

The Human Linguistic System Engenders Creativity Through Recursive Operations

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Animal World

Vervet monkeys of Kenya

(Seyfarth, Cheney, Marler 1980 *Science*)



Alarms (courtesy of Marc Hauser)

eagle



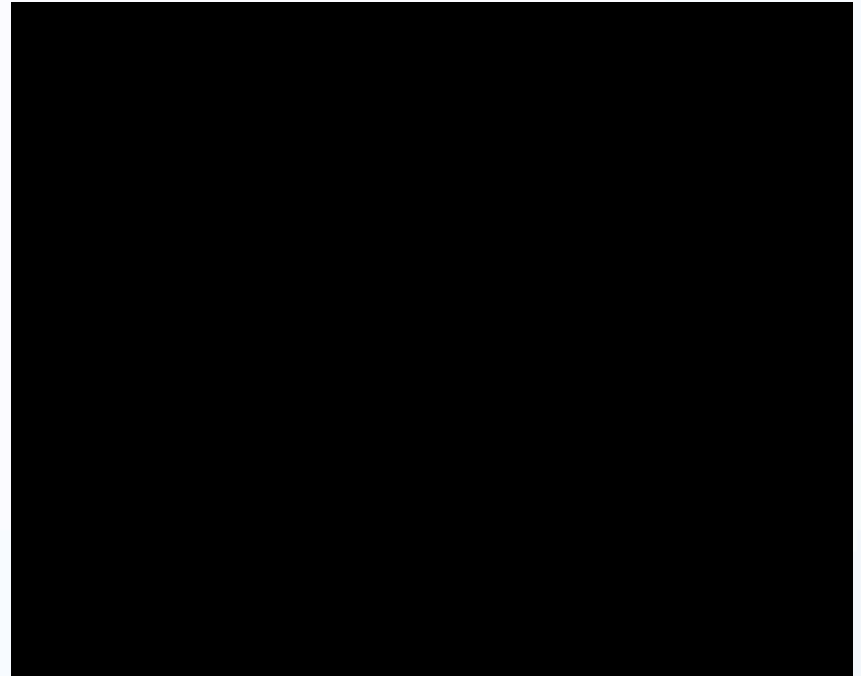
snake



leopard



Honeybees

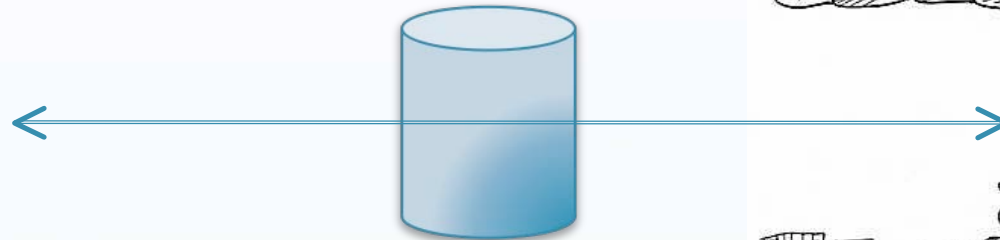


Honeybees communicate angle and distance of flowers by a dance.

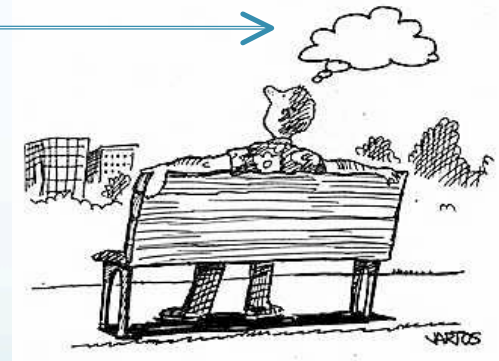
Connecting the symbol and its meaning



Language Links Sound and Meaning



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A defining characteristic of human language

Potentially infinite

Galileo, Descartes, von Humboldt, etc.

(Hauser, Chomsky, Fitch, *Science* 2002)



Limitless I: length of expressions

John thinks that Mary believes that her son said that Bob thought that the professor will handout the physics homework

tomorrow

⊞ There is no “longest” sentence.



Limitless II: combinations

that, boy, will, show, a, film

1. That boy will show a film.
2. A boy will show that film.
3. Will that boy show a film?
4. Will a boy show that film?
5. That boy will film a show.
6. A boy will film that show.
7. Will that boy film a show?
8. Will a boy film that show?
9. Show a film, that boy will.
10. Film a show, that boy will.

⌘ A high school graduate

knows up to 60,000 words

⌘ Virtually limitless

combinatorial possibilities

What is behind language's infinity?

Infinite use of finite means
(Wilhelm von Humboldt)

∞ Recursion



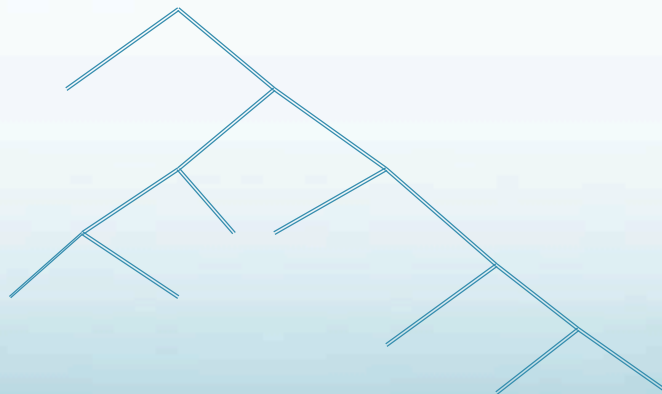
the two big blue cars
 blue cars
 big [blue cars]
 two [big blue cars]
the [two big blue cars]



The source of creativity



- ⌘ Human language generates binary hierarchical structures by combining words and phrases.
- ⌘ The structure that can be generated is potentially infinite because this operation is recursive (discrete infinity).
- ⌘ This lead to creativity - limitless potential.



Movement operations reveal structure

(1) John bought a book.

(2) What did John buy____?



More movement operations

B

A

(3) Every student certainly will read this book.

(4) This book, every student certainly will read. (A)

(5) Read this book, every student certainly will. (B)

What is human language?

⌘ Communication?

⌘ Animals, bees



⌘ How is language used mostly?

Domains

(6) John thinks that Mary believes that the professor will handout the physics homework...

John thinks

{that Mary believes}

{that the professor will hand out...}

What is the nature of these domains?

Smallest unit of “complete thought”

(7) { John thinks { that Mary praised the students } }

Reflexive pronoun: must find its antecedent in its Domain.

(8) John thinks { that Mary praised herself }

(9) John thinks { that Mary praised himself }

Pronoun: must NOT find its antecedent in its Domain.

(10) John thinks { that Mary praised him }

(11) John thinks { that Mary praised her }

Movements and Domains

(12) What did {he say {that he wanted ___} }?

West Ulster English

(13)a. What all did he say (that) he wanted ___?

b. What did he say (that) he wanted ___ all?

c. What did he say all (that) he wanted ___?

Domains sometimes block operations

(13) You bought a book.

(14) What did you buy ____?



(15) John left for that reason.

(16) Why did John leave ____?



(17) What do you wonder {whether to fix ____}?

(18) Why do you wonder whether to fix the car?

(19) Certain domains do not allow extraction of *why*

Some languages don't move the wh-phrase

(20) a. Hanako-ga piza-o tabeta.

Hanako-NOM pizza-ACC ate 'Taro ate pizza.'

b. Hanako-ga nani-o tabeta no?

Hanako-NOM what-ACC ate Q 'What did Hanako eat?'

(21) Hanako-ga {anata-ga nani-o syuurisitai ka} siritai no?

Hanako-NOM {you-NOM what-ACC fix-do-want Q} want.to.know Q

(i) 'Does Hanako want to know what you want to fix?'

(ii) 'What does Hanako want to know whether you want to fix?'

Restriction on *why*

(18) Why do you wonder whether to fix the car?

(19) Certain domains do not allow extraction of *why*

(22)

Anata-ga {Hanako-ga naze Amerika-ni iku ka} siritai no?

you-NOM {Hanako-NOM why America-to go Q} want.to.know Q

- (i) 'Do you want to know why Hanako will go to America?'
- (ii) *'Why do you want to know Hanako will go to America ___?'

Diagnosis for movement

(23) a. John read a book.

b. *A book read John.

(24) a. Gakusei-ga hon-o yonda.

student-NOM book-ACC read 'The student read a book.'

b. Hon-o gakusei-ga yonda.

book-ACC student-NOM read

Quantifier float

West Ulster English

- (13)a. What all did he say (that) he wanted ___?
b. What did he say (that) he wanted ___ all?
c. What did he say all (that) he wanted ___?

(25)a. Gakusei-ga san-nin hon-o yonda.
student-NOM 3-Classifier book-ACC read
'Three students read a book.'

b.*Gakusei-ga hon-o san-nin yonda.
student-NOM book-ACC 3-Classifier read
'Three students read a book.'

(26) Hon-o gakusei-ga san-satu yonda.
book-ACC student-NOM 3-Classifier read
'A student read three books.'