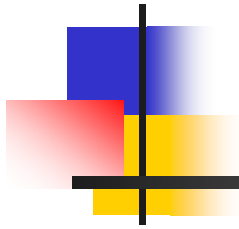# Language Evolution and the Complexity Criterion
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Introduction

- Evolution of language is rejected by most.
- But this paper argues that language has followed a developmental course.
- Steps
  - Existing situation
    - Structarilists, nonaligned linguists, innatists
  - How linguistic development can be related to biology and evolution
  - Evolution of I-E languages
  - Address what seems like counter-evidence

Cultural Relativism

- Cultural relativism infers from this record that significant dimensions of human experience, including morality and ethics, are inherently local and variable rather than universal

- Most relativists interpret and evaluate such diverse beliefs and practices in relation to local cultural frame-works rather than universal principles.

- Cultural Psychology vs. Evolutionary Psychology

Genetically Coded Grammar

- Innate grammatical model viz. UG (Chomsky) brings in evolution.
- The learning of grammar is considered to be indeed one of the highly specific skills, but 'these skills may well have arisen as a concomitant of structural properties of the brain that developed for other reasons. ... The brain that evolved might well have all sorts of special properties that are not individually selected' – Chomsky
- 'For universal grammar to have evolved by Darwinian natural selection it is not enough that it be useful in some general sense. ... There must have been a series of steps leading from no language at all to language as we now find it, each step small enough to have been produced by a random mutation or recombination, and each intermediate grammar useful to its possessor.' –Pinker
- Cultural relativism even in innatists' view
  - Last mutation coincides with occurrence of *Homo sapiens* and then evolution comes to a standstill

Language Complexity

- All natural languages are equally complex

- What do we mean by complexity?

- Is there any recognized way to measure complexity in languages?

Evolution in Linguistics

- Evolution in biology
- Selective Advantage if one feature is replaced by another regularly
- What is selective advantage in linguistics?
- 'other factors remaining constant, culture evolves as the amount of energy harnessed … is increased, or as the efficiency of the instrumental means of putting the energy to work is increased' –Leslie White defining Cultural Evolution
- 'Animals adopt a strategy that allows them to get the most food with as little energy as possible' and 'people do the same in selecting the best strategy for making money'
- Language evolution

Measuring Linguistic Advantage

- Some features acquired before another
- Early acquisition of language an advantage
    - Indexical=>symbolic referential
    - Early birth wrt general mammalian features
- But efficiency can be achieved when cost reduces BUT quality improves or remains constant

Linguistic advantage contd..

- Elimination of 3 labiovelar consonants of I-E
- Development of palatal consonants
- Functional capabilities of 'sh' > 'kw'
  - 'kw' used essentially before unrounded vowels (say 'i' and 'e')
  - 'sh' can be used before or after every vowel and combines with most consonants
- 'ei dormienti apparuit Fortuna' vs. 'Fortune appeared to him while he was sleeping'
  - while he was sleeping
  - while he slept
  - while he had to sleep
  - while he should have been sleeping
  - while he wanted to sleep
  - while he had been made to sleep
  - while he could not sleep
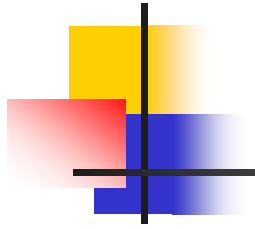- Material complexity vs. degree of functionality

Is Language Evolution a Biological Process?

- Not suggesting that change in language is directly linked to genetic mutation
- Neither that every change pairs on an one-to-one basis at the DNA level
- The language specialization of the left hemisphere
- Science has no answers!!

An Empirical Study of Language Evolution

Developments in the Phonology of Indo-European Languages

```
p?    t?    k?    kw?              p     t     k
ph    th    kh    kwh              b     d     g
bh    dh    gh    gwh              f     s     sh
                  s                v     z     zh
```
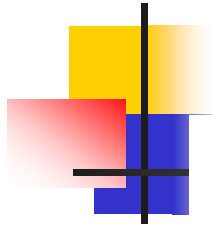
Indo-European   French

• Protolanguage can form 144 different CVC roots. Due to constraints the possible roots was only 68. Functionality of 47%

• Modern consonants can appear anywhere and combine with any other in a CVC root, efficiency of 100%.

Phonology of I-E contd..

```
p?  t?  k?  kw ?                    + glottalized
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
ph  th  kh  kwh        - voiced
------------------------            + aspirate
bh  dh  gh  gwh       + voiced      - continuant
s                                   + continuant
```

Total: 12 partially functional obstruents + 1 4 distinctive
features + 4 sets of features for the points of articulation Total
number of theoretically possible obstruents : 64 Actual number of
obstruents: 13; Efficiency rating: 20,31%

I-E obstruents

```
p   t   k - voiced
----------------------            - continuant
b   d   g + voiced
f   s   sh - voiced
----------------------            + continuant
v   z   zh + voiced
```

Total: 12 fully functional obstruents 2 distinctive features + 3
sets of features for the points of articulation Total number of
theoretically possible obstruents: 12 Actual number of obstruents:
12; Efficiency rating: 100%

French obstruents
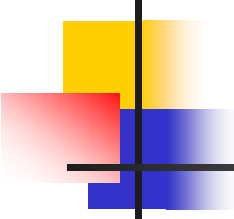
Evolution of I-E vowel system

- Laryngeals
  - H1 –no effect e.g. septem, henk
  - H2 –'a' color e.g. xege, nex
  - H3 – 'o' color e.g. dey
- Loss of laryngeals and development of 10 vowel system
- With the help of laryngeals protolanguage could produce the equivalent of six vowels
  - 'H1e' (= 'e'), 'H2e', (= 'a'), 'H3e' (= 'o'), 'eH1' (= 'e:'), 'eH2' (= 'a:'), and 'eH3' (= 'o:')
- acquisition of the equivalents of H2 and H3 by native Arab children still causes problems past the age of 10

Morphological Developments: Elimination of Dual and Regression of Gender

- Gender for inanimate referents serve no purpose
- Neither does giving a special grammatical status to the number two

Vowel Alternation => Suffixation => Free Particles

- Vowel alternation is restrictive.
- If 'write', wrote, 'written' were the rule there would not have been verbs like 'store'.
- Suffixation risks becoming a wasteful process in inflectional languages.
- Inflections to prepositions and development of articles, personal pronouns, and auxiliaries of time, voice, and mood.
- Greater functional potential and lesser material complexity.

RISE OF TEMPORAL DISTINCTIONS

- The I-E verbal paradigm:
  - only the active imperfective indicative had a past tense
  - The 'subject' was the author either of
    - an on-going action (imperfective)
    - a completed one (perfective)
    - the patient of the state resulting from the corresponding action (stative).
  - Moving in time linguistically impossible
- With the development of past tense and future tense, languages shifted from photography to motion pictures. The development that took place in language is indeed an extension of the evolution of our species' mental faculties.
- This 'quantum leap' is the long accumulation of the results of the interaction between our mental potential and linguistic implement.

RISE OF TEMPORAL DISTINCTIONS contd …

- **What about complexity??**
  - The development of tenses constitutes a definite expansion of the existing grammar, but this growth was compensated by the corresponding reduction of aspectual distinctions.
  - wherever aspect was replaced with tense, material complexity diminished since the psycholinguistic data suggest that aspectual distinctions are more difficult to handle than temporal ones.
  - Even if the overall balance were to show an increase of material complexity, the development of temporal distinctions would nevertheless constitute an enormous advantage, given their vital functional importance.

THE DEVELOPMENT OF THE SUBJECT FUNCTION AND OF THE PASSIVE VOICE

- Recounting an action not only in the perspective of the agent, but also in the reverse one.

- I-E did not have an active/passive opposition, but an active/middle dichotomy inherited from an earlier developmental phase of its syntax This opposition, which can be seen in such pairs as Engl. 'lay/lie', was at least morphologically present in Latin, where e.g., the active 'I say', contrasted with the deponent, i.e., middle, 'I speak'.

- agent/patient dichotomy offers very little flexibility for linguistic expression

Contd..

- subject' /'object' model has freed grammars from the straitjacket of the physical reality and given them the flexibility our minds are capable.

- This model increased the functionality of nouns, but also enabled speakers to capture events from different vantage points, and express them from the angle that suited the presentation best.

- English has pushed a step further than other modern languages with the possibility of casting even the beneficiary in the subject function, as in sentences such as 'The waiter was given a tip.'

THE SERIAL ORGANIZATION OF SPEECH AND THOUGHT

- Word Order
  - Latin: head-last
  - English & Modern I-E languages: head-first
    - a. [[victoriam] REPORTAVIT]
      b. (he) [WON [(a) victory]]
    - a. [[pulchra] EST]
      b. (she) [IS [beautiful]]
    - a. [[aere] PERENNIUS]
      b. [MORE LASTING [than bronze]]
  - The head-last order is based on a global perception and requires a processing that is also global. The sequence 'victoriam reportavit "or" aere perennius' can only be interpreted when the phrase-final head has been uttered.
  - In the head-first languages, the analysis begins immediately and goes on as the modifiers unfold.

Biological Perspective

- Key to the understanding of the origin of this difference and the nature of the shift
  - Left Hemisphere: detailed analysis of parts of objects
  - right Hemisphere: analysis of the more global aspects of objects

Head-Last Head-First contd.

- Advantage of Head-First:
  - it allows for the coding and decoding of linguistic messages with a minimum of mental effort, since it taxes the working memory of speakers and listeners as little as possible
  - because the processing of linguistic messages is facilitated, it makes it possible to conceive and express increasingly more complex thoughts
- The advantage of the modern order is hardly apparent if we compare brief segments such as 'victoriam reportavit' and 'he won a victory', or the Engl . 'a red ball' and the Fr. 'un ballon rouge'.
- The important advantage of a technique is not to do the simple things drastically better, but to achieve what was out of reach or to produce easily what required considerable effort.
  - 1. (The dog chased) the cheese eating mouse catching cat.
  - 2. (The dog chased) the cat that caught the mouse that was eating   the cheese.
- sentence 1, though formally correct, is in fact difficult to decode and ambiguous, whereas sentence 2 does not present any problem, neither for the speaker nor the listener.

Consequence of HFO (SVO) Fixed Word Order

- Case markers are generally lost after the shift from SOV to SVO has taken place.

- When case markers have been eliminated, word order becomes fixed.

- Slobin and Bever(1982) observed 'that even in a language that does not require word order for communication clarity, children tend to impose order in their speech'

- When word order becomes fixed, the functional yield does not change, but the material complexity of inflectional markers is eliminated and the eventual decoding problems are excluded

THE RISE OF SUBORDINATE CLAUSES: A SHIFT TO A HEAD-FIRST

- Ancestral languages: everything had to be said, and indeed could only have been said, in one simple sentence, the main verb was in a finite form, and subordinate action was expressed with verbals. Head-Last Model
    - Credebas dormienti haec tibi confecturos deos? (Ter. Ad. 693), lit. Did you believe to you sleeping these things performers gods? i.e. Did you believe the Gods would take care of things for you while you were sleeping?
- The English translation is an analytical construction which does not overload one's working memory, since it can be coded and decoded as the utterance progresses. Head-First Model

TRADE-OFFS

- the complex consonants of the ancestral sound system were replaced with simple and streamlined alternatives. But the complex items were probably easier to perceive, and thus had a communicative advantage.
    - Here the advantage was apparently outweighed by those that were achieved through their material simplification.
    - Such situation is common in biological evolution,
        - humans have traded off part of a larger olfactive faculty for a greater mental or perhaps linguistic potential. In the overall framework of our specialization, a more powerful mind proved to be more advantageous than a more potent sense of smell.

CONFLICTING PRESSURES

- Preservation of useless linguistic features such as grammatical gender, the subjunctive mood where it is meaningless, etymological spelling, and many other thorny idiosyncracies
    - A sense of aesthetics and the force of habit
    - To keep using an older less efficient implement or strategy one knows may be more economical than learn to handle their newer more efficient alternative
    - 'it should be difficult; it should hurt; victory should be snatched from the jaws of death'

      People have themselves tried to block evolution by pouring scorn on the replacement of canonical items by more efficient, but in their eyes, more 'lax' alternatives.
    - Bilingual situations: In normal, i.e., monolingual circumstances, head-first is the more advantageous word order (see above), but it is better to have a head-last order than having to juggle with two different ones

THE BUSHY PATTERN OF EVOLUTION

- Changes cannot be adaptive because what is supplanted in one language survives in another
- We have counter proof in Biological evolution.
  - There is a whole array of extant species which illustrate and, with domain-confined modifications, represent the successive evolutionary steps leading from unicellular organisms to humans.
  - There are roughly as many languages that are predominantly head-last as there are languages that are head-first, but the survival of the ancestral type, which was head-last, and their equal number, does not constitute evidence against the advantageous character of head-first structures. There are fishes today, and in greater number than mammals or even all other vertebrates put together, and yet mammalian features developed because they had selective advantages, and such is the case of head-first features.

contd ...

- extant head-last languages have undergone adaptive changes while remaining within the general confines of the ancestral pattern.
  - Agglutination: It facilitates the processing of grammatical markers, while producing structures that remain within the canonical pattern

Conclusion

- Complexity in Linguistics
- Complexity of form vs. Complexity of function
- Perfect yardstick for gauging complexity absent
- Try to lift the existing taboo on language evolution