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<th>The Design, Development and Evolution of Unbounded Merge</th>
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Kyoto University
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 language, 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
  - Exaptation
“… 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

To create is to *merge*.

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

(1) Design ……… Microgenesis
(2) Development … Ontogenesis
(3) Evolution ……. Phylogensis

(1) Descriptive Adequacy ➔ <PHON,SEM>
(2) Explanatory Adequacy ➔ I-Language
(3) Evolutionary Adequacy ➔ UG
Logical Problem of Language Evolution

Logical Problem of Language Acquisition

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: Recursion (unbounded/recursive Merge) Discontinuity

FLB: Sensory-Motor system Conceptual-Intentional system Continuity

“… 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

1. [CP C [TP T [vP V [VP V] CP C [TP T [vP V [VP V [...

2. [DP D [NP N [PP P [DP D [NP N [PP P [...

3. [TP T [vP V [VP V]]]

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:

- Unbounded Merge
- Interfaces
- Lexicon


- Merge ($\alpha$, $\beta$) = {$\alpha$, $\beta$}:
  \[
  \begin{array}{c}
  \alpha \\
  \beta \end{array}
  \] (no endocentricity)

- Embed ($\alpha$, {$\alpha$, $\beta$}) = {$\alpha$, {$\alpha$, $\beta$}}:
  \[
  \begin{array}{c}
  \alpha \\
  \beta \\
  \end{array}
  \rightarrow \text{endocentricity}
  \]

Recursive Merge (without Embed)

Recursive Embed

Internal Merge (Move) + Embed

Why not $\beta$ for direct Embed without Move?
Embed ($\beta$, {$\gamma$, {$\alpha$, $\beta$}})
Local Embed

Non-local Embed

Merge = Move = Embed (set formation)

Embed is itself an instance of Merge applying recursively.

No independent evolutionary/developmental scenario is necessary for Move and Embed.

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.’

Labeling Two Word Utterances

(1) no label
(2) endocentric
(3) *exocentric

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.’

```
A            A            AA
N
```

“Absolute categorial endocentricity”


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

(1) [A N+N ]:
    Serbo-Croatian ribolik  ‘fish+shape=fish-shaped’
(2) [A V+V ]:
    Turkish yapis yapis  ‘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.
I. Pairing Strategy

II. Pot Strategy

Action Grammar

- Pairing Method
- Pot Method
- Subassembly Method

P. M. Greenfield:
III. Subassembly Strategy

- \text{Merge (saw, Mary)} = \{\text{saw, Mary}\}
- \text{Merge (John, \{saw, Mary\})} = \{\text{John, \{saw, Mary\}}\}

III. Subassembly Strategy

- \text{Merge (the, boy)} = \{\text{the, boy}\}
- \text{Merge (\{the, boy\}, \{saw, Mary\})} = \{\{\text{the, boy}\}, \{\text{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 (S-Merge) is the genuine recursive device in human language.**

```
      saw
    /   \ 
  the   the
   \   /  
    boy  
```

What if the bare noun *boy* is already syntactically complex (*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) \[ \text{vP} - \text{again(i)} \]

\[ \text{John} \]

\[ \text{CAUSE} \]

\[ \text{vP} - \text{again(ii)} \]

\[ \text{the door} \] \[ \text{OPEN} \]

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

---

**Evidence from Developmental Data**

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


---

**Ditransitives**

(1) a. John gave Mary a book.
   b. \([ \text{vP} \text{Mary V a book }] \)
   c. \([ J. \text{CAUSE } \text{M. HAVE B. }] \)

(2) a. John gave a book to Mary.
   b. \([ \text{vP a book V to Mary }] \)
   c. \([ J. \text{CAUSE } \text{B. GO to M. }] \)

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

---

**Merge in Early Grammar**

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

Three-Layered Split VP

Agent
  V
  V1
  Causer
  V2
  V' VP2
  V3 Theme

cf. [ x DO [ x CAUSE [ y BECOME … ]]]


“Causes are realized in a position that is asymmetrically c-commanded by the Agent position.”

- *tham/hây* causatives in Thai:

1. “Saakhaa *tham* kracok treek dooy tançay.
   Saka cause mirror break by intend

2. Saakhaa *hây* dek win dooy tançay.
   Saka have child run by intend

   Saka cause have chair fall by intend

Simpler Syntax? (Culicover and Jackendoff 2005)

John gave Mary a book.
CS: [ x CAUSE [ y HAVE z ]]

Layered VP:                                Flat VP:

Layered VP:                                Flat VP:

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') [vP x CAUSE [vP y DIE]]
(2') [vP x v(cause) [vP V [TP T [vP y v(die) [vP V ]]]]]
Given that *bok* is syntactically complex, the right-branching compounding also requires S-Merge.

→ ‘Root’ compounding

- Exocentric compounds are in fact endocentric.

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

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

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

**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.*

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**Modular Architecture of the Mind**

- Domain-Specificity
- Informational Encapsulation
- Autonomous
- Innate
- Mandatory
- Fast
- Deterministic
- Neural Localization
- Idiosyncratic
- Pathological Breakdown

---

**Against Strong Innateness**

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

- “The third factor” in general biological design
Merge to Successor Function?

Merge \((1,1) = 2\)

\[\text{Merge } (2,1) = 3, \text{ etc.}\]

Mathematical capacity is an abstraction from linguistic operations.

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<th>Adaptation?</th>
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G. Marcus (2006):

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

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Some Conclusions (tentative!)

- Recursion should be understood derivationally.
- S-Merge makes human syntax possible.
- Syntax generates words.
- Linguistic structure is always endocentric.
- Action Grammar may be explored as a precursor to Merge.