Did Homo erectus use an RRG grammar?
RRG -2019

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Language is a *Biocultural* Behavior

- Language is a biocultural behaviour. Thus research into its origins is necessarily an interdisciplinary exercise. Models of language origins typically integrate social, cognitive, anatomical and genetic data with broad comparative perspectives drawn from ethology while archaeology provides the critical time-depth for model-building. Although there is widespread agreement that symbols are crucial to language, there is profound disagreement on what constitutes language and when it evolved.

What Evidence is Available to Tell This Story?

- Archaeology
- Linguistics & Field Research on Contemporary Languages
- Semiotics
- Comparative Biology
- Philosophy
- Cognitive Science
- Paleoneuroscience
- Neuroscience
- Evolutionary Theory
- Genetics

What IS Language?

- A set of sentences described by a recursive grammar
- OR
- Transfer of information via symbols.

Who Has Language?

- All entities in the world, arguably even minerals, *communicate*.
- Only humans appear to have *Language.*

Communication vs. Language

- Communication is the transfer of information via *signs.*
- Language is the transfer of information via *symbols.*

Symbols and Signs

- Index: A sign connected physically to its referent.
  - Footprints; smoke; smells; pointing…
- Icon: A sign that resembles its referent.
  - Photograph; painting; diagram; blueprints…
- Symbol: A sign that picks out a referent by convention
  - "Dog" means 'canine' because English speakers agree that it does.

Gradual or Sudden?

- The threshold to symbols was likely sudden. But the evolution of the platforms for language took time.
- One view is that language is about 100-200,000 years old.
- An alternative view, my own, is that language has existed for 60,000 plus *generations*, or more than 1 million years old. This is my proposal. In this time that we have together, I am going to tell you why I believe this.

Speech vs. Language

- **Speech is secondary; language is primary**
  - There are languages that can be whistled, hummed, or spoken with very few sounds.
  - Computers get by with two "sounds"
- Many are coming to believe that erectus, in fact many other animals (if Fitch is correct) had the capacity for modern human speech.
- Quantal vowels: i, a, u
  - Found in all of the world's languages
  - Easiest to hear
  - Already there or came later?
  - Laitman & Lieberman vs. Fitch
- Blasi and Rogers, and C. Everett all argue for exo-centric factors – inter alia – affecting speech evolution

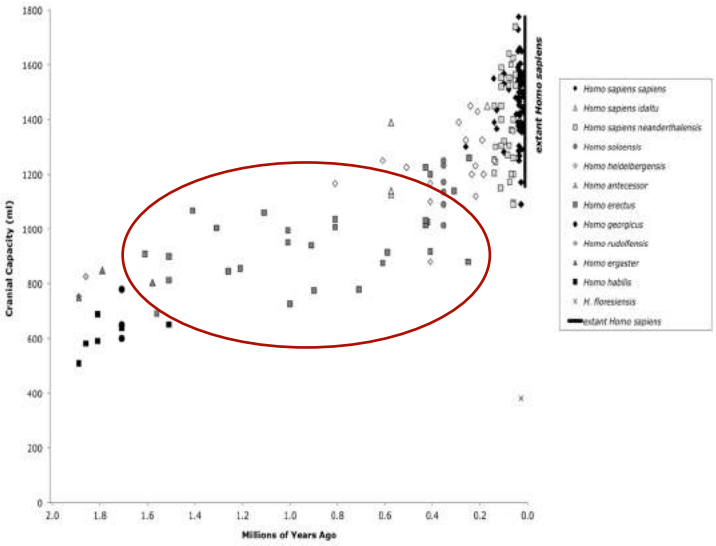
Who Was Homo erectus?

- 1.8mya-140kya – most successful species in the history of the genus Homo
- 5'8"-5'11"
- 950cc brains (overlapping in range with some European sapiens females)
- Wide-ranging, polymorphic species.
- Arguably possessed modern vocal apparatus (if not, no big deal – the body evolves to support new abilities that enhance survival – e.g. language).
- Ocean-traveler, tool-maker, cultural, invented fire, communities

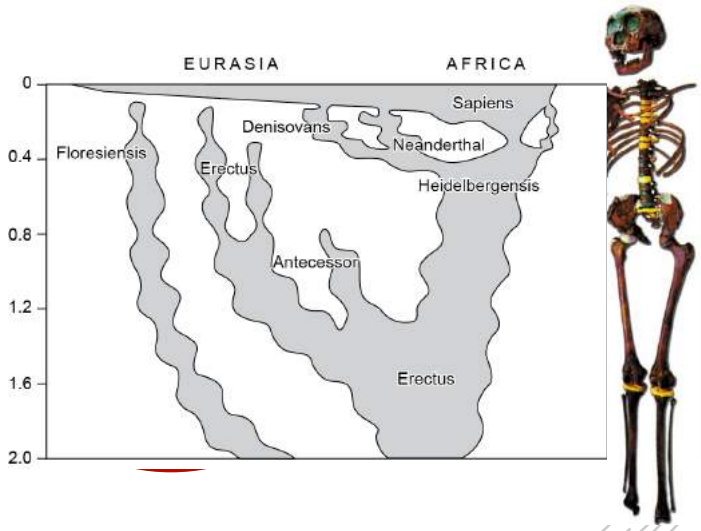
Opposing Views (There Are Always Opposing Views!)

- Gradualist vs. saltationist views of language origins.
- Grammar vs. symbols (words, constructions, etc) as the starting point.
- Uniquely human or non-unique human set of human abilities shared with other animals.
- Cartesian vs. non-Cartesian models.

Evolution of the Brain



Human ancestry, 2012 model



19TH Century Philosopher Charles Sanders Peirce

- Invented formal logic before Frege (1870)
- Invented Semiotics before Saussure (1867)
- Invented Pragmatism (1878; name co-opted by W. James)
- Considered America's greatest mathematician.
- Other fundamental discoveries in mathematics, chemistry, geology, astronomy, and other fields.

Dark Matter of the Mind (Everett 2016)

- **Dark matter of the mind:** any knowledge unspoken in normal circumstances, usually unarticulated even to ourselves. It may be ineffable.
- **DMM** emerges from acting, "languaging" and "culturing" as we learn conventions and knowledge organization, and adopt value properties and orderings. It is shared and it is personal. It comes via emicization, apperceptions, and memory, and thereby produces our sense of "self".

What is Culture (Everett 2016)

- **Culture** is an abstract network shaping and connecting social roles, hierarchically structured knowledge domains, and ranked values. **Culture** is dynamic, shifting, reinterpreted moment by moment. **Culture** is only found in the bodies (the brain is part of the body) and behaviors of its members.

Universal Grammar: Logical, Interactional or Biological?

- First UG – logical properties of signification, neither nature nor nurture (Modistae 13th and 14th centuries; C.S. Peirce 19th and 20th centuries). Built on semiotic (sign)_ relationships, not syntax.
- Second UG – Major argument: "my granddaughter is not a kitten nor a rock" –
  - No one denies that language is based on biology. That is not the question. The question is whether the biology is specific to language.
- Both UGs have recursion: Peirce's has *semantic* primarily; Chomsky's *syntactic* primarily. The crucial issue is whether language is mainly about ***form*** or ***meaning.***

Tools Are Social Conventions

- Individual devices or process that meets perceived needs of individuals, communities.
- A set of devices, processes, and expertise used to harness the properties of a particular material.
- Full culturally-constructed repertoire of knowledge, conventions, devices, and processes. Values are vital at each stage/level.

Human Technology

- Enmesh the material with the ideational.
- Social constructivism.
- ***Tools become symbols*** as they emerge from the values, knowledge structures, and social roles of a particular culture.

Implications of Social Constructivism

- Learning of technical skills takes place using a combination of language, gesture, imitation, and guided intervention. (This applies to all erectus, neanderthalensis, and sapiens tools.)
- Based on lab experiments with stone-tool learners.
- My experience in the Amazon – e.g. Banawa blow guns.

Signs

- Object –
- Representation –
- Interpretation –

Indexes

- All animals – physical connection to "referent"
- Nonintentional
- Nonarbitrary
- Displacement

Icons

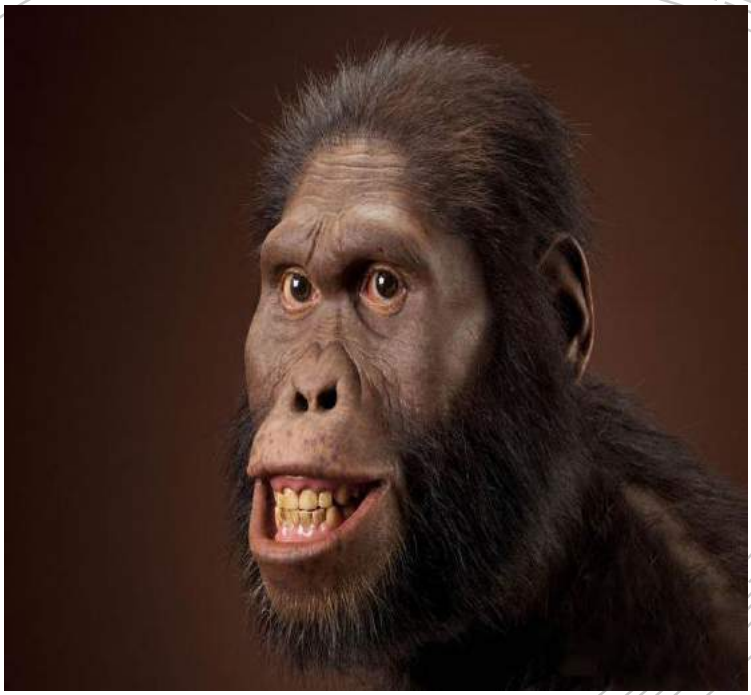
- Physical resemblance
- Nonintentional
- Nonarbitrary
- Displacement/representation

Symbols

- 1. Conventional
- 2. Intentional in form and interpretant
- 3. Displacement
- 4. Symbols are the prerequisites for language.
  - No symbols → no language.

Fossil Indexes (Au.af.): Laetoli Footprints: ca. 3.7mya

Australopithecus africanus

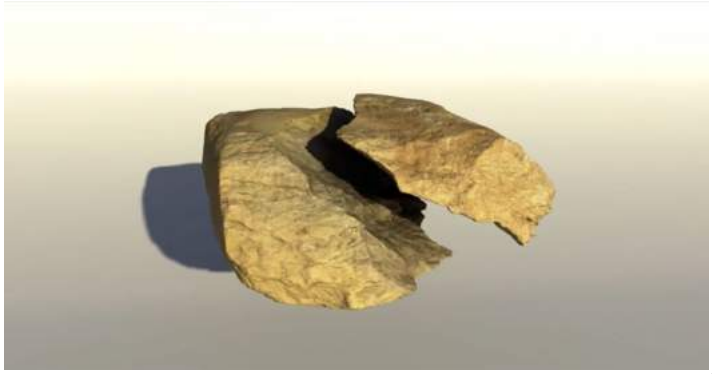


Makapangsgat Pebble
ca 3mya

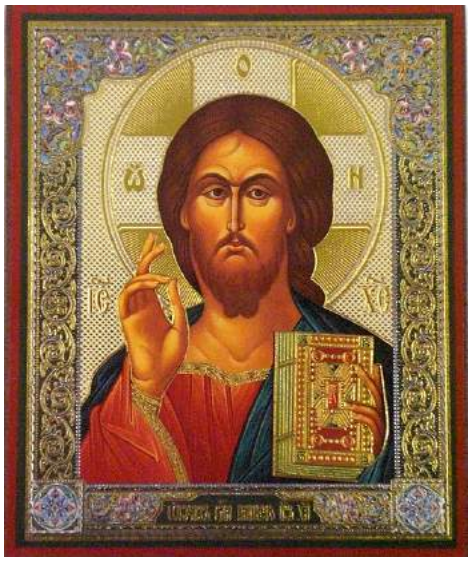
Australopithicene Tools

Earliest Stone Technology, 3.3mya, Lomekwi 3, Kenya

No Imposition of Form; Hammer on Anvil



Icons



Symbols (Conventional, Displaced Meaning)

Symbols to Grammars

- G_1 grammars allow symbols to be arranged by linear precedence rules only – no hierarchy, no recursion.
- A G_2 grammar allows structures with hierarchy, but does not allow recursive structures.
- A G_3 grammar allows structures with both recursion and hierarchy.
- Symbols are crucial; grammar is secondary (cf. Murphy 2017)

Erectus Icons

- **Humans Represent Anything**

Erfoud Manuport
ca. 300kya

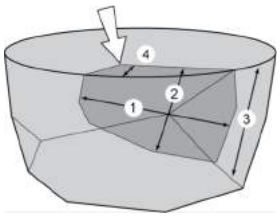
H. erectus and Acheulean technology: intentional tool forms: handaxe, cleaver, pick from 1.8 million to 200,000 years ago

Refined (thinned) handaxe, Late Acheulean, South Africa

Shaping = imagination, intention, planning, memory

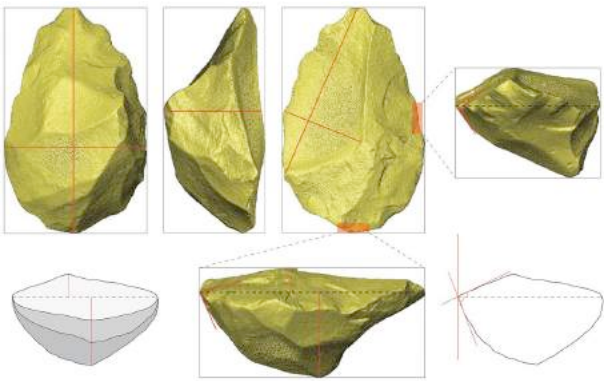
H. erectus inventions & innovations

- Controlled use of fire
- Pre-shaping stone tools
- Use of wood, bone tools



Hierarchical planning for pre-shaping block to remove large flake blank for making a cleaver

Prepared cores, south & north Africa – ~1 million years ago (Li et al. 2017 Royal Society Open Science 4)



Late Acheulean innovations after 1 million years ago

- **~900-800 ka**: early prepared core technologies (Li et al. 2017); 'hand points' – small bifaces (Gowlett et al. 2017); soft hammer thinning (Galloti et al. 2010)
- **~550-500 ka**: blades (Johnson & McBrearty 2010; Wilkins & Chazan 2012); and controlled use of fire
- **~500-300 ka**: ochre use (Deino & McBrearty 2002; Watts et al. 2016; Brooks et al. 2018); **hafting** (Ambrose 2010; Barham 2013; Sahle et al. 2013; Wilkins et al. 2012, 2014); Levallois technologies, MSA points (Brooks et al. 2018)

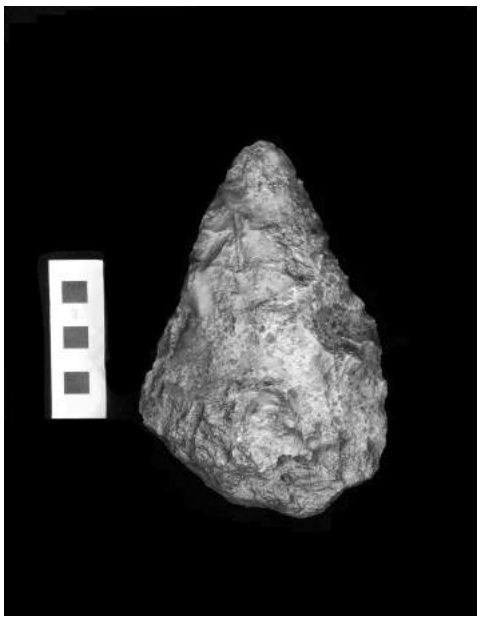
Hafting (Attaching Tools to Tools - e.g. a handle)

- Combinatory thinking; imagining the future.
- But imagining the future is found in other tools.
- Likely invented by erectus. One of the most significant technological breakthroughs in history.

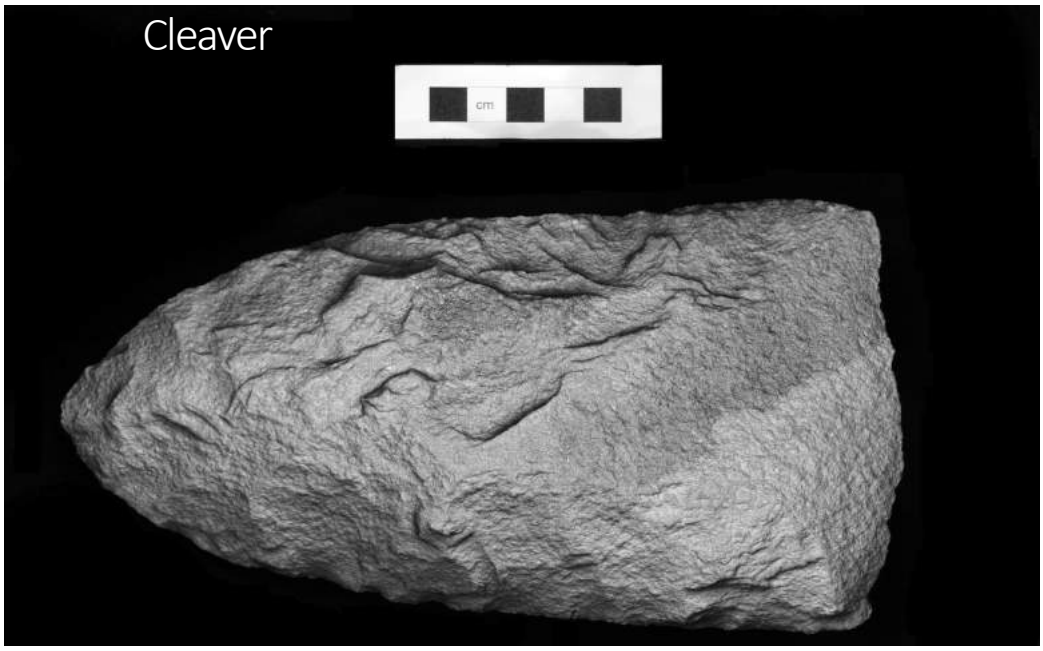
Beyond Function: Ochre

- The use of ochre is significant for the idea that they were symbols. (500kya)
- New work in progress by Barham suggests as early as 900kya erectus put tools through a multi-stage process to dye them. (Dating not yet confirmed, so not to be cited.)

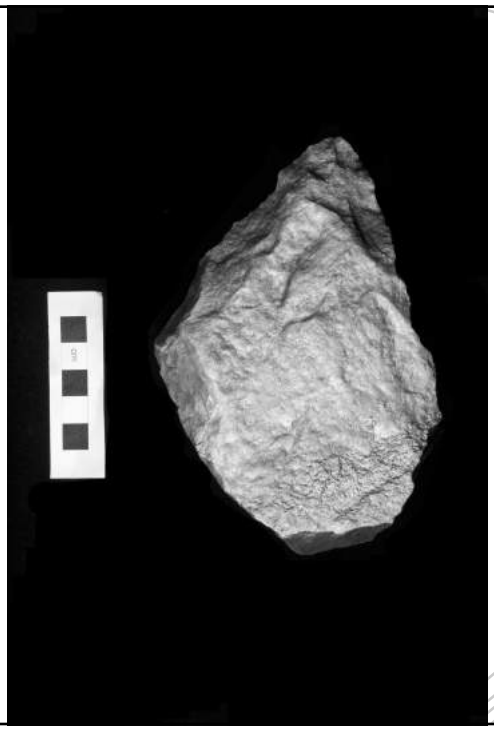
Handaxe



Cleaver



Pick

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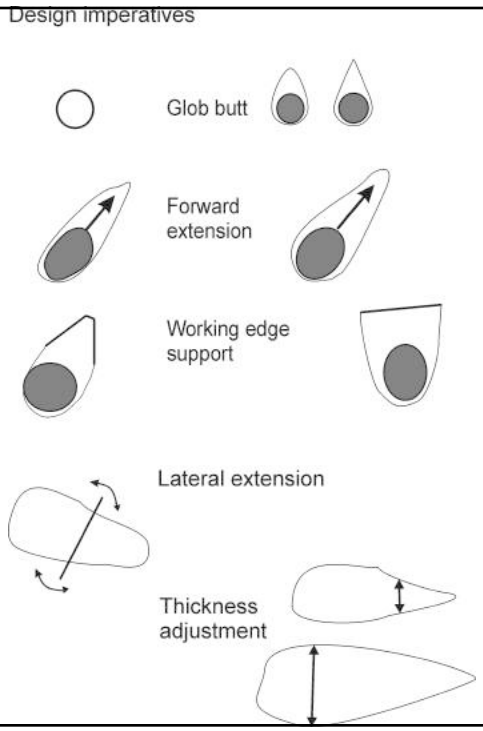
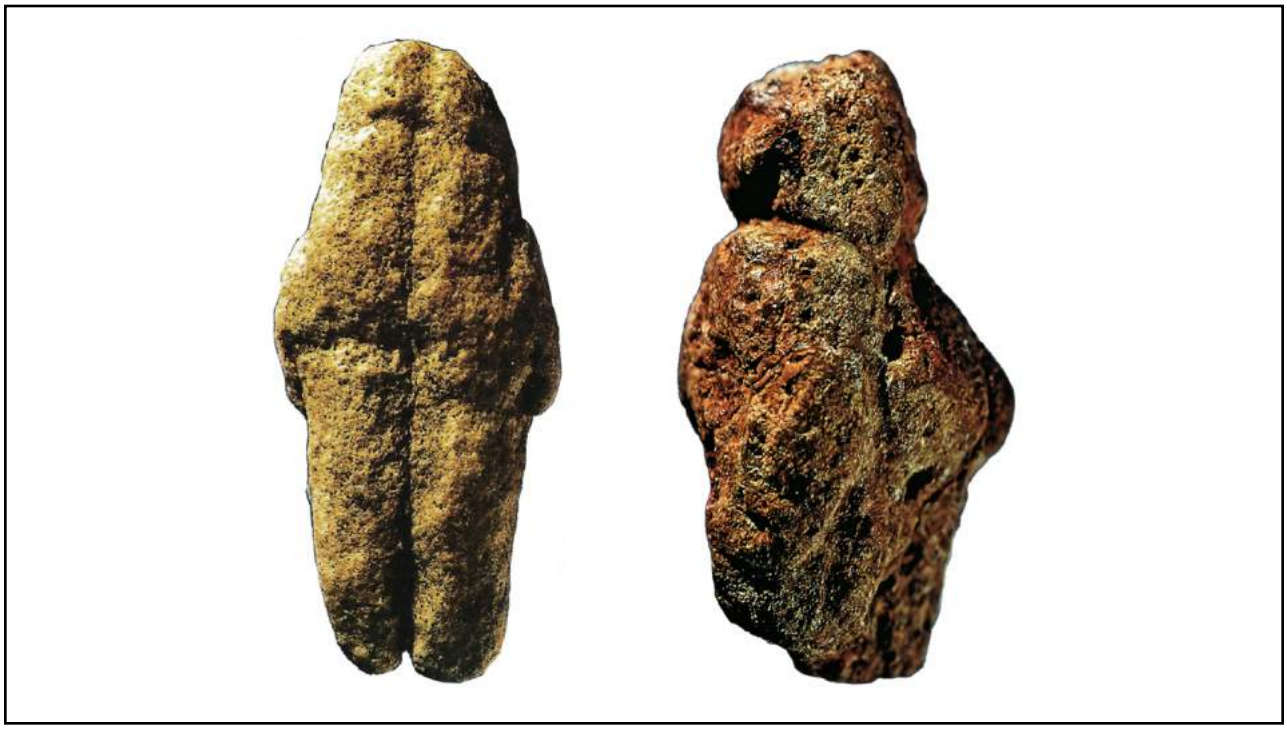


End of Acheulean, Mieso, Ethiopia, 212 Ka (de la Torre et al. 2014 *JHE*)

Very late Acheulean co-existing with Middle Stone Age at Mieso



Erectus Tools: Implications

- 1. Symbolic & social components
- 2. Tools simultaneously indexes (of task); icons (of other tools); symbols (of the values and labor of the community).
- 3. Symbols in linear order = language
- 4. The leap to "grammar" is far smaller than the leap to symbols.
- 5. No need for proto-language.
- 6. Culture in the sense defined here is the threshhold.

Getting to Modern Languages from Erectus (Steels; Everett)

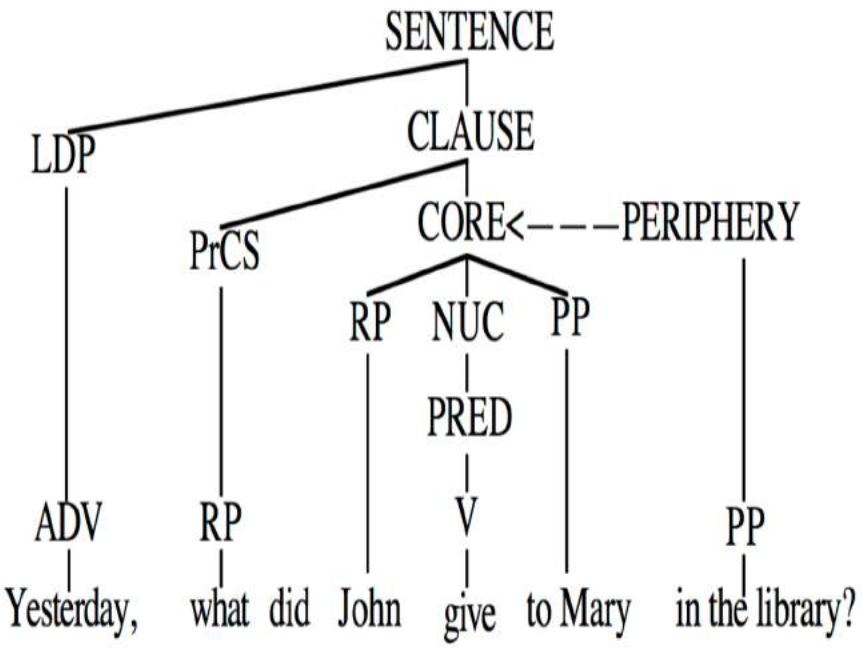
- (i) language systems (systematic domains of vocabulary or grammar, e.g. tense- aspect, colour terms, etc.) – *Objects;*
- (ii) conceptual systems (pragmatic and semantic distinctions expressible in the language – *Interpretants;*
- (iii) linguistic systems (rules and structure of syntax, morphology, phonology). *Forms*
- *All of these are additions; none are crucial to language*

What is a likely semeiotic grammar?

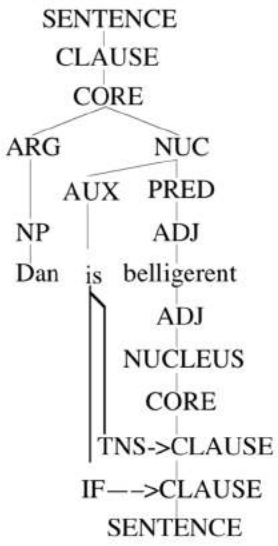
- Initially, linear order. How is linear order of symbols likely to be synthesized into something more?
- A natural, iconic representation of semeiotic relationships
- Taking the *dicisign* information as basic (a dicisign is roughly a proposition).
- Index (subject), icon (predicate), symbol (proposition/dicisign).

Index, Icon, Symbol: The Dicisign

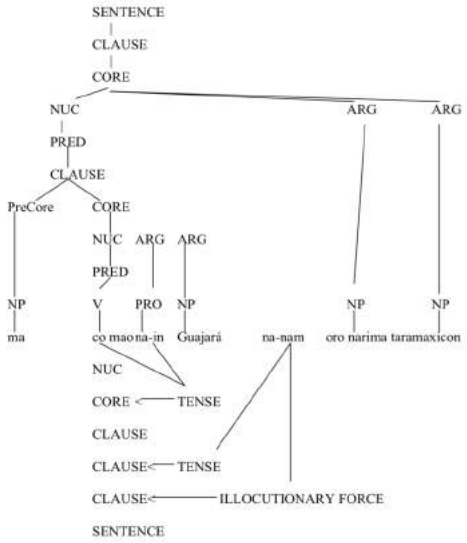
- Propositional structure is found in many places: pictures, weather vanes, sentences, lexical representations, RRG structures
- The first combination of symbols would have produced a dicisign – i.e. where the semantics are the core to the syntax. The syntax being a way of expressing the semantics (at least initially).
- Since RRG produces lexical representations, clausal representations as the "Core" of the grammar, it is preferred to a syntactocentric grammar that cannot as easily interface with the known evolutionary trajectory of icon -> index -> symbol.



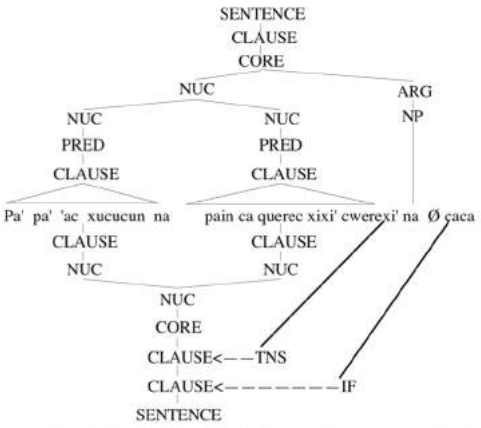
Basic RRG Clause Structures: Subject = index; Predicate = icon; Clause = symbol.



More complex: Wari' Intentional State Constructions: Icons within Icons and Indexes



Wari' complex nuclei



'Then they hit (lit:kill) each other because they want to see the body.' (lit: '(Then) it (is that) they hit (kill) each other [because they (say), "We should see the body consenting."]')

Enhancement: Layering

- *Yesterday*, what did JOHN give to Mary in the library?

Levels of Sound Enhancement (Phonology)

- Phonemes
- Syllables
- Phonological words
- Phonological phrases
- Phonological paragraphs
- Phonological texts
- Conversational features

Enhancement in Grammar

- Representing Grammat Hierarchically (in the brain)

Grammatical Enhancement Levels

- Morpheme (e.g. suffixes and affixes)
- Word
- Phrase
- Sentence
- Paragraph
- Discourse
- Conversation

Enhancements: Gestures

- Some enhancements, including many gestures and sound layering, are there from the beginning.

Evidence for Erectus Language: Travels

- **Middle East:**
  - *Gesher Benot Ya'aqov (790kya)*
  - *Erq al-Ahmar (1.95mya)*
  - *Ubeidya (1.4mya)*
  - *Bizat Ruhama (1.96mya)*
- **Italy**
  - *Pirro Nord (1.6mya)*
- **Turkey**
  - *Dursunlu (before 1mya)*
- **Iran**
  - *Kashafrud (before 1mya)*
- **Pakistan**
  - *Riwat (before 1mya)*
  - *Pabbi Hills (before 1mya)*
- **Georgia** (before 1mya)
- **Spain** (before 1mya)
- **Indonesia** (around 1mya)
- **China** (before 1mya)

Gesher Benot Ya'aqov (790kya)

- Controlled use of fire
- Specialized spaces: "*Spatial Organization of Hominin Activities at Gesher Benot Ya'aqov, Israel*, authored by Nira Alperson-Afil *et al*, in which they reflect upon the organisational abilities of archaic humans in the Lower Palaeolithic of the Middle Pleistocene, who at GBY, represent the oldest known fisher-hunter-gatherers so far discovered in the archaeological record. It's fair to say this paper has made something of an impact, with the general consensus being that archaic humans of this era were capable of organisational behaviours similar to that of anatomically modern humans…"

GBY

- The spatial designation of discrete areas for different activities reflects formalized conceptualization of a living space. The results of spatial analyses of a Middle Pleistocene Acheulean archaeological horizon (about 750,000 years ago) at Gesher Benot Ya'aqov, Israel, indicate that hominins differentiated their activities (stone knapping, tool use, floral and faunal processing and consumption) across space. These were organized in two main areas, including multiple activities around a hearth. The diversity of human activities and the distinctive patterning with which they are organized implies advanced organizational skills of the Gesher Benot Ya'aqov hominins.

Ocean Travel

Socotra: 1.4mya

Culture emerging: Values

Schoeningen Spears: Values; Social Organization

Erectus & Language Summary

- 1.5 million years ago - G1 Language (at a minimum – could have been G3 or G2)
- Separate bands – dialects, cultures
- Language-implying tasks:
  - Tools as cultural products are symbols
  - Status symbols and sailing
  - Space specialization in erectus settlements

How Old Is Language?

- 1.5-2 Million Years Old
- Neanderthals and Sapiens Were Born Into a Linguistic World
- Icons -> Indexes -> Symbols -> Dicisigns -> RRG (perhaps 2 million years ago, with growing innovations and additions).

The Family

Getting to the Present