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Kyoto University
**Action Meets Syntax:**
Evolingo and Biolinguistic Minimalism

Koji Fujita
Kyoto University

(1) Design ………… Microgenesis
(2) Development … Ontogenesis
(3) Evolution …… Phylogenesis

“To create is to recombine.” - F. Jacob

“… an evolutionary novelty may result from the combination of two pre-existing parts with unrelated functions.” - M. Ridley

“Evolution has recruited for language purposes brains structures that performed other functions in non-human primates.” - T. Deacon
Logical Problem of Language Evolution
(Darwin’s Problem)

- How was it possible for FL to emerge during the hominin evolution?

- “… UG is not evolutionarily viable.”
  (Christiansen & Chater 2008)

Language evolution is an instance of biological evolution (and cultural evolution).

→ If one’s theory of biological evolution fails to account for the evolution of FL, then it needs a serious reconsideration.

Neo-Darwinism (Modern Synthesis)

- Adaptationist Program
  - Functionalism
- Natural Selection / Sexual Selection as the First Resort
- Gradualism
Neo-Neo-Darwinism (Expanded Synthesis)

- Non-adaptationist Program
  - Formalism
- Pluralism
  - NS/SS as the Last Resort
- Punctuated Equilibrium (saltationism?)
- Exaptation

Bio-linguistic Minimalism

- (Almost) No Internal Modularity
- Anti-adaptationism

Evolutionary Psychology

- Massive Modularity
- Adaptationism

Arrival of the Fittest

Survival of the Fittest

The functions of the components that jointly constituted the language faculty later in the hominin evolution may have had nothing to do with the current (or even original) function(s) of language.

Animal communication may have only an indirect bearing on language evolution.
Strong Minimalist Thesis (SMT)

- Language is an optimal solution to legibility conditions.
- Unexplained elements of UG are zero.
- There is virtually nothing special about the origins and evolution of language.

Language is uniquely human.

- Are its components uniquely human, too?
- Minimize the discontinuity elements in language evolution.
- FLN / FLB

“... unbounded Merge is not only a genetically determined property of language, but also unique to it.”

“... for both evolution and development, there seems to be little reason to suppose that there were precursors to unbounded Merge.”

- N. Chomsky
... no clear evidence for languages that demonstrably lack recursion of any kind.

(B. Heine & T. Kuteva)

- Recursion is absent in Pirahã. (D. Everett)

- Many languages have no, or very circumscribed recursion in their syntax.

(N. Evans & S. Levinson)

- Recursion is just a theoretical artifact.

(D. Bickerton)

Derivational recursiveness:
- Recursive Merge

Representational recursiveness:
- Self-embedding

Representational recursiveness is just one aspect of derivational recursiveness.

Actual application of Merge is subject to a variety of constraints.

If CP is never selected by a head, then there will be no clausal complementation in that language. (functional parametrization?)
Language evolution boils down to the emergence of:

- Recursive Merge
- Interfaces
- Lexicon

Decomposing/Factorizing Merge

- Concatenate + Label (Hornstein 2009)
- (Proto-) Merge + Embed (Fukui 2006)

Only the labeling operation belongs to FLN.

Labeling and `Embed`

- Proto-Merge \((\alpha, \beta) = \{\alpha, \beta\}\):
  \[
  \alpha \quad \beta \\
  \quad \to \quad \text{(no endocentricity)}
  \]
  
  Base Set (BS) = \{\alpha, \beta\}
  
  Embed \((\alpha, \{\alpha, \beta\}) = \alpha \sqcup \text{BS} = \{\alpha, \{\alpha, \beta\}\}:
  
  \[
  \alpha \quad \beta \\
  \to \quad \text{endocentricity}
  \]

- Proto-Merge without Embed

- Recursive Merge with Embed
  \[
  \alpha \quad \beta \\
  \gamma \quad \alpha \quad \beta
  \]
Non-Recursive Proto-Merge

Recursive Merge

Embed

cf. Exocentric compounds as a fossil of proto-syntax
(Progovac & Locke 2008)

Internal Merge (Move) + Embed

Why not β for direct Embed without Move?
Embed (β, {γ, {α, {β}}})

Local Embed

Non-local Embed

→ exocentricity

Internally-headed relatives:

(1) [John-ga saifu-wo nakushita no]-wo Mary-ga mitsuketa.
   [John-Nom wallet-Acc lost Comp ]-Acc Mary-Nom found
   ‘Mary found the wallet John had lost.’

John-ga

saifu

saifu-wo nakushita
Merge = Move = Embed (set formation)

- Embed is itself an instance of Merge applying recursively.
- No independent evolutionary/developmental scenario necessary for Move and Embed.
- Embed as an exaptation of proto-Merge?

Labeling Two Word Utterances

1. no label
   - milk \(\rightarrow\) cup

2. endocentric
   - cup \(\rightarrow\) milk

3. *exocentric
   - milk \(\rightarrow\) cup
   (in the sense of ‘milk & cup’)

Recursive Merge is already fully operative at the two-word stage. (see Roeper 2007)

But what about truly exocentric compounds?

1. Tatemono-no takai-hikui-ga juuyoo da.
   - building-Gen high-low -Nom important is
   - ‘The height of the building matters.’

   N A
   A

‘Absolute categorial exocentricity’
(1) [A N+N]:
Serbo-Croatian ribolik ‘fish+shape=fish-shaped’

(2) [A V+V ]:
Turkish yapıs yapıs ‘stick+stick=sticky’

(3) [A V+N ]:
French lève-blocs ‘lift+block=block lifter’

(4) [A N+V ]:
Korean neknek-hata ‘sufficiency+to be= sufficient’

Scalise et al.

Some Possible Precursors

- Syllable Structure
- Birdsong
- Music
- Social Intelligence
  - Theory of Mind (ToM)
  - Machiavellian Intelligence
- Navigation and Foraging
- Number
- Manual Dexterity, Motor Control
- Tool Using and Tool Making
  - Action Grammar

- twig
- hammer
- nut
- anvil
- termites
Action Grammar
- Pairing Method
- Pot Method
- Subassembly Method


I. Pairing Strategy
- Merge (saw, Mary) = \{saw, Mary\}
- Merge (John, \{saw, Mary\}) = \{John, \{saw, Mary\}\}

II. Pot Strategy
- Merge (saw, Mary) = \{saw, Mary\}
- Merge (John, \{saw, Mary\}) = \{John, \{saw, Mary\}\}
III. Subassembly Strategy

- Merge (saw, Mary) = {saw, Mary}
- Merge (the, boy) = {the, boy}
- Merge ({the, boy}, {saw, Mary})
  = {{the, boy}, {saw, Mary}}

Subassembly strategy required

---

Subassembly Strategy in Compounding

Swedish: barn bok klub:
- barn
- bok
- klub

English: child book club:
- child
- book
- club


Subassembly-type Merge (Sub-Merge) is the genuine recursive device in human language.

\[
\text{saw} \quad \text{the} \quad \text{boy}
\]

What if the bare noun *boy* is already a syntactically complex object (*n+BOY*, etc.)?

Lexicon as a Conceptual Barrier

- To the extent that the lexicon belongs to FLN as a distinct component of grammar, language evolution becomes a harder topic.

Anti-Lexicalism

- Words are also generated by recursive syntax.
- The (substantive) lexicon is decomposed into FLN (recursion) and FLB (SM/CI)
- The syntax-CI interface may be optimized
- There is *virtually* no lexicon.

Syntactic Nature of ‘Lexical’ Verbs

1. John opened the door again.
   i. repetitive reading
   ii. restitutive reading

2. \[ \text{vP - again(i)} \]
   \[ \text{John} \quad \text{v} \quad \text{CAUSE} \quad \text{VP - again(ii)} \]
   \[ \text{the door} \quad \text{OPEN} \]

3. LCS: \[ x \text{ CAUSE } [ y \text{ OPEN again(ii) } ] \text{ again(i) } \]}
Ditransitives

(1) a. John gave Mary a book.
   b. [\(x\) John \(v [v\) Mary \(V a\) book ]] 
   c. [ J. CAUSE [ M. HAVE B. ]]

(2) a. John gave a book to Mary.
   b. [\(x\) John \(v [v a\) book \(V to\) Mary ]]  
   c. [ J. CAUSE [ B. GO to M. ]]  

- The mapping between syntactic structure and conceptual structure is straightforward.

Evidence from Developmental Data

CAUSE \((2;0.4) \geq \) HAVE \((2;0.7) \geq \)  
Double Obj verbs \((2;1.6) > \) GO \((2;4.0) \geq \) Dative Obj verbs \((2;4.9)\)


Merge in Early Grammar

- “No verb is an island.”
- “Children start to use Merge already with their very first word combinations.”

A. Ninio. 2006. Language and the Learning Curve. OUP.

Three-Layered Split VP

\[
\begin{align*}
\text{VP1} & \rightarrow \text{Agent} \\
\text{VP2} & \rightarrow \text{Causer} \\
\text{VP3} & \rightarrow \text{Theme}
\end{align*}
\]

cf. [ \(x\) DO [ \(x\) CAUSE [ \(y\) BECOME … ]]]
“Causes are realized in a position that is asymmetrically c-commanded by the Agent position.”

(1) This glass breaks easily.
[TP [this glass T [µP µ [VP1 IMP V1 [VP2 V2 [VP3 breaks this glass ]]]]]]

(2) This glass suddenly broke.
[TP [this glass T [VP1 V1 [µP µ [VP2 IMP V2 [VP3 breaks this glass ]]]]]]

<table>
<thead>
<tr>
<th>Middles</th>
<th>implicit Agent</th>
<th>Generically quantified</th>
<th>*stative</th>
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<tr>
<td>Ergatives</td>
<td>(implicit Causer)</td>
<td>Existentially quantified</td>
<td>+eventive</td>
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\*tham/hây\ causatives in Thai:
(1) *Saakhâa tham krâcok teêk dooy tançay.
\(\text{Saka cause mirror break by intend}\)
(2) Saakhâa hây dek win dooy tançay.
\(\text{Saka have child run by intend}\)
(3) Saakhâa tham hây kaw?i lom dooy tançay.
\(\text{Saka cause have chair fall by intend}\)


Simpler Syntax? (Culicover and Jackendoff 2005)

John gave Mary a book.
CS: \([ x \text{ CAUSE } [ y \text{ HAVE } z ]]\)

Layered VP:
\(\text{vP}
\)

Flat VP:
\(\text{VP}
\)
Flat VP: optimal for SM-system
- Language for communication
- Lexicalism

Layerd VP: optimal for CI-system
- Language for thought
- Anti-Lexicalism

Symplicity is in the eye of the beholder.

From FLB to FLN:
- Recursive syntax could be an exaptation from the recursive CI-system.

(1) John killed the cat on purpose.
(2) John caused the cat to die on purpose.

J. Fodor (1970)

(1') \[x \text{CAUSE} [y \text{DIE}]\]
(2') \[x \text{V(cause)} [V [T [y \text{DIE} [V]]]]\]

Given that bok is syntactically complex, the right-branching compounding also requires Sub-Merge.

→ ‘Root’ compounding
Exocentric compounds are in fact endocentric.

(1) $A + A \rightarrow N$

(2) $\sqrt{A} + \sqrt{B} + n \rightarrow N$

The issue of whether protolanguage was holophrastic (à la Wray, Arbib) or synthetic (à la Bickerton, Tallerman) is largely irrelevant here.

Word-like elements in protolanguage (proto-words) could exist in the absence/prior to syntax.

From Pot to Subassembly
From Subassembly to Merge

<table>
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<tr>
<th>Merge</th>
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</tr>
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<tbody>
<tr>
<td>Unbounded?</td>
<td>Yes</td>
</tr>
<tr>
<td>Symmetric?</td>
<td>Yes/No</td>
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Merge to Successor Function?

Merge (1,1) = 2
Merge (2,1) = 3, etc.

Mathematical capacity is an abstraction from linguistic operations.

Modular Architecture of the Mind

- Domain-Specificity
- Informational Encapsulation
- Autonomous
- Innate
- Mandatory
- Fast
- Deterministic
- Neural Localization
- Idiosyncratic
- Pathological Breakdown
“Modularity, a biological approach that views organisms as the integration of partially independent, interacting units at several hierarchical levels, has been described as ‘a conceptual framework for evo-devo’, and ‘a meeting place for evolutionary and developmental biologists’.”

B. K. Hall and W. M. Olson eds.: Keywords & Concepts in Evolutionary Developmental Biology.

Against Strong Innateness

Departure from strong genetic determinism in Evo-Devo and in MP

“The third factor” in general biological design

G. Marcus (2006):

descent-with-modification modularly
(as opposed to sui generis modularity)

Recursion: The Generative Engine of the Mind

- Morality
- Number
- Music
- Concepts
- Theory of Mind
- Action Grammar
- Language
- Religion

Thank you.