The steady growth of hominin cranial capacity during the Lower and Middle Paleolithic (L/MP) supported the emergence of controlled vocalizations, orchestrated mimetic techniques, deductive tracking skills and exogrammatic information storage. 'Exograms' are defined as memory traces stored outside the brain as consciously-sequenced information packages meant to stabilize abstract calibrations of reality. The first instances of their use document the universal emergence of a species-specific objective state of consciousness. Although the ability to produce them is a biological development, the transmission of exogrammatic meaning becomes culturally-conditioned. As all the faculties listed above were in place long before the Aurignacian, the Upper Paleolithic (UP) ‘revolution’—unlike the L/MP transition—cannot be attributed to changes in the size or shape of the cranium. The period was rather characterized by accelerated cognitive specialization to deterministically-predictable cultural niches constructed in unreliable environments. By adapting to their calibrated models of reality, archaic populations underwent rapid physiological/psychological transformations. It is contended that the UP ‘creative explosion’ illustrates the attempt to counter cognitive losses inherent in cumulative cultural evolution and incipient self-domestication.

Unfortunately, by considering the cumulative type of cultural evolution as the ‘natural choice’ of all cognitively modern humans, gene–culture coevolution theory implies that the ‘ratcheting’ of innovations is the only index of ‘progress.’ In the modelling of the theory the stress is placed on social complexity, the absence of which would render small and isolated populations vulnerable to the ‘treadmill effect,’ the inevitable consequence of impaired social learning. However, the anthropological literature documents isolated hunter-gatherer groups that have developed intricate exchange networks that do not necessarily rely on technological innovation and function only in low demographical settings. Not only that the biases upon which transmission depends in cumulative cultural evolution—prestige, skills, success—are unknown, but certain ‘leveling mechanisms’ inhibit these very parameters and thus, no cultural models can rise to prominence. Contrary to the predictions of the theory, these societies do not seem to be plagued by cultural ‘loss’ and, instead of hopelessly running the treadmill and living in poverty, they have developed egalitarian and, to an extent, ‘affluent’ societies.

Populations following a non-cumulative type of cultural evolution—known in anthropology as ‘immediate-return’ hunters-gatherers—are often described as ‘pedomorphic,’ due to their markedly neotenous morphological features and cognitive attitudes. On the other hand, populations that follow a cumulative type of cultural evolution are surprisingly ‘robust’ phenotypes. In the case of the latter, a cultural ‘sudden jump’ seems to have occurred during the Late Pleistocene which, in its turn, resulted in the entrenchment of archaic behavioral traits and the establishment of hierarchical societies. Conversely, with certain isolated hunters-gatherers, a cultural ‘regression’ seems to have taken place during the Early Holocene. The adoption of a cultural ‘primitivism’—immediate-return subsistence—offered a degree of evolutionary flexibility that allowed for a neotenal leap. This, in its turn, enabled the reduction of archaic behavioral traits and the emergence of egalitarian societies.
The archaeological record documents both L/MP examples of iconic understanding and UP instances of abstract representation: the relationship between them is rather complementary than linear.

- The anthropological literature mentions cultures that favor ‘meaningful’ abstract patterns over ‘childish’ iconic illustrations (but also instances in which there is a balanced and simultaneous use of both).
ANATOMICAL (A) + BEHAVIORAL (B) + COGNITIVE (C) CHANGES IN ARTIFICIAL ENVIRONMENTS (as observed with chimpanzees and bonobos)

Kanzi’s ‘giraffe’

Kanzi’s early *Homo*-type ‘tools’

Kanzi’s ‘rabbit’

Markedly advanced bipedal locomotion/gait
ANDAMANESE JARAWAS: 
‘MEANINGFUL’ PATTERNS IN A NATURAL ENVIRONMENT / ‘CHILDISH’ DRAWINGS IN AN ARTIFICIAL (HOSPITAL) ENVIRONMENT

Jarawa headband featuring a traditional woven pattern

Jarawa chestguard featuring a painted red on white pattern

Iconographic drawings of the Jarawa boy Emmy (Sreenathan et al. 2008)
The Eurasian Upper Paleolithic transition should not be perceived as the replacement of one species with another but as a *culturally-determined* behavioral ‘sudden jump’ followed by a morphological transition within the same [cognitively already modern] species.
A COMPARISON OF HOMININ EVOLUTION AND TECHNOLOGY IN WESTERN EURASIA/NORTH AFRICA (left) AND SOUTHERN AFRICA (right) SHOWING THE RELATIVE DURATIONS OF THE USE OF MAJOR PALEOART FORMS IN THE PLEISTOCENE. (Although there are differences in the duration of some of the indices, none of the regions can be regarded as a source area for the general use of exograms.)

L/MP pigment use, engravings and notches, beads and pendants, cupules: indexes of [biologically-developed] CONSCIOUSNESS and COGNITIVE ‘MODERNITY’


EXOGRAMS: EXTERNALLY STORED ‘MEMORY TRACES’
- Do you remember your first kiss?
- How does she/he remember it?

Short-term memory storage

Long-term memory [re]consolidation

(Thum et al. 2007; De Jaeger et al. 2014)
Collective memory can be constructed, fixed and passed on, by small and/or large social groups. (Wikipedia)

EXOGRAMS = ‘memory traces’ stored outside the brain as consciously-sequenced long-term information packages meant to stabilize causal calibrations of reality.
High-fidelity cultural transmission of Dreamtime stories ‘fixed in stone’

+ (RHYTHM + MUSIC + DANCE + SONG) = ‘STABILIZED’ RITUAL TRANSMISSION

* via material + non-material ‘mnemonic techniques’
“Science is the attempt to make the chaotic diversity of our sense-experience correspond to a logically uniform [unified] system of thought.”

- Albert Einstein

“The capacity to shift between associative—conducive to forging new and random concept combinations—and analytic thought, conducive to manifesting them in an ordered, reciprocally understandable fashion.”

“Symbolic thinking led to a fundamentally different way to compute data, one that extracts only the essence required for abstract representation instead of computing the entire set of incoming raw information.”

(cf. Mithen 1996; Dauvois 1996; Tattersall 2017; Spikins 2018)
THE ORIGINS OF THE MODERN MIND
(Donald 1991)

With *H. erectus*, the vocal and neurological apparatus for voluntary control over the structure and complexity of vocal utterances fully-developed ➔ Extended and planned sequences of such utterances likely common 600 ka ago.

“Short sequences of vocalizations consciously-controlled for pitch/contour/intensity would be communicative in their own right. As control increased, the length/complexity of sequences could also increase.

Subsequently, the order in which the expressive vocalizations occurred could assume meaning.”

Three uniquely human systems of memory representation:

1) Mimetic (*H. erectus* - 1.5 million years BP); 2) Lexical (Archaic *H. sapiens* - 300 ka BP); 3) External (‘anatomically modern humans’ - 40 ka BP).

**BUT:** Evidence points to a single transition instead of 3 distinct punctuations ➔ the cognitive expressions of the 1st + 2nd ‘stages’ include all the abilities attributed to the 3rd.
FROM **NUMBER SENSE TO NUMBER SYMBOL**  
(d’Errico et al. 2017)

- Cultural exaptations

Exosomatic devices meant to store numerical information were in use with archaic humans during the African MSA and the European MP.

**HOW MAN MADE LANGUAGE, HOW LANGUAGE MADE MAN**  
(Bickerton 2009)

**BIOLOGICAL TIME**  
(Taylor 2017)

**ART**  
(sensu Ellul 1964; Zerzan 1999)

**ORCHESTRATED REDUCTION (OR)**  
(Penrose and Hameroff 2011)

- Copenhagen

Conscious observation *results in* quantum state reduction.

- OR

Consciousness *is the result of* quantum state reduction.

FROM PHENOMENAL [P-] TO ACCESS [A-] CONSCIOUSNESS  
(Block 1995)

- **P-consciousness**

Raw experience of movement, colors, forms, sounds, sensations, emotions and feelings, with our bodies and responses at the center.

- **A-consciousness**

Information stored in our mind made accessible for verbal report, reasoning, and the control of behavior.
FROM [P-] SENSE TO [A-] SYMBOL
(d’Errico et al. 2017; Block 1995)

Blombos Cave, South Africa
(d’Errico et al. 2013, 2018)

Gorham’s Cave, Gibraltar
(Rodriguez-Vidal et al. 2014)
(>39 ka)

Kiik – Koba, Crimea
(Majkić et al. 2018) (Mousterian)

Baboon fibula from Border Cave, South Africa
(44 ka)

Fragment of a hyena femur from Les Pradelles, France
(72 ka)

Stone plaque with engraved lines, Wonderwerk Cave,
South Africa (c. 300 ka) (Bednarik 2013)

Engravings on a forest elephant tibia, Bilzingsleben,
Germany (>325 ka) (Bednarik 2014)

Grooves on a bovid bone, Kozarnika Cave, Bulgaria
(>1 million years old?) (Bednarik 2014)
Bonobos?  Chimpanzees?  + Punctuated equilibria
THE TEMPO AND MODE OF EVOLUTION RECONSIDERED
(Gould and Eldredge 1977)

Blaga’s (1943) ‘New Approach’ to evolution
through ‘sudden jumps’, by conserving neotenous features
(on neoteny, see Ashley Montagu 1989; Charlton 2006; Gould 1977; Haeckel 1883; Hulse 1962)
THE UPPER PALEOLITHIC ‘SINGULARITY’

When the rate of cultural change becomes faster than that of biological evolution.

Nyborg’s ‘Cyborgs’

- Archaic H. sapiens
- C - A - B
- C - B - A
- Operational range of the ‘CONTEXTUAL FOCUS’

NC is the process in which an organism alters its own—or other species'—environment, often but not always, in a manner that increases its chances of survival. Changes that organisms bring about in their worlds that are of no evolutionary or ecological consequence are not examples of niche construction.

(Odling-Smee et al. 1997)

Ratcheting techniques/
Treadmill effect
(Tomasello 1999/
Henrich 2004)
(contra: Andersson & Read 2016)

Leveling mechanisms
(Woodburn 1982)

ONLY WHEN BOTH MECHANISMS CONSIDERED DO WE GAIN A COMPLETE PICTURE OF CULTURAL EVOLUTION [WITHIN A CONSTRUCTED NICHE]
LATE NEANDERTHAL SOCIAL MEMORY UNITS (SMU)  
Richter 2000  

Social memory is the ability of a group of humans to maintain a specific set of information by means of tradition over many generations.  

- The more individuals contribute to and participate in such a pool of ideas and concepts, the higher the chance for successful transmission and for long-term maintenance of the pool's contents.  

- By contrast, a small population which is isolated from others may develop specific ideas and concepts which get lost as soon as the population becomes extinct by starvation or other factors.  

Accumulation (left) vs. Reduction (right) of:  

- Prestige  
- Power  
- Wealth... and of the biases they pertain (sensu DIT)  

‘LEVELING MECHANISMS’ (LM)  
Woodburn 1982  

10,000 YEARS OF CULTURAL NEOTENY  

Culturally-refined ‘regulation’ of:  

- Mobility and flexibility  
- Access to means of coercion  
- Access to food and other resources  
- Sharing  
- Sanctions on the accumulation of personal possessions  
- The transmission of possessions between people  
- Leadership and decision-making  

- Leveling mechanisms disengage people from property and inhibit the elaboration of social complexity (without the risk of cultural loss through the ‘treadmill effect’).  

5 distinct social memory units identified in the European OIS 4 and OIS 3; 60 to 40 ka

**Cultural gracilization vs. Biological neoteny**

Depiction of male/female relative cranial gracility in Europe through time: the decline in robusticity is gradual in males, but accelerated in females between 40 and 30 ka (Bednarik 2008, 2017). After continuously growing in size over the span of the Pleistocene, our brain volume has contracted by 13% in the past 20,000 years or so (Hawks 2011).

NOTES - Switch in the deletion/duplication of NOTCH2NL genes in a cultural environment? (Fiddes et al. 2018) - From ‘autism’ to ‘schizophrenia’? (Srinivasan et al. 2015; Spikins et al. 2018)
CULTURAL SPECIATION

- Biological response to the LGM
- Neoteny leap
- Cultural reduction to IR strategies
- Egalitarian societies (ex: Ikung, Hadza, Mbuti, Betek)

+ CULTURAL HETEROCHRONY

( = DIFFERENT TEMPO/DATE OF CULTURAL EVOLUTION/SPECIATION)

- Continuation of ‘median’ cultural trajectory
- Retention of Mode 3 technology
- Social and ritual response to the LGM
- No neoteny, no gracilization
- Mixture of egalitarian and hierarchical social structures (ex: Australian Aboriginals) (contra Hayden 2003)

- Moderate cultural reaction to the LGM
- Strengthening of DR strategies
- Moderate gracilization
- Hierarchical societies (ex: most tribal societies)

- Massive cultural niche construction
- Compensatory cultural response to the LGM
- 60 millennia of cumulative cultural evolution
- Gracilization manifested as ‘domestication syndrome’
- Strong cultural response to the Younger Dryas
- Trans-egalitarian societies (ex: ancient, modern and contemporary ‘civilizations’)
### ABSTRACT

**REPRESENTATION OF ENVIRONMENT [PYGMY COSMOLOGICAL MODEL] IN BATWA ROCK ART**

<table>
<thead>
<tr>
<th>Shape examples</th>
<th>Shape</th>
<th>Subject matter</th>
<th>Symbolism</th>
<th>Gender</th>
<th>Node</th>
<th>Mediator</th>
</tr>
</thead>
<tbody>
<tr>
<td>dumbbells (sausage + concentric circle / circle)</td>
<td>penis phalli</td>
<td>virility potency of the forest</td>
<td>male</td>
<td>Fire (when inactive, kept in water)</td>
<td>Molimo</td>
<td></td>
</tr>
<tr>
<td>sausage</td>
<td>phallic</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>concentric circles</td>
<td>vagina womb</td>
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<tr>
<td>U-shapes</td>
<td>vulva</td>
<td>crucible of life</td>
<td>female</td>
<td>Water</td>
<td>Elina</td>
<td></td>
</tr>
<tr>
<td>outline &amp; solid circles</td>
<td>moon</td>
<td>potency of the forest</td>
<td></td>
<td>Fire</td>
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<tr>
<td>rayed circles</td>
<td>fire</td>
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</tbody>
</table>
FROM COMMUNAL (EGALITARIAN) TO SPECIALIZED (ON-DEMAND) RITUAL

1. Inherited **iconographic expression** from robust (DR/non-egalitarian) ‘ancestors’ used in the ILLUSTRATION OF BEHAVIOR

2. Pre-‘Bushman’ abstract petroglyphs (cupules)

3. AT CONTACT (EXTERNALLY-INDUCED CULTURAL ENVIRONMENT → BEHAVIORAL CHANGES)

4. AFTER CONTACT

FROM (COMMUNAL) COPING TO (MONOPOLIZED) CONTROL

From inherited and *moderately-employed* abstract and illustrative expression to the ratcheting and *grandiose display* of CREATIVITY (ART?)

FROM EXPRESSION OF COGNITIVE ABILITY

(SELF-CONSTRUCTED CULTURAL ENVIRONMENT $\rightarrow$ SELF-INDUCED BEHAVIORAL/ANATOMICAL CHANGES)

(Gorham’s Cave, > 39 ka BP)

(La Pasiega Cave, > 66 ka BP)

(Chauvet Cave, > 37 ka BP)

(Clottes 2016; see also Otte 2003; Noll 1983; Winkelmann 2003; Srinivasan et al. 2016; Spikins et al. 2018)
WHY THE SUDDEN AND OBSESSIVE FORCING OF THE POSSIBILITIES GRANTED BY PSYCHOLOGICAL NEOTENY? 
(sensu Charlton 2006) 
[contra Spikins et al. 2018]

WHY DO THE (PERCEIVED AS) ‘SUPERIOR’ CREATIVE CAPACITIES OF CHILDREN BECOME SUDDENLY IMPORTANT?

‘CREATIVITY’ – the upper ‘zoom-out’ limit of the operational range of the contextual focus, 40 ka ago 
(sensu Gabora 2003)

The perceptions of the ‘savage mind’ in anthropological and ethnographical works of the 19th century seem to document a less restricted operational range of the CF: “The cognitive capacities of natural people were considered to be ‘childish,’ with cause and effect randomly sequenced in a world of probabilities that was also able to accommodate contradictions that were not recognized and ‘corrected,’ and in which the spiritual side was not a stranger to reality.”

(Low 2004)
CONCLUSIONS

COGNITIVE FLEXIBILITY/SPECIALIZATION

a: A Bushman healer’s two-holed pebble: (The shaman enters and leaves the spirit world naturally, whenever he/she wants to)

b: A Bantu witchdoctor’s one-holed stone: (The sorcerer has access to the spirit world but he cannot escape it and becomes mad)

c: An unperforated Boer pebble: (The preacher is unable to enter the spirit world, he can only ideate it)

NOTE - Bushman, Bantu and Boer are not meant pejoratively: the designations are borrowed from 19th century sources used in the explanation of this slide.
Andersson, C. and D. Read 2016.

Growing young. Bergin & Garvey. Westport, CT


Bednarik, R. G. 2013.
Pleistocene paleoart of Africa. *Arts* 2: 6-34.

Bednarik, R. G. 2014.
Pleistocene paleoart of Europe. *Arts* 3: 245-278.

Bednarik, R. G. 2014.


Bickerton, D. 2009.
*Adam's tongue.* Hill and Wang, New York.

(First published 1943) *Aspecte antropologice.* Editura Facla, Timisoara, Romania.

Blench, R. 2008
Was there an interchange between Cushitic pastoralists and Khoisan speakers in the prehistory of southern Africa and how can this be detected? In In W. Möhlig and A Fleisch (Eds.), *Sprache und Geschichte in Afrika*, pp. 19-34. Koenigswinter, Cologne.

Block, N. 1995.


Cameron, E. 2015.
Is it art or knowledge? Deconstructing Australian Aboriginal creative making. *Arts* 4: 68-74


Culley, E. V. 2016. (PhD thesis) A semiotic approach to the evolution of symboling capacities during the Late Pleistocene with implications for claims of 'modernity' in early human groups. Arizona State University.


Goren-Inbar, N. 1986. A figurine from the Acheulian site of Berekhat Yam. M’ikut Ha’even 19: 7-12


Haeckel, E. 1883.  

Hawks, J. 2011.  

Hayden, B. 2003.  


Race as an evolutionary episode. American Anthropologist 64(5): 929-945.


Lewis-Williams, J. D. 1988.  

Liebenberg, L. 2013b.  
The origin of science. CyberTracker, Cape Town.


Mithen, S. 1996.  


(PhD thesis) The evolutionary origins and archaeology of music: An investigation into the prehistory of human musical capacities and behaviours, using archaeological, anthropological, cognitive and behavioural evidence. Cambridge: Cambridge University, Darwin College.


---


Memory – Wikipedia: https://en.wikipedia.org/wiki/Memory?wprov=sfla1