Title	A quick review of some of the recent developments in the minimalist program
Sub Title	
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Publisher	慶應義塾大学言語文化研究所
Publication year	2022
Jtitle	慶應義塾大学言語文化研究所紀要 (Reports of the Keio Institute of Cultural and Linguistic Studies). No.53 (2022. 3) ,p.151- 164
JaLC DOI	
Abstract	
Notes	研究ノート
Genre	Departmental Bulletin Paper
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AN00069467-00000053-0151

Reports of the Keio Institute of Cultural and Linguistic Studies 53 (2022), 151~164

A Quick Review of Some of the Recent Developments in the Minimalist Program

Hisatsugu Kitahara

What follows is an edited version of the handout used for the keynote speech at the workshop, organized by *Core-to-Core Program A. Advanced Research Networks International Research Network for the Human Language Faculty* (Online, October 23, 2021). As its title indicates, the purpose of this talk is to review some of the recent minimalist developments, presented in the following two recent talks by Noam Chomsky:

LSJ 161 Noam Chomsky "Minimalism: where we are now, and where we are going" (November 22, 2020) https://www.youtube.com/watch?v=X4F9NSVVVuw

WCCFL 39 Noam Chomsky "Genuine Explanations" (April 8, 2021)
https://www.youtube.com/watch?v=F6SbPKmVNVQ

I would like to thank the organizers for this opportunity and the workshop participants for their very helpful comments and suggestions. This handout contains materials based on the intensive discussions with a group formed by the late Samuel D. Epstein, and I would like to thank the group members, Noam Chomsky, T. Daniel Seely, Riny Huijbregts, Sandiway Fong, Andrew McInnerney, Yushi Sugimoto, and Bob Berwick, for very insightful and stimulating ideas. I also thank the Keio Study Group of Generative Grammar for valuable feedback. All remaining errors are, of course, my own.

I. Willingness to be puzzled about the world

(1) a. John is/*are in the room.
    b. Mary and John *is/are in the room.
    c. the boys and the girls *is/are in the room.
    d. the boys and Mary *is/are in the room.

(2) a. John is/*are in the room.
    b. Mary or John is/*are in the room.
    c. the boys or the girls *is/are in the room.
    d. the boys or Mary *is/*are in the room.

(3) a.* John saw X.
    b. John was seen X.

(4) a. John tried [X to win].
    b.* John tried [Mary to win].

(5) a. (we thought) [they expected [X to see each other]].
    b. (we wondered) which boys C_Q [they expected [X to see each other]].

(6) a. (we thought) John INFL [arrived X_1] and [X_2 met Bill]
    b. (we wondered) what C_Q [John bought X_1] and [Bill handed X_2 to Tom].
    c. (we wondered) which article C_Q [John filed X_1] [without reading X_2].

Are we willing to be puzzled about these facts?

(i) language did not escape the attention of 17th century thinkers: Galileo, Port Royal logicians, Descartes ...
(ii) thinking hard about very simple properties of nature can be a highly productive feature of inquiry
(iii) human language is an organic object
(iv) the inquiry into the nature of language and mind, into the unique nature of the human species
(v) the Galilean style: a higher degree of reality is given to abstract models of the

universe
(vi) the Galilean principle: nature is simple and it is the task of the scientist to show it
(vii) the Galilean challenge: How is this remarkable achievement possible?

There were two important aspects of the Port Royal elaboration of the Galilean challenge:

(i) seeking universal principles underlying human languages
(ii) seeking to go beyond description to explanation

II. The generative enterprise

The generative enterprise began to develop in mid-20th century.

There were two important shifts from the largely shared consensus (that linguistics is a taxonomic science):

(i) seeking explanations
(ii) adopting the biolinguistics framework

What is the biolinguistics framework?

(i) language is a property of the organism, a computational system coded in the human brain
(ii) for each individual, the computational system recursively generates an infinite array of hierarchically structured expressions
(iii) each expression formulates a thought, each potentially externalized in some sensory-motor (SM) medium

This is what we call the Basic Property of language.

For language, there are two kinds of explanation needed.

(i) for individual languages, explanations are provided by a generative grammar

(ii) for the faculty of language FL, explanations are provided by Universal Grammar (UG)

UG is our primary concern:

(i) it makes language acquisition possible
(ii) it is concerned with the innate factors
(iii) it distinguishes humans from all other organisms

These concerns pose at least three seemingly contradictory conditions that UG must meet:

(i) it must be rich enough to overcome the problem of poverty of stimulus (POS)
(ii) it must be simple enough to have evolved under the conditions of human evolution
(iii) it must be the same for all possible languages, given that language is a species property common to humans

We achieve a genuine explanation of some linguistic phenomenon only if it keeps to mechanisms that satisfy the joint conditions of learnability, evolvability, and universality.

(i) the generative enterprise for the past 70 years has been driven by the goal of reconciling these conflicting requirements
(ii) the Strong Minimalist Thesis (SMT) sets the task of resolving this tangle of dilemmas as a prime goal of the theory of language

III. The first genuine explanation of a significant property of language: structure-dependence

Let's begin with a simple but crucial property of language: structure-dependence.

(1) a. John is/*are in the room.
    b. Mary and John *is/are in the room.
    c. the boys and the girls *is/are in the room.

d. the boys and Mary *is/are in the room.

(i) the child does not use the simplest computational rule, adjacency
(ii) the child reflexively relies on something it never hears, hierarchical structure
(iii) hierarchical structure requires a far more complex calculation than adjacency (and none of this can be learned)
(iv) why are simple computations of linear order and adjacency not used?
(v) because linear order is simply not available to the I-language, the system that constructs thoughts.

We also observe that structure-dependence interferes with communication.

(2) a. John is/*are in the room.
b. Mary or John is/*are in the room.
c. the boys or the girls *is/are in the room.
d. the boys or Mary *is/*are in the room.

(i) there is no way to externalize the thought intended in (2d) (either the boys are in the room or Mary is in the room).
(ii) design of language causes problems of communication
(iii) when Mother Nature was constructing language, she was concerned with optimal design, not how the system might be used.
(iv) if the problem of agreement is removed, the expression has no problem at all, as in "the boys or Mary will be in the room"
(v) the only plausible conclusion from these considerations is that language has two distinct components:
    (a) the I-language that generates the linguistic structures of thought, and
    (b) a system of externalization that maps the generated structures to some SM medium.

Given these two components, let us consider the joint conditions of learnability, evolvability, and universality, repeated below:

(i) it must be rich enough to overcome the problem of poverty of stimulus (POS)
(ii) it must be simple enough to have evolved under the conditions of human

evolution
(iii) it must be the same for all possible languages, given that language is a species property common to humans

Suppose we put the universality condition (iii) to the side as a problem for the system of externalization.

Then, at least for I-language, the twin conditions of learnability (i) and evolvability (ii) are the ones we want to resolve, and they will be resolved if the structures of I-language are generated by the simplest operations, in accord with "third factor" principles.

SMT sets this outcome as a prime goal of the theory of language, and conforming to SMT, we seek to show all linguistic phenomena can receive genuine explanations in this sense.

The case of structure-dependence is the first genuine explanation of a significant property of language

(i) the problem of learnability is overcome if the property is part of UG, no learning
(ii) the problem of evolvability is overcome if the property follows from the simplest combinatorial operation, the best answer
(iii) if the simplest combinatorial operation is binary set-formation Merge, then structure-dependence follows at once
(iv) if the computation is based on Merge, then linear order is not an option for the child

There are genuine Merge-based explanations for other fundamental properties of language:

(i) the Basic Property is a product of Merge-based computation
(ii) the ubiquity of displacement with reconstruction follows from the subcase of Merge, Internal Merge (IM)
(iii) the subcase of Merge, External Merge (EM) is a reflection of the fact that argument structure requires EM-generated structures

(7)	a.	the man who met Mary and John is in the room.	*unambiguous*
	b.	the man who met Mary and John are in the room.	*unambiguous*
	c.	the man who met Mary and John will be in the room.	*ambiguous*

(8)	a.	the man who met the boys or Mary is/*are in the room.	*ambiguous*
	b.	the man who met Mary or the boys is/*are in the room.	*unambiguous*
	c.	the man who met Mary or the boys will be in the room.	*ambiguous*

The fact that these properties of language exist provides evidence that language conforms to SMT, and from this perspective, there are two functions that SMT serves:

(i) SMT serves a disciplinary function as a constraint on what can appear in language
(ii) SMT also serves an enabling function as a facilitator of the richness of human language

Those core properties such as structure-dependence, displacement, and reconstruction are in effect enabled by SMT, because they would have no reason to exist if language did not obey SMT.

IV. The simplest structure-building operation: Merge

Keeping to SMT, we assume there is only one operation that forms the expressions satisfying the Basic Property, call it Merge:

(9) Merge is the simplest structure-building operation

There is a standard definition of Merge, but it embodies hidden assumptions and permits unacceptable rules. So, let's begin by asking what is the simplest structure-building operation for I-language.

First consider a standard example of general recursion with no concern for SMT, say propositional calculus. Take LEX = {p, q, r,…~, v}, as in (i). The rules allow us to form the elements of (ii), step by step:

(i) LEX = {p, q, r,…~, v}
(ii) p, ~p, ((~p) v q)

At each stage of the derivation, we have a set of already generated items that are available for carrying the derivation forward. Call this set the Workspace WS.

(10) The Workspace (WS) determines the current state of the derivation.

We assume the next step of the derivation doesn't have access to the history, so we take derivations to be Markovian:

(11) Derivations are Markovian.

But notice, that doesn't matter in the case of propositional calculus since WS includes everything previously generated.

(12) WS = [p, ~p, ((~p) v q)]

In WS, the inscription p appears three times, and they are taken to be occurrences of p, a convention, called STABILITY:

(13) STABILITY: the inscription p appearing three times in WS are all occurrences of p

For language, the notion occurrence can be eliminated in favor of a very simple rule, called FORMCOPY (FC):

(14) FORMCOPY (FC) assigns the relation Copy to certain identical inscriptions.

Merge automatically provides both EM and IM, but its application is restricted to the Duality of Semantics (Duality):

(15) Duality of Semantics (Duality): EM is associated with theta roles and IM with discourse/information-related functions.

When there is a choice, "economical" IM (forming {P, Q}, with one a term of the other) wins over "richer" EM (forming {P, Q}, with neither a term of the other), where X is a term of Y if X is a member of Y or a member of a term of Y.

To keep search space minimum, Merge should construct the fewest possible new items that are accessible to further operations

Merge(P, Q) necessarily constructs one such SO: {P, Q}. It should yield no more than that. Call it RESOURCE RESTRICTION (RR).

(16) RESOURCE RESTRICTION (RR): Merge(P, Q) should yield no more than {P, Q}.

Given SMT and language specific conditions such as Duality and RR, we can define Merge as (17):

(17) Merge(P. Q, WS) = WS' = [{P, Q}, W, Y], where Z

(i) Merge applies to P, Q, WS, and it forms a new workspace WS'
(ii) WS' is the set containing the new item, the set {P, Q} and then a bunch of other things.
(iii) W is whatever is unaffected by the operation, hence carried over.
(iv) Y is whatever added to WS', but under RR, Y is null.
(v) Z is the condition that the operation must satisfy (i.e. SMT and language specific conditions such as Duality and RR)

RR has important empirical consequences. Ignoring RR, Merge, like standard recursion, yields (18):

(18) WS = [P, Q, {P, Q}]

(18) permits indeterminacy and also faces the problem of overgeneration. Under RR, however, the only element added to WS is the newly created {P, Q}, as in (19), and there is no need to stipulate REMOVE in the definition of Merge, to achieve this result.

(19) WS = [{P, Q}]

RR also rules out parallel, sidewards, late Merge. They all add more than one new element, and unlike IM, no copies are protected by minimal search (MS). The only cases that survive RR are IM and EM.

(i) EM (3→4): given WS = [a, b, c], MERGE(a, b, WS) = WS’ = [{a, b}, c]
(ii) IM (5→6): given WS = [{a, {b, c}}], MERGE(c, {a, {b, c}}, WS) = WS' = [{c, {a, {b, c}}}], where lower c is inaccessible under MS
(iii) parallel and sideward Merge (4→6): given WS = [a, {b, c}], MERGE(a, c, WS) = WS’ = [{a, c}, {b, c}]
(iv) late Merge (6→8): given WS = [{a, b}, {c, d}], MERGE(b, {c, d}, WS) = WS’ = [{a, b}, {b, {c. d}}]

Notice, RR renders derivations strictly Markovian in a strong sense, beyond the normal Markovian property of derivations.

(20) Derivations are strictly Markovian.

(i) For language, the derived Workspace, the current state of the derivation, does not contain items that were generated earlier.
(ii) For normal recursion, such as propositional calculus, the history of derivation is contained in the current state.

Given the strictly Markovian property of derivations, FC operates at the phase level in accord with MS:

(21) FC selects an element X, then selects a structurally identical element Y, and assigns the relation Copy to X and Y.

(i) Suppose FC is not subject to conditions that hold for the structure-building operation Merge (such as Duality).
(ii) Then we expect to find configurations subject to FC but not Merge. Call such configurations Markovian-gaps (M-gaps).

(22) Markovian-gaps (M-gaps) are configurations that are subject to FC but not

Merge.

The existence of M-gaps is predicted by the enabling function of SMT.

V. The existence of M-gaps

Let us investigate and identify configurations where M-gaps occur. First consider (3a,b), with their structures (23a,b):

(3) a.* John saw X.
b. John was seen X.

(23) a. $John_1$ INFL [$John_2$ [v [saw $John_3$]]
b. $John_1$ INFL [was [seen $John_2$]]

In (23a), if FC takes $John_1$ and $John_2$ to be copies, then theta theory is met. If not, $John_1$ fails to be linked to any theta position, thereby violating theta theory. Thus, $John_1$ and $John_2$ to be copies , and $John_2$, being a lower copy, gets deleted for SM.

If FC takes $John_2$ and $John_3$ to be copies, then the univocal property of theta theory is violated:

(24) the univocal property of theta theory: a single theta assigner cannot assign two theta roles to the same element

The verb "see" would then be assigning two theta roles to the two copies of "John," thereby violating theta theory. Thus, FC does not apply here; hence, $John_2$ and $John_3$ are non-copies (repetitions), and the sentence gets pronounced as "John saw John."

In (23b), however, to satisfy theta theory, FC has no choice but take $John_1$ and $John_2$ to be copies, and the sentence gets pronounced as "John was seen."

Next consider (4a,b), with their structures (25a,b):

(4) a. John tried [X to win].

b.* John tried [Mary to win].

(25) a. $John_1$ INFL [$John_2$ [v [tried [$John_3$ to win]]]]
b. $John_1$ INFL [$John_2$ [v [tried [Mary to win]]]]]

In (25a), FC takes $John_1$ and $John_2$ to be copies, satisfying theta theory. Now suppose FC takes $John_2$ and $John_3$ to be copies. This time, the univocal property of theta theory is met, because there are two theta assigners, "try" and "win."

Application of IM to move $John_3$ to $John_2$ would violate Duality, but there is no barrier to FC; hence $John_3$ is an M-gap, and the sentence gets pronounced as "John tried to win."

Suppose FC does not apply here. Then $John_2$ and $John_3$ are non-copies (repetitions), and the sentence gets pronounced as "John tried John to win." Here, $John_3$ violates the Case-filter., in the same way that "Mary" in (4b) (with the structure (25b)) violates it.

As demonstrated above, the M-gap $John_3$ yields the so-called obligatory Control construction. This is a module enabled by SMT.

In (25a), there are two kinds of gaps, one derived from Merge ($John_2$) and the other from FC ($John_3$): trace and PRO in traditional terms. But there is no need to stipulate them. The existence of these two gaps follows from SMT and Duality.

Now consider (5a,b), with their structures (26a,b):

(5) a. (we thought) [they expected [X to see each other]].
b. (we wondered) which boys C_Q [they expected [X to see each other]].

(26) a. (we thought) [$they_1$ INFL [$they_2$ [v [expected [$they_3$ to see each other]]]]
b. (we wondered) which $boys_1$ C_Q [$they_1$ INFL [$they_2$ [v [expected [which $boys_2$ to see each other]]]]

In (26a), FC takes $they_1$ and $they_2$ to be copies, and $they_2$ and $they_3$ to be copies. The univocal property of theta theory is met, because there are two theta assigners, “expect” and “see.” The sentence gets pronounced as “(we thought) they expected to see each other” where $they_3$ is the antecedent of “each other.”

In (26b), FC takes which $boys_1$ and which $boys_2$ to be copies, and $they_1$ and $they_2$ to be copies. The copy pair ($they_1$, $they_2$) satisfies theta theory, and the copy pair (wihich $boys_1$, which $boys_2$) yields an operator-variable interpretation. The sentence gets pronounced as “(we wondered) which boys they expected to see each other” where which $boys_2$ is the antecedent of “each other.”

Finally consider the more complex cases with the two kinds of gaps, (6a-c), assigned the structures (27a-c), respectively:

(6) a. (we thought) John INFL [arrived X_1] and [X_2 met Bill]
b. (we wondered) what C_Q [John bought X_1] and [Bill handed X_2 to Tom].
c. (we wondered) which article C_Q [John filed X_1] [without reading X_2].

(27) a. (we thought) $John_1$ INFL [arrived $John_2$] and [$John_3$ met Bill]
b. (we wondered) $what_1$ C_Q [John bought $what_2$] and [Bill handed $what_3$ to Tom].
c. (we wondered) which $article_1$ C_Q [John filed which $article_2$] [without reading which $article_3$].

In (27a), FC takes $John_1$ and $John_2$ to be copies, and $John_1$ and $John_3$ to be copies. Either $John_2$ or $John_3$ moved to $John_1$, and the one that didn’t move is an M-gap. The sentence gets pronounced as “(we thought) John arrived and met Bill.”

In (27b), FC takes $what_1$ and $what_2$ to be copies, and $what_1$ and $what_3$ to be copies. Either $what_2$ or $what_3$ moved to $what_1$, and the one that didn’t move is an M-gap. The sentence gets pronounced as “(we wondered) what John bought and Bill handed to Tom.”

In (27c), FC takes which $article_1$ and which $article_2$ to be copies, and which $article_1$ and which $article_3$ to be copies. Given the adjunct condition, which $article_3$ is an M-gap (where wh-movement inside the adjunct is ignored here). The sentence gets pronounced as “(we wondered) which article John filed without reading.”

As shown above, in addition to Control, ATB and PG constructions fall out as special cases, enabled by M-gaps, which would have no reason to exist if language did not abide by SMT.

We keep to mechanisms that satisfy the joint conditions of learnability, evolvability, and universality, specifically the simplest structure-building operation Merge, and we propose a unified explanation of seemingly distinct linguistic phenomena, such as Control, ATB, and PG constructions, seeking genuine explanation.

SMT serves not just as a constraint on what can appear in language, but as a facilitator of the richness of human language. This is a new perspective, which poses new questions on the modules of language, identified in the preceding generative investigation.

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