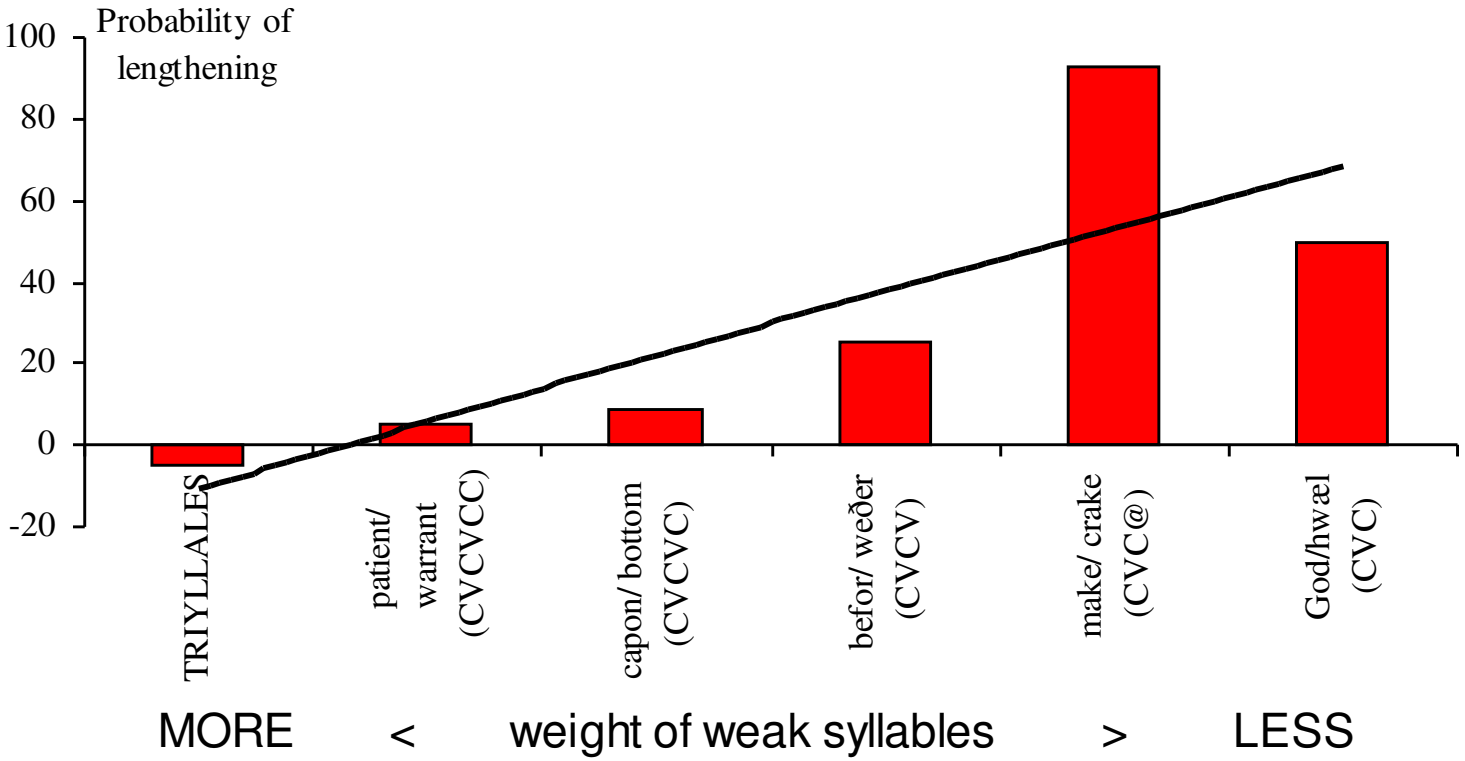
- Under strategy (c), the situation can be improved for both morphs and phonemes, if morphs adopt phonemes of the quantity that is least likely to be distorted for rhythmical reasons.


Probability of lengthening
100
80
60
40
20
0
-20
TRIYLLALES
patient/ warrant (CVCVCC)
capon/ bottom (CVCVC)
befor/ weðer (CVCV)
make/ crake (CVC@)
God/hwæl (CVC)
MORE < weight of weak syllables > LESS

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For adaptationist accounts to be noticable and interesting, there must obtain a very specific relationship between the period P_e for which a selectively relevant environmental factor obtains, and the speed S_v with which a population of replicators can produce variation.

If P_e is very short, or S_v very small, then little adaptation will occur. If P_e is very long, or S_v very high, then a very high degree of adaptedness will be the default condition, and thereby appear uninteresting.

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Consonants:

- Degemination
- /h/-loss
- Nasal + stop clusters
- Vocalisations: /l/, /r/
- Kn → n
- Nts → ns

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Vowels

- OE – Breakings
- Palatal Diphtiongisation
- Quantity Adjustments: Shortenings + Lengthenings
- Vowel Shift
- Vocalisations of l and r

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- **Starting point**
- **End point**
- **rich system of vowels and dipthongs, often contrasting with one another on more than one dimension; particularly: no pure length contrast)**
- **Reduced consonant inventory, reduced numberof lexically well formed clusters**

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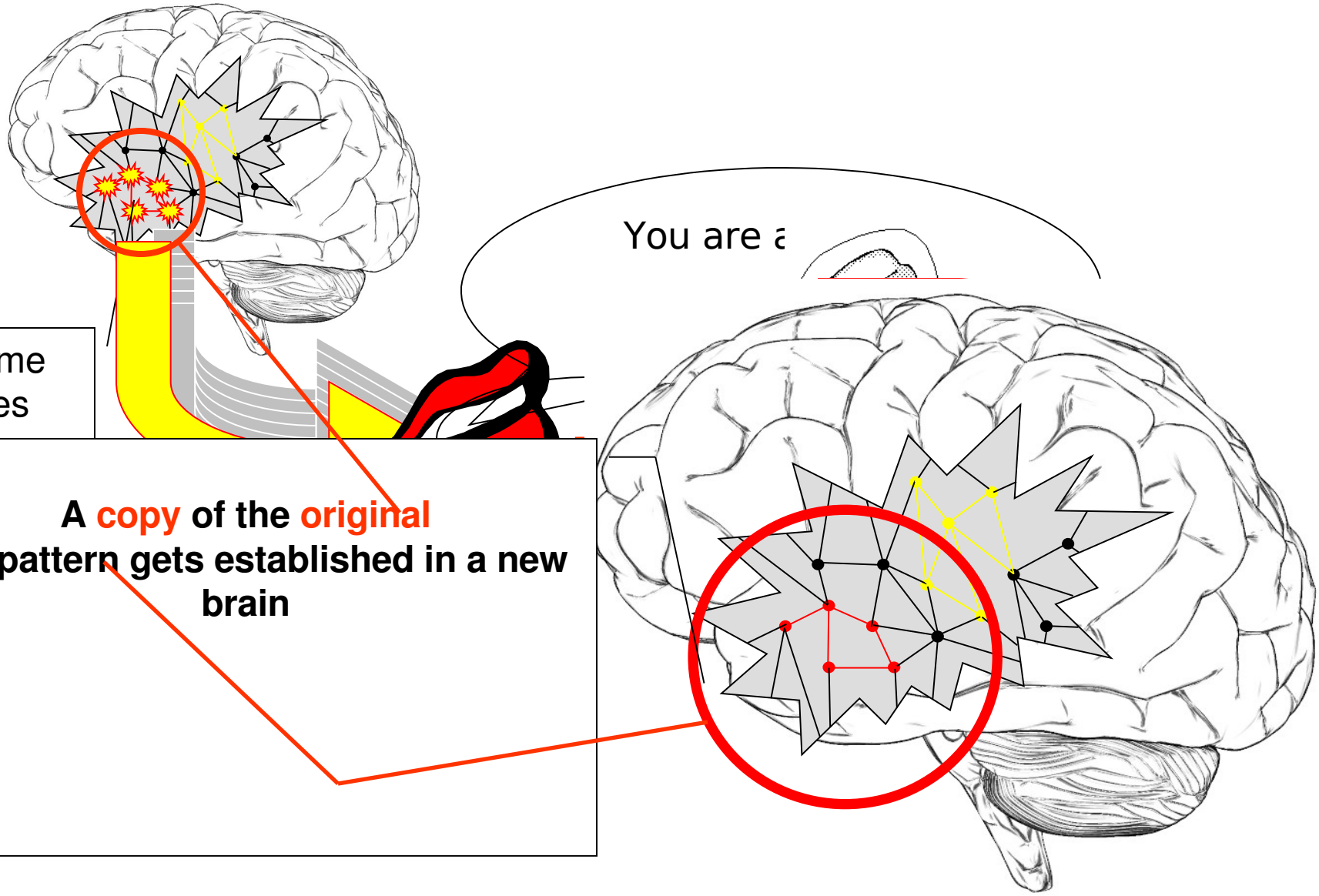

Meme fires

A copy of the original link pattern gets established in a new brain

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- **Works well with English rhythm.**
- **Stress timing, isochrony**

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1. **Homorganic Lengthening**

V +*long* /_{nd, mb, ng, ld, rd, rs, rð} [= Homorganic Clusters]

bind, *child*, *hound*

2. **Open Syllable Lengthening**

[non-high vowels in penultimate open syllables, ie. before single consonants or clusters that may start a syllable like *st*, *br*, etc. - but not before clusters such as *nt*, *rs*, etc.]

$$V \begin{bmatrix} V \\ -high \end{bmatrix} \rightarrow +long / \_ C\#\_ \S\ s$$

make, eat, hope

2. **Trisyllabic Shortening**

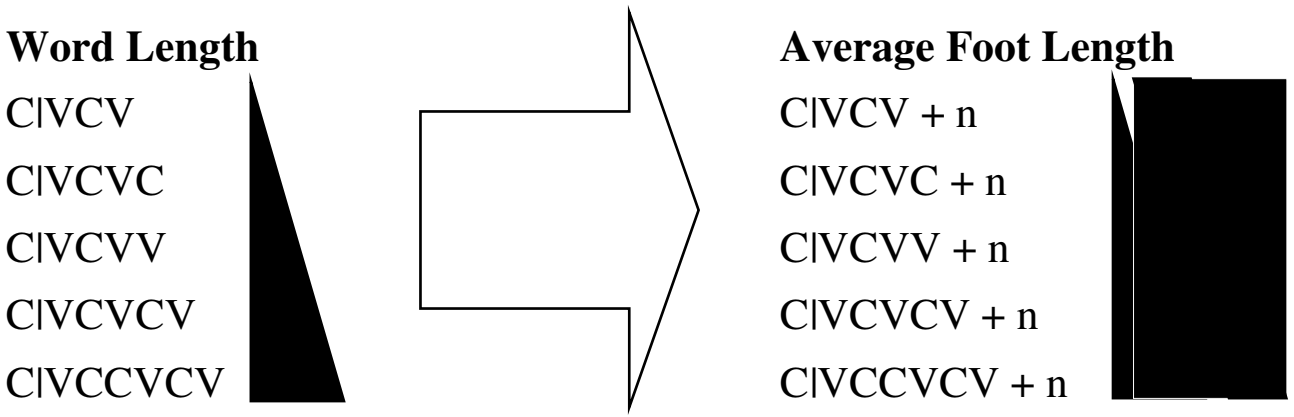
[Vowels in antepenultimate syllables]

errand (< æ[:]rende), *southern* (< su[:]therne)

3. **Shortening before consonant clusters**

V -long / _ CC

If you are a vowel phoneme →
predict the length of the foot you will be expressed in
and assume the most fitting quantity



If you are the /æ:/ in *ærende* 'errand' shorten
If you are the /a/ in *make* lengthen

- **In a word where it is followed by a lot of segmental material, a short vowel will replicate more faithfully than a short one.**
- **In a word where it is followed by little segmental material, a long vowel will replicate more faithfully than a short one.**