

Introduction

1. Hauser, Chomsky & Fitch 2002 [HCF 2002], pp. 1570-1573 (cf. also [Chomsky 2010:52])
 - (a) Language Faculty - Narrow Sense (FLN): contains components that are both unique to humans and unique to language
 - (b) Language Faculty - Broad Sense (FLB): contains all components that play a role in the knowledge and processing of language ($FLN \subseteq FLB$ by definition, actually $FLN \subset FLB$)
 - (c) (Internal) Language (FLN) = Interfaces + Recursion (Thesis T) [Chomsky 2010:52]
 - (d) Language = Interfaces + Merge (Strong Minimalist Thesis) [Chomsky 2010:52]



Figure 1: Basic Model of the [HCF 2002]

- (e) Evolution
 - i. FLB has homologues in nonhuman animals and "as a whole, thus has a long evolutionary history, long predating the emergence of language"
 - ii. FLN: its status "as an adaptation is open to question", since "the argument from design" is "nullified".
 - iii. → saltational character of the evolution of language
2. (Pinker & Jackendoff 2005) [P&J2005]:
 - (a) "the language faculty, like other biological systems showing signs of complex adaptive design, is a system of co-adapted traits that evolved by natural selection" (p. 204) (cf. also e.g. [Pinker & Bloom 1990], [Pinker 1994:333], [Jackendoff 2002: chapter 8]).
 - (b) there is much more to the language faculty that is highly specific to human language (FLN) than just recursion and interfaces to other components
 - (c) (e.g. in syntax:) words, word order, agreement, and case marking, all kinds of grammatical words of categories such as auxiliary, complementizer, determiner, etc, and grammatical categories such as case, gender, voice, mood, etc
 - (d) it is not obvious that recursion is specific to language
3. My position: a paradox?
 - (a) FLN is a relatively recent development and is not an adaptation gradually evolved by natural selection (following [HCF 2002])

- (b) FLN is not just recursion and interfaces, but is a richly structured system with many properties that are highly specific to human language (following [P&J2005])
 - i. grammatical category: N,V, A, P, D, C, T, Coord, Num, ...
 - ii. other grammatical features: *person, number, gender/class, case, tense, aspect, mood, force, voice, pronominals v. bound anaphors, ...*
 - iii. and their possible values: *1,2,3; singular, dual, plural etc; masc, fem, neuter, class1,.. classN; nominative, accusative, genitive, dative, ...; etc etc*
 - iv. syntactic selection features: [=N =P], [=N =N] ([Chomsky 1965] here. in [Stabler 2011] style)
 - v. modification features: [=A] (e.g *very* can only modifies phrases of category A)
 - vi. a set ('lexicon') of grammatical items defined in terms of these features
 - A. closed class items (of grammatical category D, C, T, Coord, ...)
 - B. open class items (of grammatical category N, V, A, ...)
 - vii. grammatical relations: *subject, object, indirect object, predicate, head, complement, ...*
 - viii. syntactic selection and modification principles
 - ix. agreement and government/case assignment operations
 - x. non-recursive combinatory operations
- 4. grammatical items: examples¹
 - (a) boys: [cat=N id=boy1 number=pl]
 - (b) children: [cat=N id=child1 number=pl]
 - (c) men: [cat=N id=man1 number=pl]
- 5. phonological/phonetic/orthographic representations, purely morphological properties (e.g declension/conjugation class), and meaning are NOT part of a grammatical item (they belong in PF/S-M and Semantics/C-I)
- 6. Solution for this paradox (preview)
 - (a) (informally) FLN=The Grammatical Module (GM), which 'is a copy of' C-I
 - (b) GM connects C-I and (part of) S-M, accounting for *externalization*
 - (c) The recursive mechanism (*Merge*) \notin FLN but \in FLB (not discussed here, see my TIN-dag and April 8 presentations)

Resolving the Paradox: General Remarks

- 7. FLN is a relatively recent development and is not an adaptation evolved by natural selection

¹elements from C-I will be notated in *UPPER CASE*; elements from GM in *lower case*

8. → the change that caused it must have been very small. (a big change is very unlikely to lead to a well-functioning organism and is unseen elsewhere in evolution).
9. but the change or changes involved must be (cf. [Fitch 2010:55])
 - (a) small at the **genotype** level
 - (b) can be big at the **phenotype** level
10. Examples of independent of language:
 - (a) Neoteny Hypothesis
 - i. "the retention, by adults in a species, of traits previously seen only in juveniles In neoteny, the physiological (or somatic) development of an animal or organism is slowed or delayed Ultimately this process results in the retention, in the adults of a species, of juvenile physical characteristics well into maturity. [Wikipedia]
 - ii. has been invoked as an explanation for the evolutionary development of flightless birds, pets such as dogs (claimed to retain juvenile properties of wolfs), domesticated silver foxes, and humans [Wikipedia]
 - iii. "Man, in his bodily development, is a primate foetus that has become sexually mature". [Bolk 1926]
 - iv. small change at the genotype level (only a few genes for regulating the development of the human body changed) causes a large change at the phenotype level:
 - v. sparse body hair, enlarged heads with high relative brain weight, lactose tolerance, the flatness of the human face compared with other primates, the late arrival of the teeth, loss of pigmentation in skin, eyes, and hair, the form of the external ear, the epicanthic (or Mongolian) eye fold, the central position of the foramen magnum (it migrates backward during the ontogeny of primates), persistence of the cranial sutures to an advanced age, the labia majora of women, the structure of the hand and foot, the form of the pelvis, the ventrally directed position of the sexual canal in women, certain variations of the tooth row and cranial sutures, and *a dozen of additional features*. [Gould 1977]
 - (b) homeotic genes, in particular the so-called hox genes, a special cluster of homeotic genes that determine how a cell has to develop depending on its location in the developing body. [Mayr 2002: 110-111; Deacon 1997:165-192; Ridley 1999; Fitch 2010:53-54,216, 219; Ronshaugen et al 2020].
 - i. flies with these genes mutated started to develop in unusual ways, e.g. "they had legs where they should have antennae, or wings where they should have small stabilizers called halteres" [Ridley 1999:176].
 - ii. Transgenic mice in which both copies of the homeotic gene LIM1 (which appears also to be involved in Williams syndrome) have been knocked out fail to develop heads altogether, even though the remainder of the body develops normally [Deacon 1997:273]

- iii. mutations in the so-called 'gap' genes, which "had big effects, defining whole areas of the body" (Ridley 1999:176)
- 11. → there are **small** genotype level changes that can cause **big** phenotype level changes

Resolving the Paradox: Specific Proposal

Assumptions

- 12. Modularity of the mind/brain
 - (a) Each module operates autonomously (i.e., it functions by its own rules / principles / operations only)
 - (b) is influenced by outputs of other modules only if an explicit interface between the modules enables this.
 - (c) A module is *informationally encapsulated*, i.e. the data structures and operations it uses are invisible to other modules unless they are explicitly made visible via an interface.
 - (d) One may group certain modules in a faculty (e.g. several modules in the language faculty) for convenience but this need not have a basis in reality.
- 13. Modules assumed in our direct ancestor
 - (a) (simple) Conceptual-Intentional Module (C-I) (Fitch 2010:148] [Hurford 2003:44]; [Fitch 2010:18]
 - (b) Emotional-Affective Module (E-A)('fear', 'excitement', 'anger', 'enjoyment', etc.)
 - (c) Social Interaction Module (S-I) cf. [Fitch 2010:237]
 - (d) Sensory-Motor Modules (S-M), among which
 - (e) a module for interpretation/production of mouth-made sounds, gestures and facial expressions (SGF). See [Hauser & Fitch 2003:179] though the assumption made here is stronger. See also [Fitch 2010:174] and [Fitch 2010:495]
- 14. connections between these modules
 - (a) S-M is connected with C-I and E-A
 - (b) SGF is connected with E-A (e.g. alarm calls; [Hauser 1996],[Deacon 1997:234-235])
 - (c) SGF is connected with S-I cf. [Fitch 2010:237]
 - (d) but crucially NOT with C-I [Fitch 2010:148]
- 15. See Figure 2
- 16. Modules assumed in humans
 - (a) all assumed in our direct ancestors, plus

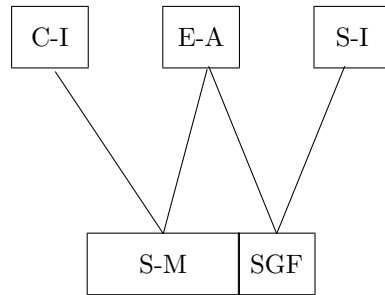


Figure 2: Relevant Modules and their connections in our direct ancestor

- (b) a recursive mechanism (e.g. Chomsky’s *Merge*)
- (c) a grammatical module GM (encompassing parts of syntax and parts of morphology), which defines everything listed in (3b).

17. connections between these modules

- (a) all as with our direct ancestor
- (b) GM is connected with C-I (‘semantics’)
- (c) GM is connected with SGF (‘PF’=phonology, morphophonology, parts of morphology))

18. See Figure 3 :

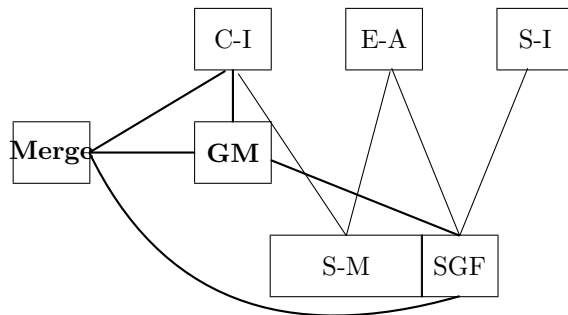


Figure 3: Relevant Modules and their connections in humans

19. Conceptual Copy Hypothesis (CC-Hypothesis, or CCH)

- (a) a small genetic change causes the development of a second module in the brain (GM), modeled after the C-I module
 - (b) GM is the core of FLN
 - (c) copying is at the genotype level: copying of regulatory genes
 - (d) after copying two modules develop instead of one
 - (e) the new module is a separate module, it develops and acts independently and autonomously
 - (f) it will have a different location + intensional specification of connection potential → different connections with other modules
 - (g) Hypothesis: GM connects to C-I and SGF, thus accounting for (what Chomsky calls) *externalization*, but crucially via GM.
 - (h) structured in the same way as C-I but its contents will be completely different because it has a completely different input.
20. Gene Duplication is a major mechanism through which new genetic material is generated during molecular evolution [Ohno 1970] [Friedberg 2011] [Fitch 2010:54-55] http://en.wikipedia.org/wiki/Gene_duplication
21. Some have made similar suggestions, without being as specific as I am here: [Jackendoff 1992:39], [Fitch 2010:430-431]
22. C-I component properties of our direct ancestor (based on [Jackendoff 1992, 1994])
- (a) is independent of language and receives and interprets input from the visual, auditory, tactile, olfactory and taste senses [Jackendoff 1992:33].
 - (b) operates on basic units called concepts (I-concepts in [Jackendoff 1992:22]).
 - (c) no innate concepts ([Jackendoff 1994:190]), but C-I innately determines to a high degree how concepts can be made, how they are structured, what properties they can have, how they are distinguished from other concepts, what relations they can have with other concepts, etc.;
 - (d) new concepts can be formed during one's whole life
 - (e) Concepts are not atomic but composite [Jackendoff 1992:25]
 - (f) limited options for combining concepts, e.g. a concept for an action with (some of) its participants. but NO recursion
 - (g) one has voluntary control over one's conceptual module (one can determine what to think about, and this is not triggered automatically by the direct environment). (plays no role in this presentation, but it does in the full paper)

Towards Evidence

23. Two types of evidence

C-I	GM
concepts	grammatical items
concepts are composite	grammatical items are composite
new concepts can be made (for certain types of concepts)	new grammatical items can be made (for certain types of grammatical items)
no new concepts can be made (for other types of concepts)	no new grammatical items can be made (for other types of grammatical items)
part of C-I is more or less predetermined (quantification, logical relations, conceptual properties)	part of GM is more or less predetermined: grammatical features and the closed class grammatical items.
mechanisms to determine, based on input which concepts to form	mechanisms to determine, based on input which grammatical items to form
limited options for combining concepts	limited options for combining grammatical items
effortlessly and automatically acquired by children	effortlessly and automatically acquired by children
search for concepts (in a set of several tens of thousands) is (apparently) effortless and very fast (direction sensory input → concept)	search for grammatical items (in a set of several tens of thousands) is (apparently) effortless and very fast (direction phonetic form → grammatical item)

Table 1: Global Correlates C-I v. GM

- (a) Global Correlates: the global structure of C-I and GM must be identical
 - (b) Local Correlates: for each conceptual property there must be a correlating grammatical property (in the union of all possible GMs)
24. Global Parallels C-I v. GM: see table 1
25. prediction: critical period for acquisition will be identical for both modules (I do not know what the facts are)
26. Note: These correlates are necessary under the CC-hypothesis and their existence is therefore promising, but they are not necessarily strong arguments in favor of the CC-theory: for that we must exclude any alternative explanation of these correspondences
27. Local Correlates
- (a) Pinker's Table
 - (b) Some specific examples
 - (c) each individual language only provides evidence for grammatical categories for which the PF/SGF component makes form distinctions, or that are necessary because of the internal organisation of GM:
 - (d) The GM of each individual language is only an imperfect reflection of the C-I component

- (e) the union of the GMs of individual languages (actually: the set of possible GMs) will provide the full picture (example: Dutch, English provide no evidence for grammatical feature (or value) *dual*, but other languages do)
28. Pinker's table: see table 2 on page 12 [Pinker 1984]
- (a) set up for a different purpose: semantic bootstrapping hypothesis (which does not concern us here)
 - (b) whether the exact mapping that Pinker proposes is the right one does not concern me for now
 - (c) but what is significant is that such a table with very plausible correspondences between semantic notions and grammatical correlates can be made at all.
29. possible objections
- (a) 'the correspondence exists just because grammatical properties must have a meaning.'
 - i. Many have no meaning at all (e.g. *noun*, *subject*, *nominative*, *syntactic selection features*, etc.).
 - ii. Many grammatical properties have in some cases a meaning (e.g. *number* on nouns in many constructions) but often also not (e.g. *number* on adjectives, verbs and nouns in certain constructions)
 - iii. even with meaning (e.g. PLURAL v. plural), the correspondence is simple: but this is not logically necessary (cf. German plural is realized in PF in 8+ different ways)
 - (b) "syntax presumably evolved as a means to express conceptual structure, so it is natural to expect that some of the structural properties of concepts would be mirrored in the organization of syntax" [Jackendoff 1992:39]
 - i. But there is no logical necessity for this
 - ii. PF/S-M expresses the same but is structured in a completely different way (completely different units, completely different combinatorial principles, complex mappings between GM and S-M) (see plural example above, and German adjectival inflection: 48 GM distinctions mapped onto 5 affixes.
30. the correspondences shown by Pinker's table are promising but not necessarily strong arguments for the CC-hypothesis. We need more specific evidence.
31. The kind of evidence that we need:
- (a) for each conceptual category we must find a corresponding grammatical category (the correspondence must be precise)
 - (b) the conceptual category postulated must be justified independently of language (e.g. evidence from pre-linguistic human babies, other primates, or evidence for explaining phenomena from nonlinguistic input to humans)

- (c) weaker alternative: the conceptual category must be shown to exist for speakers of a language that does not have a correlate grammatical property (example: SPEAKER, ADDRESSEE, OTHER in Japanese demonstratives (*kore, sore, are*), but no grammatical property *person*)
32. Example 1: *number* is a correlate of *NUMEROSITY*
- (a) primates and children before they attain language have a concept of NUMEROSITY [Dehaene 1999:24-25; 66; Pinker 2007:138-141; Fitch 2010:152]
- i. very precise for small numbers (1 - 3) ('small-exact', [Fitch 2010:152])
 - ii. approximate for larger numbers ('large - approximate')
- (b) the grammatical property *number* makes exactly the same distinctions [Corbett 2000]:
- i. *singular-dual-trial* (corresponding to 1-2-3),
 - ii. *paucal-greater paucal-plural* (corresponding to FEW - INTERMEDIATE - MANY) [
- (c) There is no logical necessity for this. It could have been completely different. Example in [Odijk 2011:24] But this is how natural language is structured w.r.t. *number*
33. Example 2: *proper noun/common noun* are correlates of *NAMING INDIVIDUAL OBJECTS / NAMING CLASSES OF OBJECTS*
- (a) bonobos and chimpanzees apparently are able to make the distinction (observed by [Bickerton 2009:80])
- (b) very young children also appreciate this distinction ([Jackendoff 2002:239] reporting on work by [Macnamara 1982])
- (c) all languages subdivide *nouns* in *proper nouns* and *common nouns*
34. correlates (my tentative view), see Table 3 on page 13.
35. Problems
- (a) Case: ??? no correlates of thematic roles despite Pinker's table and Fillmore's "(Deep) Cases". Perhaps [Pesetsky 2010] = (N,V, A, P)),
- (b) pronominals v. bound anaphors: ?? (maybe [Reuland 2011] helps to explain it)
- (c) Agreement, Case Assignment: ???
- (d) word v. clitic v. affix: not just PF distinctions? cf. *special clitics* e.g. in French
- i. Jean voit Pierre/*le
 - ii. Jean *Pierre/le voit
 - iii. Jean a vu Pierre/*le
 - iv. Jean a *Pierre/*le vu
 - v. Jean *Pierre/l' a vu

Concluding Remarks

36. The CC-Theory has been presented. It is, if correct, an attractive theory:
- almost all of (3b) is explained from a very small evolutionary change
 - the character of the evolutionary change is biologically and evolutionary plausible
 - Also Chomsky needs a second evolutionary event to account for *externalization*. The CC-Theory makes a specific proposal for this, with a far wider scope than just externalization
 - GM is evolutionary young, but since it is modeled after C-I, which is evolutionary much older, GM gets a rich evolutionary history 'for free'
 - it provides a basis and a rationale for *substantive universals* involving formal grammatical categories [Chomsky 1965:28]
 - it offers possibilities to merge insights from Cognitive Grammar ([Langacker 1999]) with grammar frameworks that assume autonomy of syntax
 - It is falsifiable since it describes the components involved in language in the human mind/brain. Our direct ancestor can be approximated by investigating contemporary primates. Evidence can be obtained from linguistics, cognitive science, psycholinguistics, biology/ neurophysiology /neuro-imaging of the human brain itself and as compared to animal brains, etc. etc.
 - if it can be established for a significant set of grammatical categories, it might lead to new opportunities for investigating the C-I component via the G-M component
37. However, research on it is not easy:
- (a) It attempts to explain properties of GM (of which we think we know something) on the basis of properties of C-I (of which we know that we know hardly anything)
 - (b) What we know of C-I often comes through language (so there is a danger of circularity here)
 - (c) It is essential to obtain evidence on C-I that is independent of language
 - i. by showing that it plays a role in nonlinguistic beings such as primates or other animals, or
 - ii. in prelinguistic beings such as very young children, or
 - iii. at the very least that there is evidence for a conceptual category independent of the correlating grammatical category (e.g in a language that does not distinguish the relevant grammatical category).

References

See the full paper for most references except the following ones:

Friedberg 1970 Friedberg, Felix (2011), Gene Duplication. ISBN 978-953-307-387-3, Hard cover, 400 pages, Publisher: InTech, Published: October 21, 2011 under CC BY 3.0 license DOI: 10.5772/88

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Grammatical Element	Semantic Inductive basis
<i>Syntactic Categories</i>	
Noun	Name of person or thing
Verb	Action or change of state
Adjective	Attribute
Preposition	spatial relation, path or direction
Sentence	main proposition
<i>Grammatical Functions</i>	
Subject	agent of action; cause of causal event; subject of an attribution of location, state or circumstance; argument with autonomous reference
Object or Object2	Patient or Theme
Oblique	Source, Goal, location, instrument
Complement	proposition serving as an argument within another proposition
Topic	Discourse topic distinct from the arguments of the main predicate
Focus	Discourse Focus
<i>Cases</i>	
Nominative or Ergative	Agent of Transitive action
Accusative or Absolutive	Patient or Theme of transitive action
Nominative or Absolutive	Actor of intransitive action
Dative	Goal or Beneficiary
Instrumental	Instrument
etc.	
<i>Grammatical Features</i>	
Tense	Relative Times of event, speech act and reference point
Aspect	Durativity
Number	Number
Human	Humanness
Animate	Animacy
<i>Tree Configurations</i>	
Sister of X	Argument of X
Sister of X' (Aunt of X)	Restrictive modifier of X
Sister of X'' (Great-aunt of X)	Nonrestrictive modifier of X

Table 2: Pinker's table of correspondence for semantic bootstrapping

GM	C-I
grammatical category	conceptual categories
other grammatical features and their values	conceptual categories
syntactic selection features	semantic selectional properties
modification features	semantic selectional properties
a set ('lexicon') of open class grammatical items	a set of freely composable concepts
a set ('lexicon') of closed class grammatical items	a set of largely pre-determined concepts
grammatical relations	thematic relations
syntactic selection and modification principles	semantic selection principles
agreement and government/case assignment operations	???

Table 3: Table of global correspondences (Odijk's view)