Human self-domestication and the evolution of modern language(s)

INVITED TALK 2

Antonio Benítez Burraco

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University of Seville (Spain)

REVIEW ARTICLE

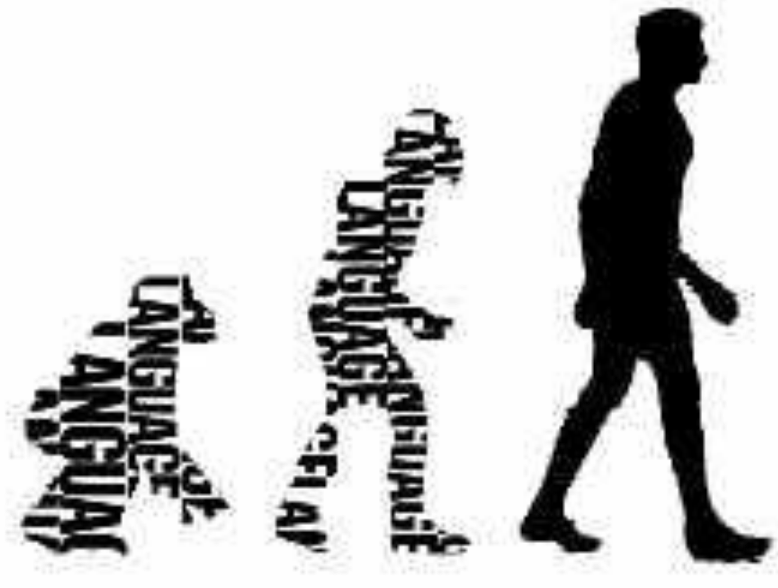
The major evolutionary transitions

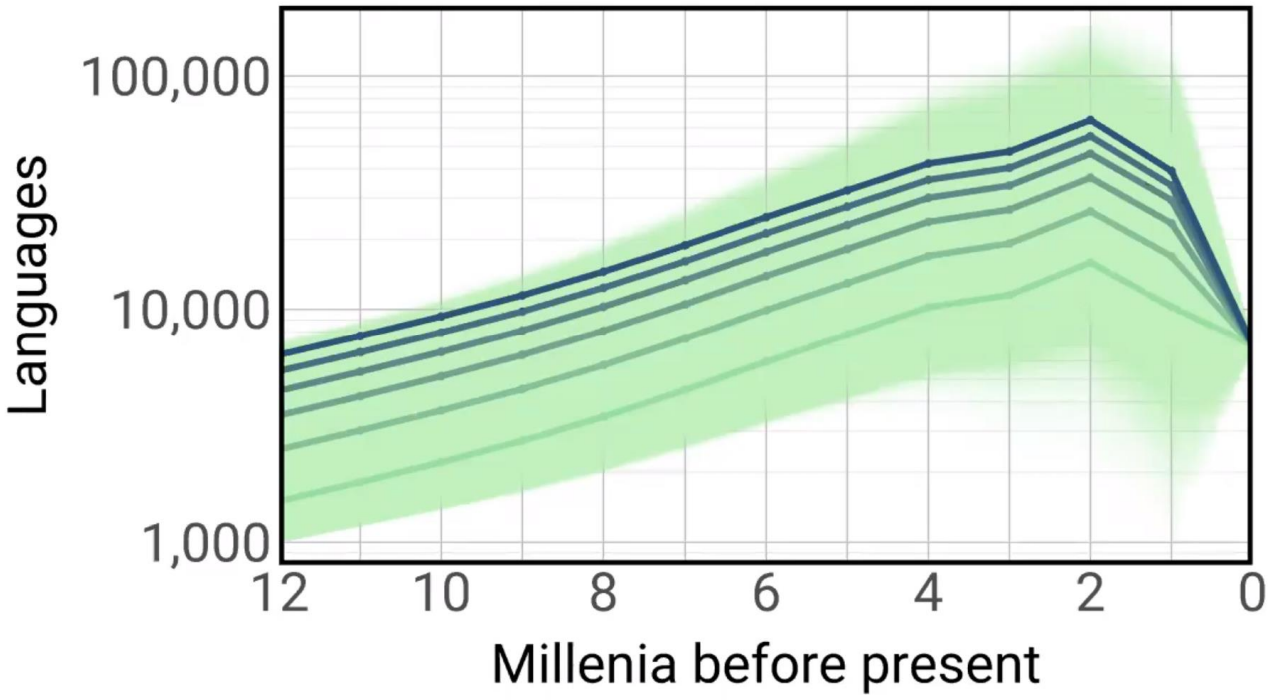
Eörs Szathmáry & John Maynard Smith

There is no theoretical reason to expect evolutionary lineages to increase in complexity with time, and no empirical evidence that they do so. Nevertheless, eukaryotic cells are more complex than prokaryotic ones, animals and plants are more complex than protists, and so on. This increase in complexity may have been achieved as a result of a series of major evolutionary transitions. These involved changes in the way information is stored and transmitted.

(8) The emergence of proto-language in *Homo erectus*—a cultural inheritance system with limited potential in which, because of the absence of grammar, only certain types of statement can be made[48].

(9) The emergence of human language with a universal grammar[49] and unlimited semantic representation[50].


LANGUAGE


100,000
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Languages
12
10
8
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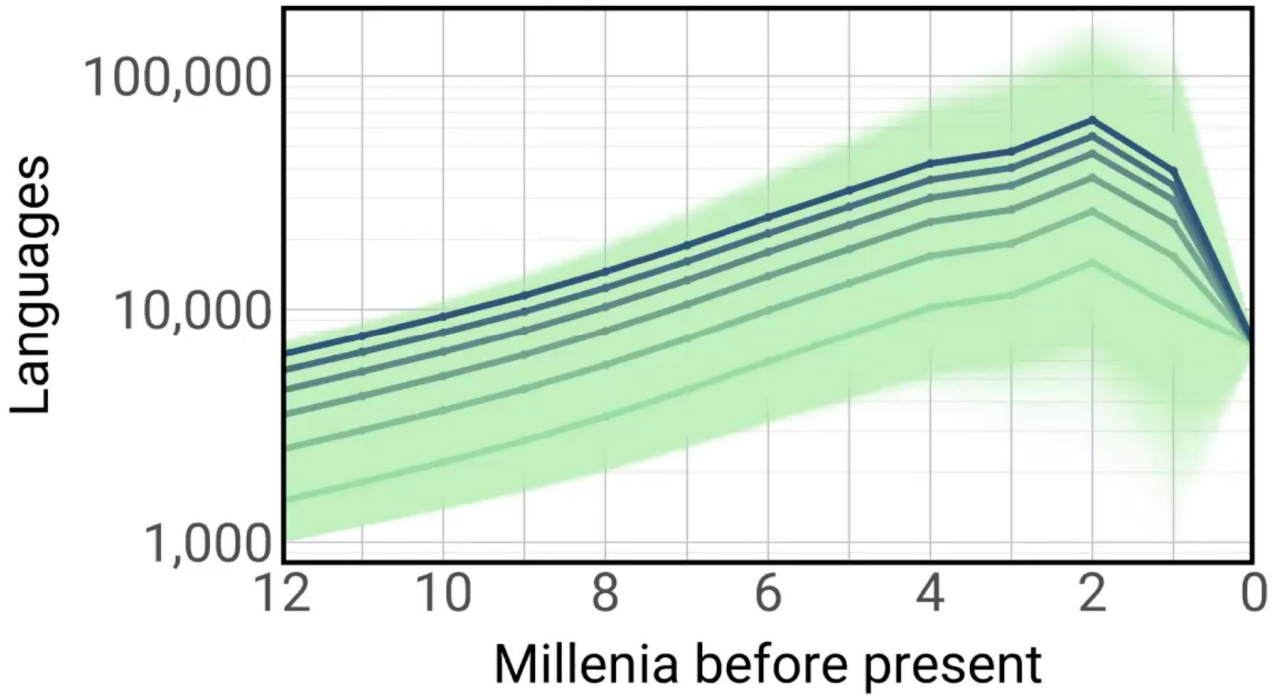
Millenia before present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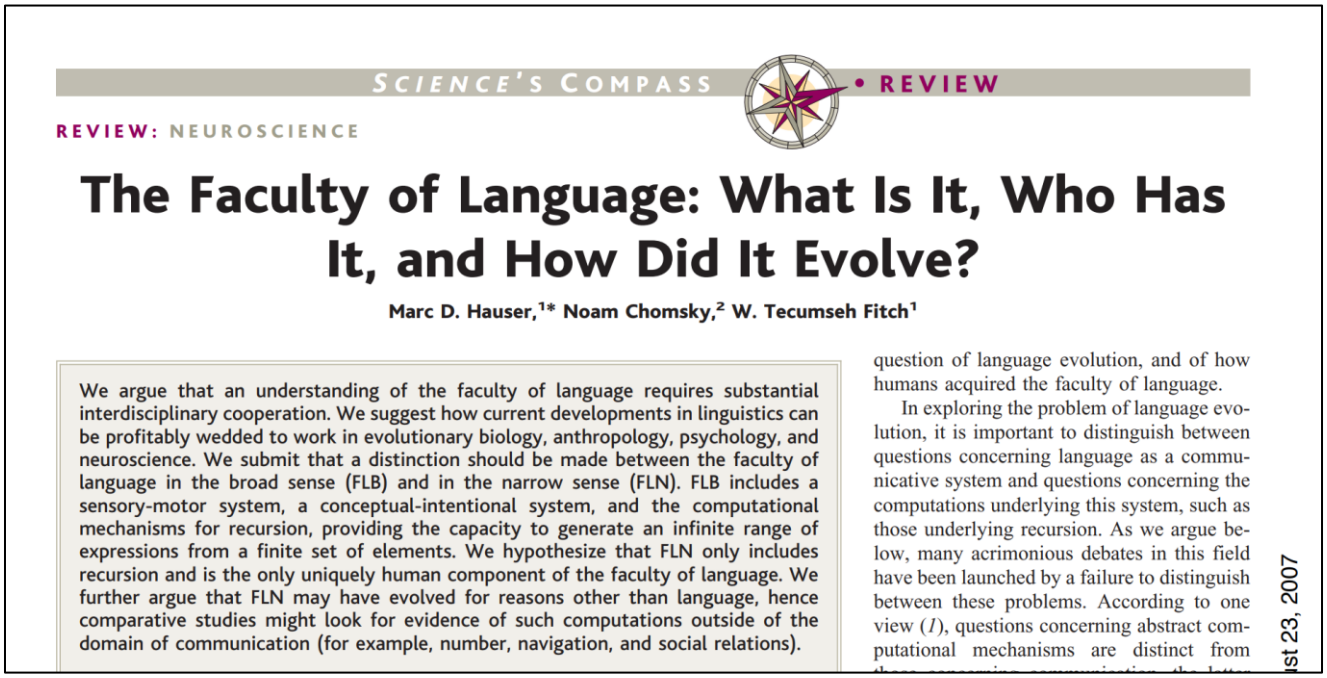
Millenia before present

Human linguisticality



SCIENCE'S COMPASS • REVIEW

REVIEW: NEUROSCIENCE

The Faculty of Language: What Is It, Who Has It, and How Did It Evolve?

Marc D. Hauser,[1]* Noam Chomsky,[2] W. Tecumseh Fitch[1]

We argue that an understanding of the faculty of language requires substantial interdisciplinary cooperation. We suggest how current developments in linguistics can be profitably wedded to work in evolutionary biology, anthropology, psychology, and neuroscience. We submit that a distinction should be made between the faculty of language in the broad sense (FLB) and in the narrow sense (FLN). FLB includes a sensory-motor system, a conceptual-intentional system, and the computational mechanisms for recursion, providing the capacity to generate an infinite range of expressions from a finite set of elements. We hypothesize that FLN only includes recursion and is the only uniquely human component of the faculty of language. We further argue that FLN may have evolved for reasons other than language, hence comparative studies might look for evidence of such computations outside of the domain of communication (for example, number, navigation, and social relations).

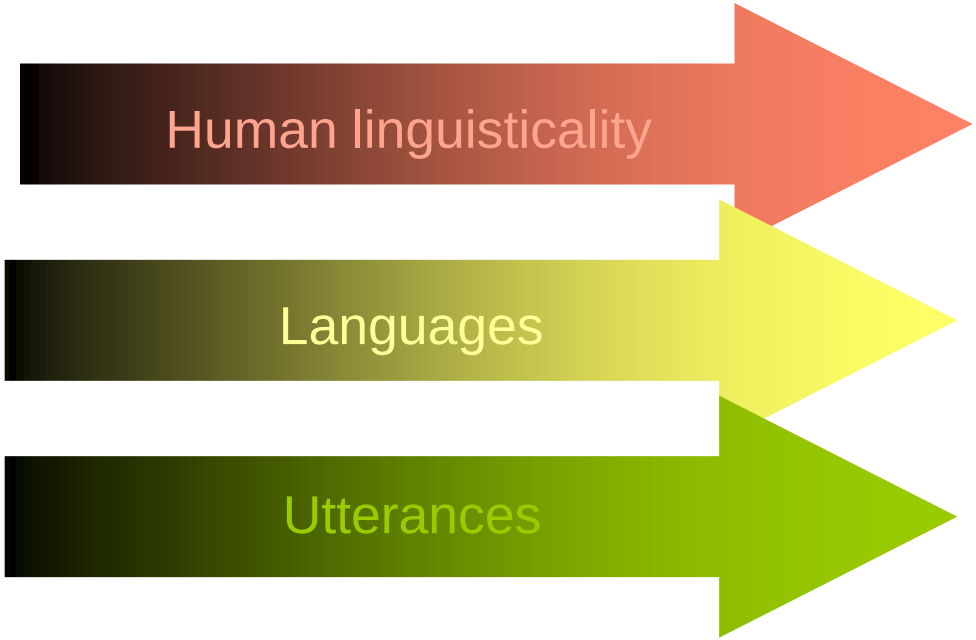
question of language evolution, and of how humans acquired the faculty of language.

In exploring the problem of language evolution, it is important to distinguish between questions concerning language as a communicative system and questions concerning the computations underlying this system, such as those underlying recursion. As we argue below, many acrimonious debates in this field have been launched by a failure to distinguish between these problems. According to one view (*1*), questions concerning abstract computational mechanisms are distinct from

st 23, 2007

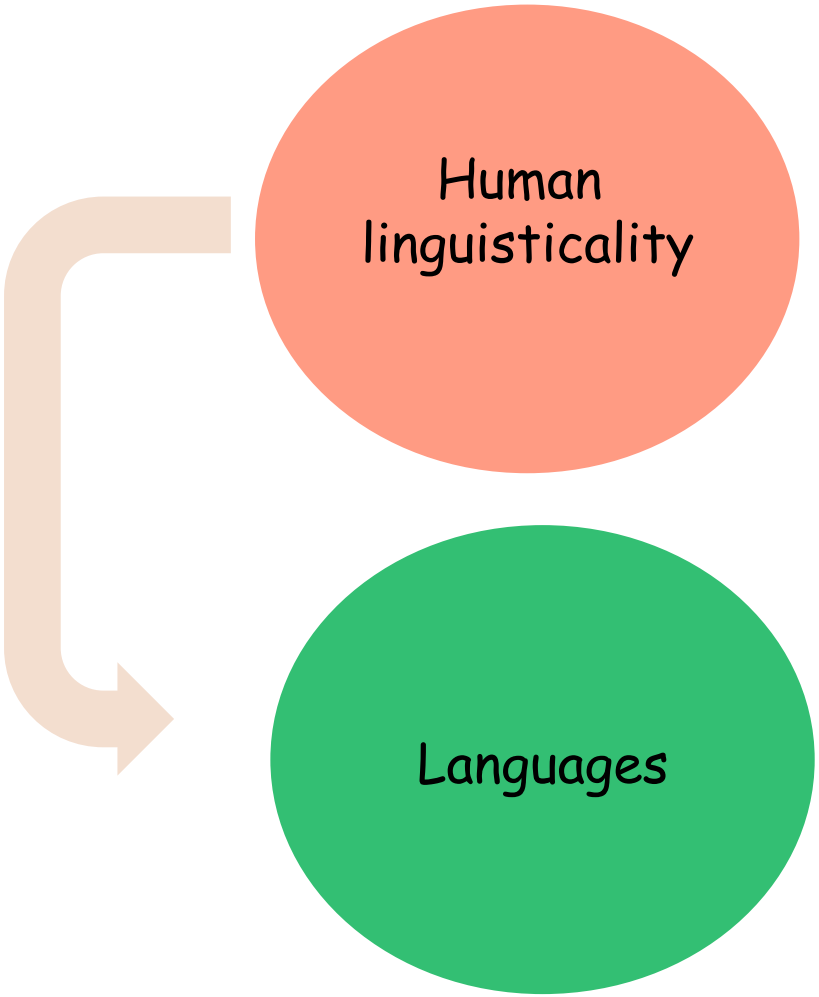
Human linguisticality

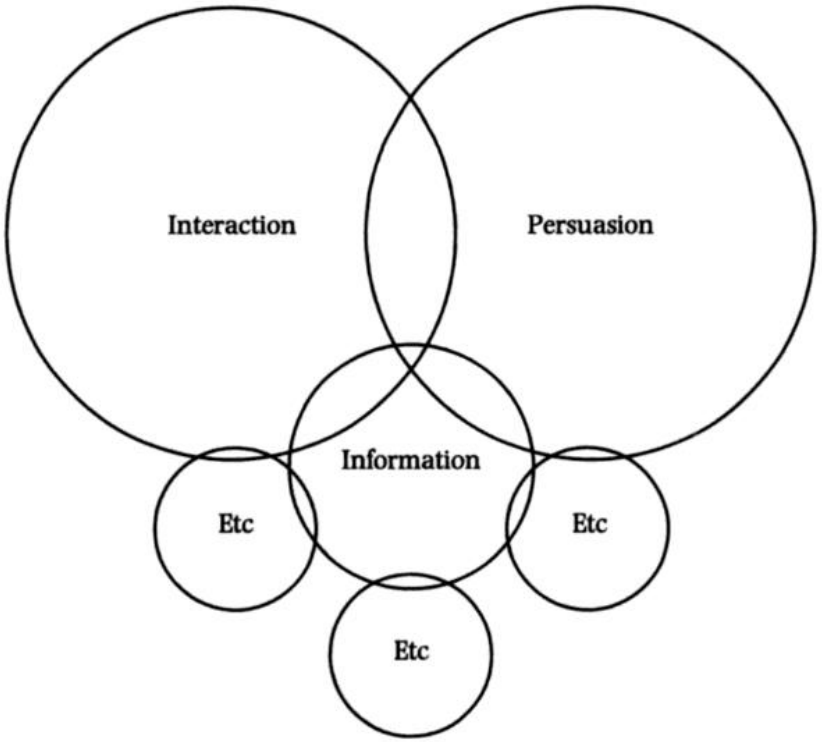
Languages


Human linguisticality
Languages
Utterances

HOW I HAVE STRUCTURED MY TALK

1. Introduction
2. Language(s) evolution (research): an outline
3. The self-domestication account of human evolution
4. Conclusions and future prospects


Human linguisticality
Languages



Human linguisticality

Languages

Abstract: The evolution of the faculty of language largely remains an enigma. In this essay, we ask why. Language's evolutionary analysis is complicated because it has no equivalent in any nonhuman species. There is also no consensus regarding the essential nature of the language "phenotype." According to the "Strong Minimalist Thesis," the key distinguishing feature of language (and what evolutionary theory must explain) is hierarchical syntactic structure. The faculty of language is likely to have emerged quite recently in evolutionary terms, some 70,000–100,000 years ago, and does not seem to have undergone modification since then, though individual languages do of course change over time, operating within this basic framework. The recent emergence of language and its stability are both consistent with the Strong Minimalist Thesis, which has at its core a single repeatable operation that takes exactly two syntactic elements *a* and *b* and assembles them to form the set {a, b}.

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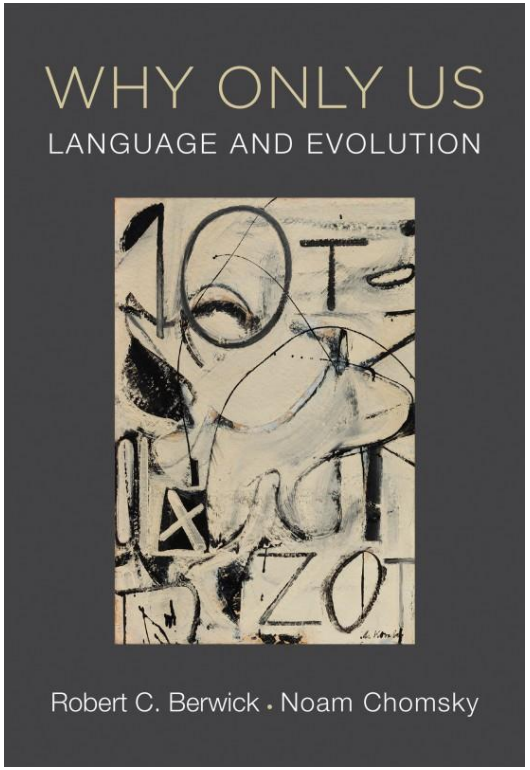
PLOS | BIOLOGY

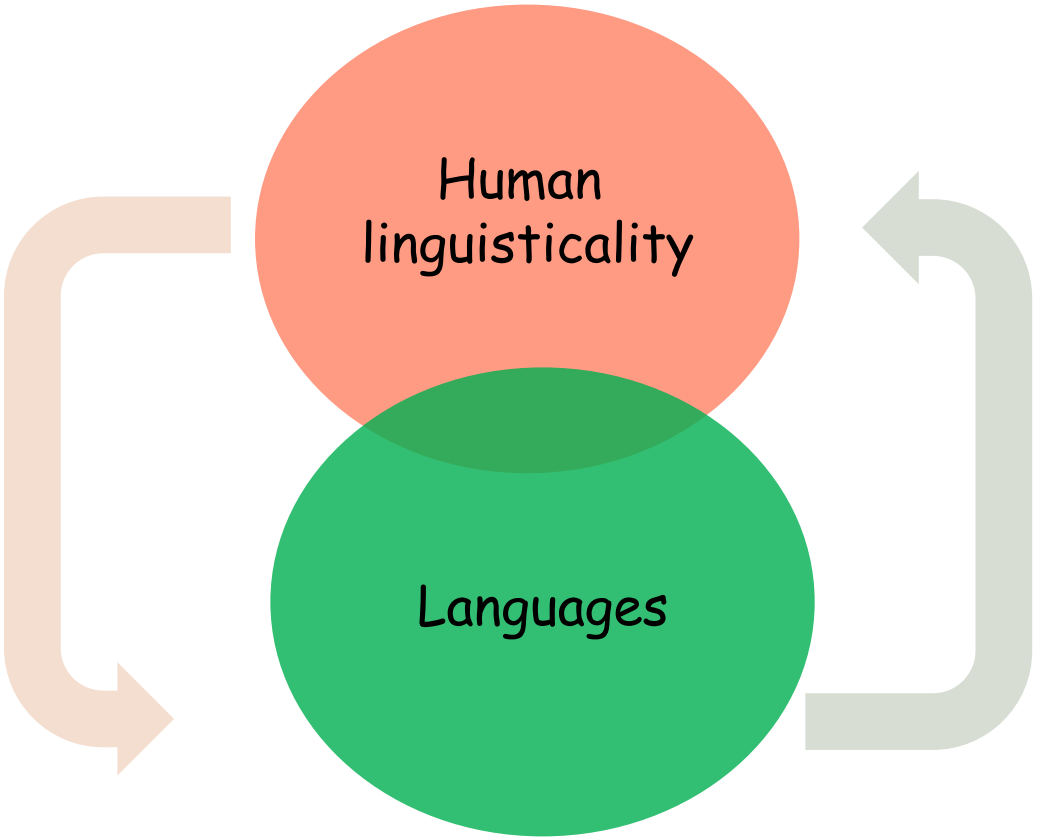
Essay

How Could Language Have Evolved?

Johan J. Bolhuis[1,2]*, Ian Tattersall[3], Noam Chomsky[4], Robert C. Berwick[5]

1 Cognitive Neurobiology and Helmholtz Institute, Departments of Psychology and Biology, Utrecht University, Utrecht, The Netherlands, **2** Department of Zoology and Sidney Sussex College, University of Cambridge, Cambridge, United Kingdom, **3** Division of Anthropology, American Museum of Natural History, New York, New York, United States of America, **4** Department of Linguistics and Philosophy, MIT, Cambridge, Massachusetts, United States of America, **5** Department of Electrical Engineering & Computer Science and Brain and Cognitive Sciences, MIT, Cambridge, Massachusetts, United States of America




Human
linguisticality
Languages

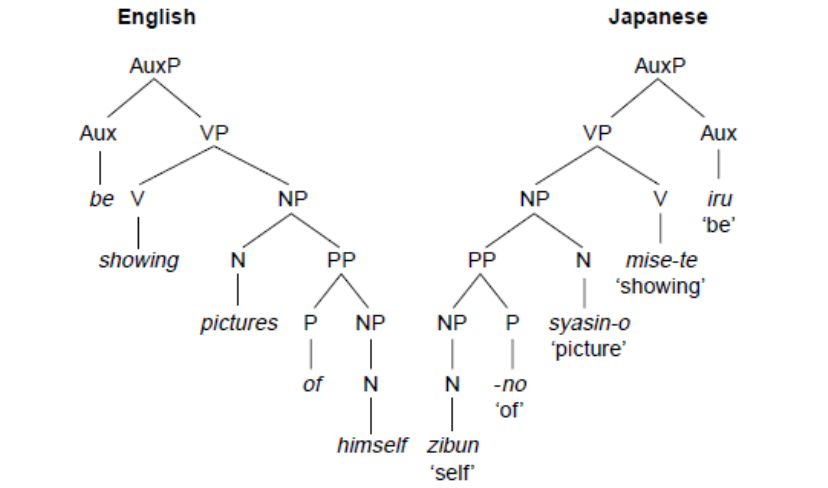
SCIENTIFIC REPORTS

OPEN

The word order of languages predicts native speakers' working memory

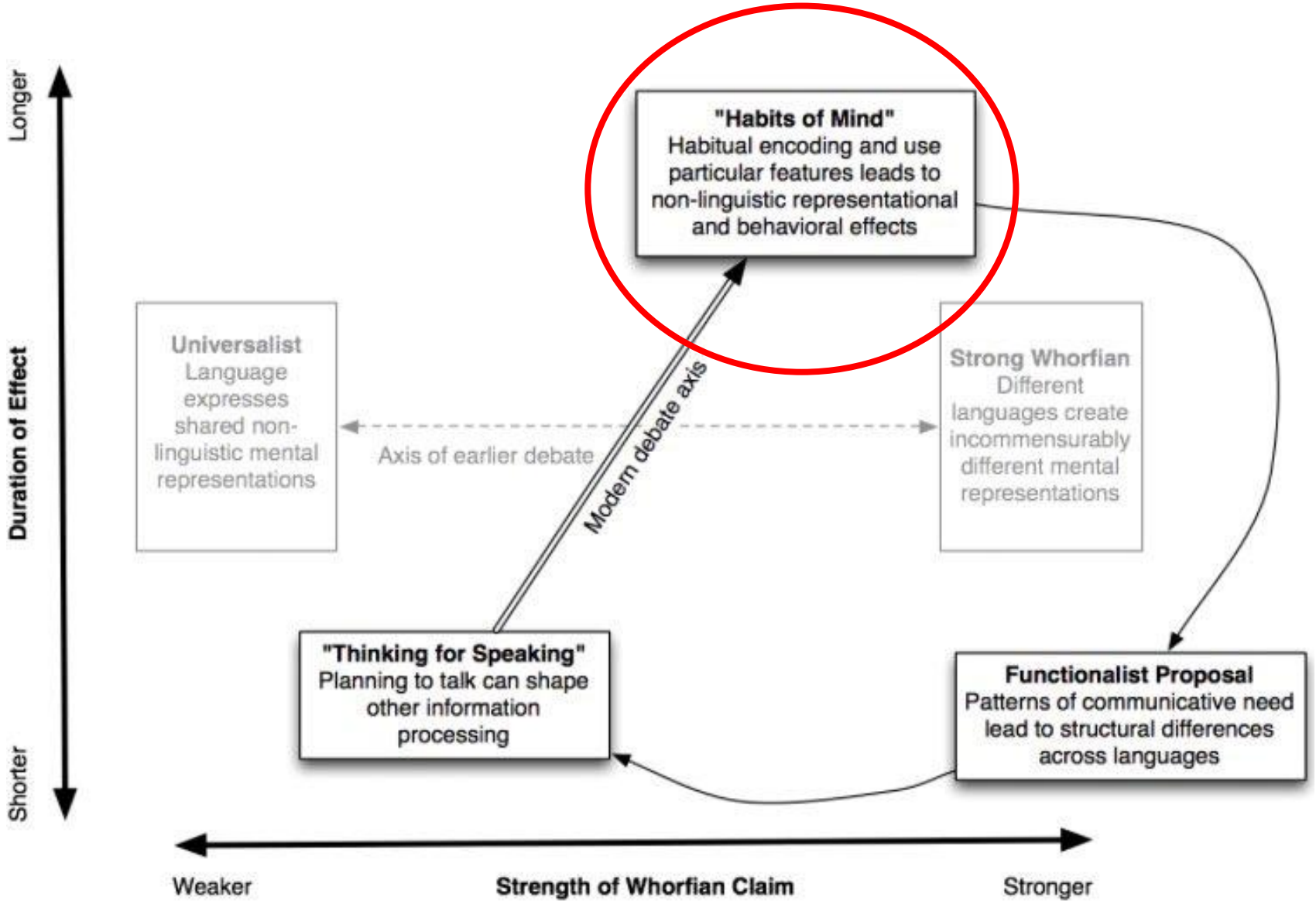
Received: 3 May 2018
Accepted: 12 December 2018
Published online: 04 February 2019

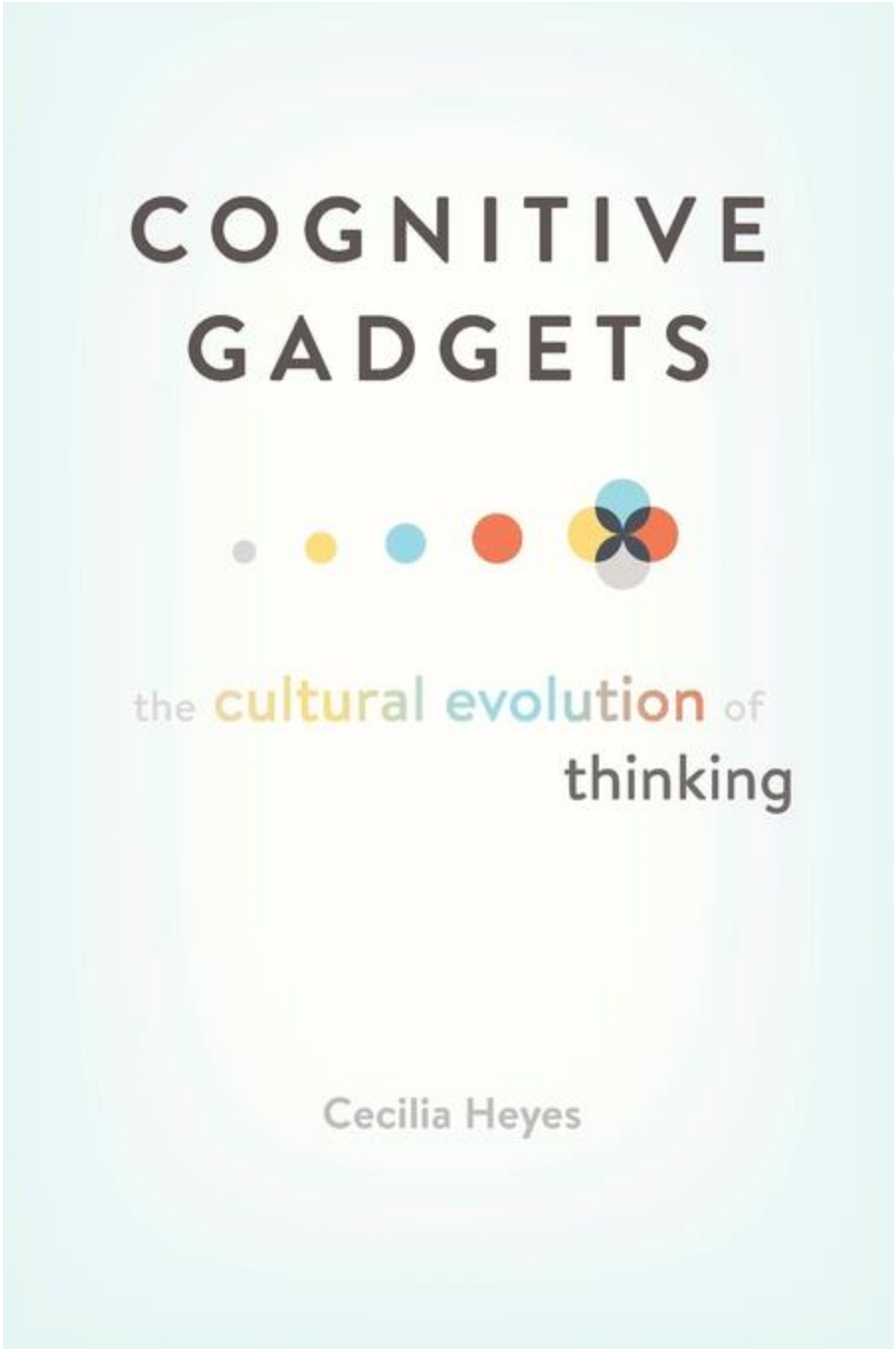
Federica Amici[1,2], Alex Sánchez-Amaro[3,4], Carla Sebastián-Enesco[5], Trix Cacchione[6,7], Matthias Allritz[3], Juan Salazar-Bonet[8] & Federico Rossano[4]

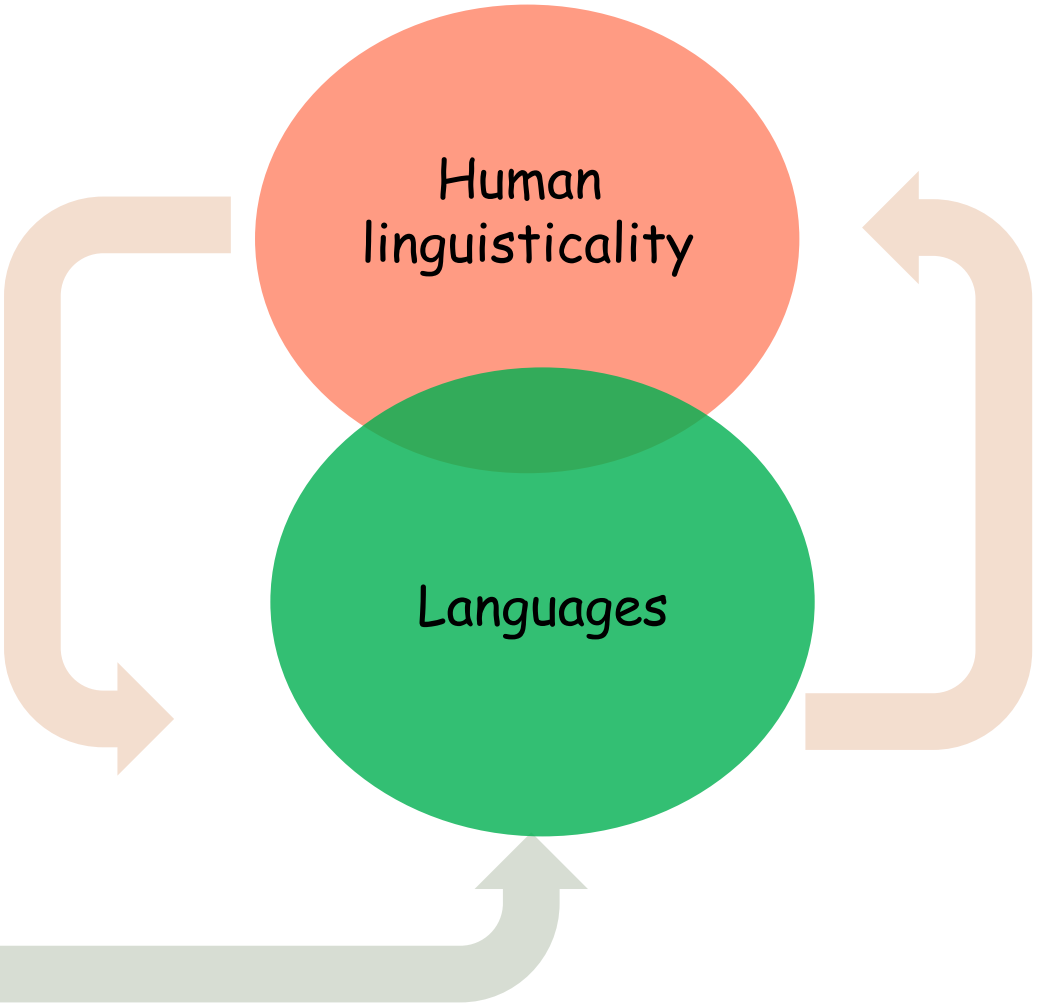


English parameter: build bigger phrases by adding new words on the *left*

Japanese parameter: build bigger phrases by adding new words on the *right*


Longer
Duration of Effect
Shorter
"Habits of Mind"
Habitual encoding and use particular features leads to non-linguistic representational and behavioral effects
Universalist
Language expresses shared non-linguistic mental representations
Axis of earlier debate
Modern debate axis
Strong Whorfian
Different languages create incommensurably different mental representations
"Thinking for Speaking"
Planning to talk can shape other information processing
Functionalist Proposal
Patterns of communicative need lead to structural differences across languages
Weaker
Strength of Whorfian Claim
Stronger

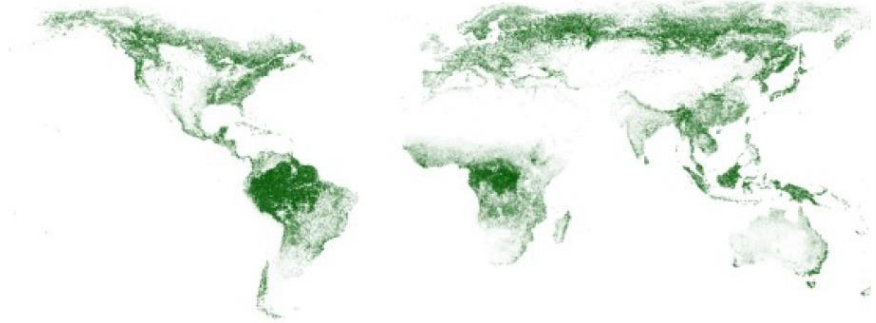

COGNITIVE
GADGETS
the cultural evolution of
thinking
Cecilia Heyes

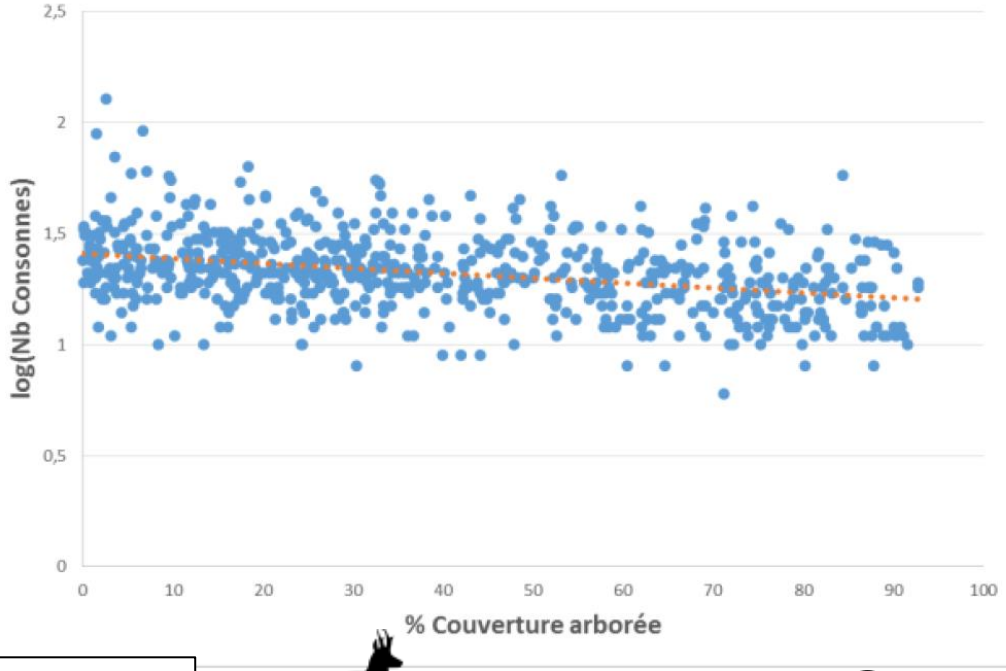

Human linguisticality
Languages

KEIO/2

Quelle adaptation acoustique pour les langues du monde ?

C. Coupe[a] et I. Maddieson[b]
[a]Laboratoire Dynamique du Langage, Institut des Sciences de l'Homme, 14 Avenue Berthelot, 69007 Lyon, France
[b]Department of Linguistics, University of New Mexico, MSC03 2130, 1 University of New Mexico, Albuquerque, 87131-0001, USA
christophe.coupe@cnrs.fr





Functional Ecology 2007
21, 134–142

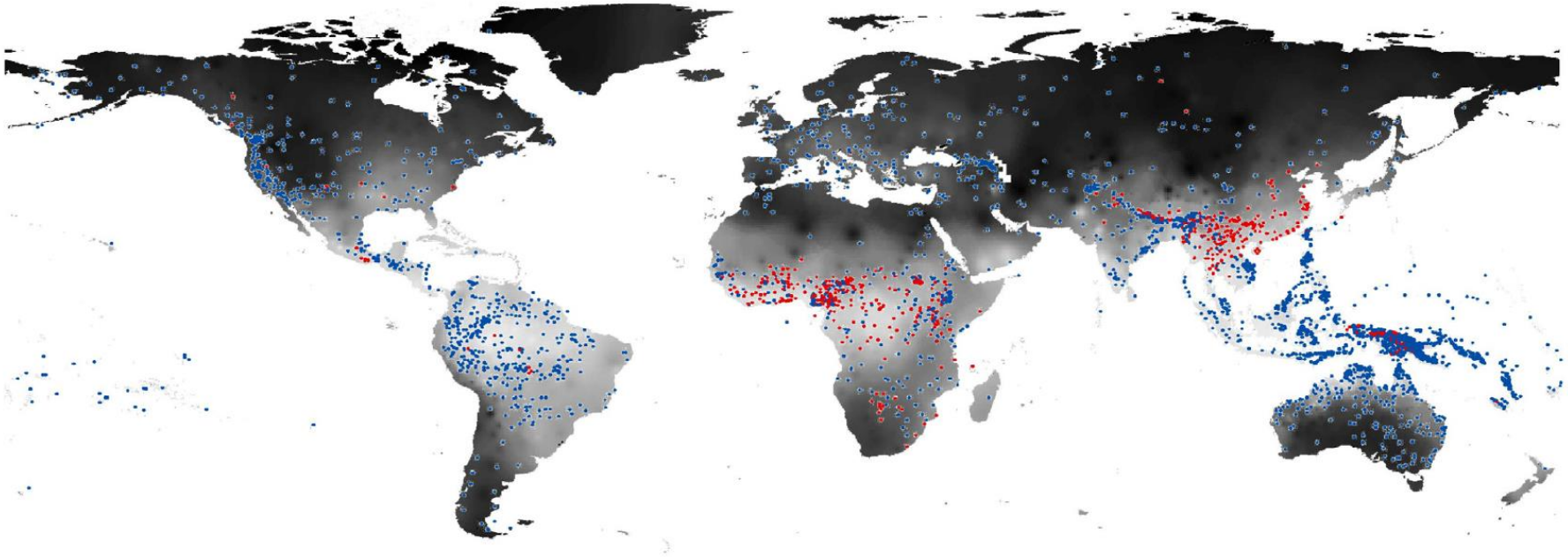
Habitat structure and the evolution of bird song: a meta-analysis of the evidence for the acousti adaptation hypothesis

GIUSEPPE BONCORAGLIO† and NICOLA SAINO
Dipartimento di Biologia, Università di Milano, via Celoria 26, I-20133 Milano, Italy

Original Articles

THE "ACOUSTIC ADAPTATION HYPOTHESIS"—A REVIEW OF THE EVIDENCE FROM BIRDS, ANURANS AND MAMMALS

E. EY & J. FISCHER
Pages 21-48 | Received 25 Nov 2008, Accepted 06 Feb 2009, Published online: 13 Apr 2012
Download citation https://doi.org/10.1080/09524622.2009.9753613



Trends in Cognitive Sciences

Figure 2. The Relation between Climate and Use of Tone. Languages that use lexical tone (red dots) tend to be distributed in warmer and more humid climates (lighter shading) than languages that lack tone (blue dots) [49] possibly due to dryer air making precise vocal control more difficult. Reproduced, with permission, from [49].

KEIO/2

PNAS nexus

PNAS Nexus, 2023, 2, 1–9
https://doi.org/10.1093/pnasnexus/pgad384
Advance access publication 5 December 2023
Research Report

Temperature shapes language sonority: Revalidation from a large dataset

Tianheng Wang[a], Søren Wichmann[b], Quansheng Xia[c,*] and Qibin Ran[a,d,*]

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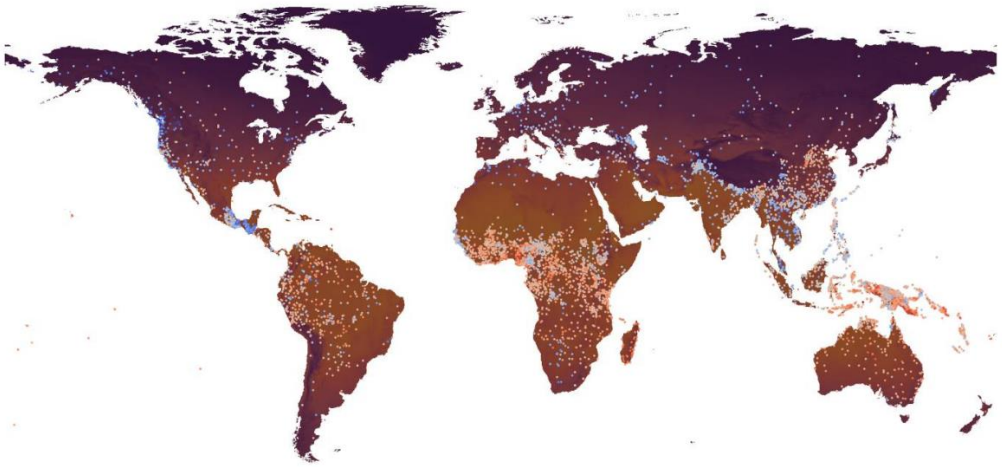
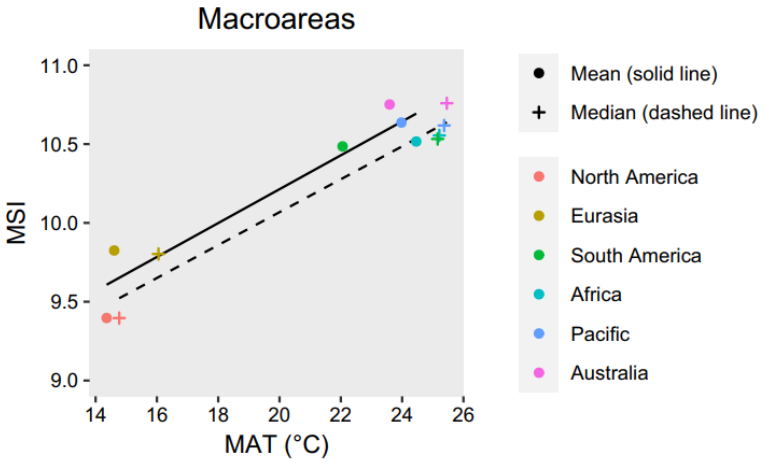
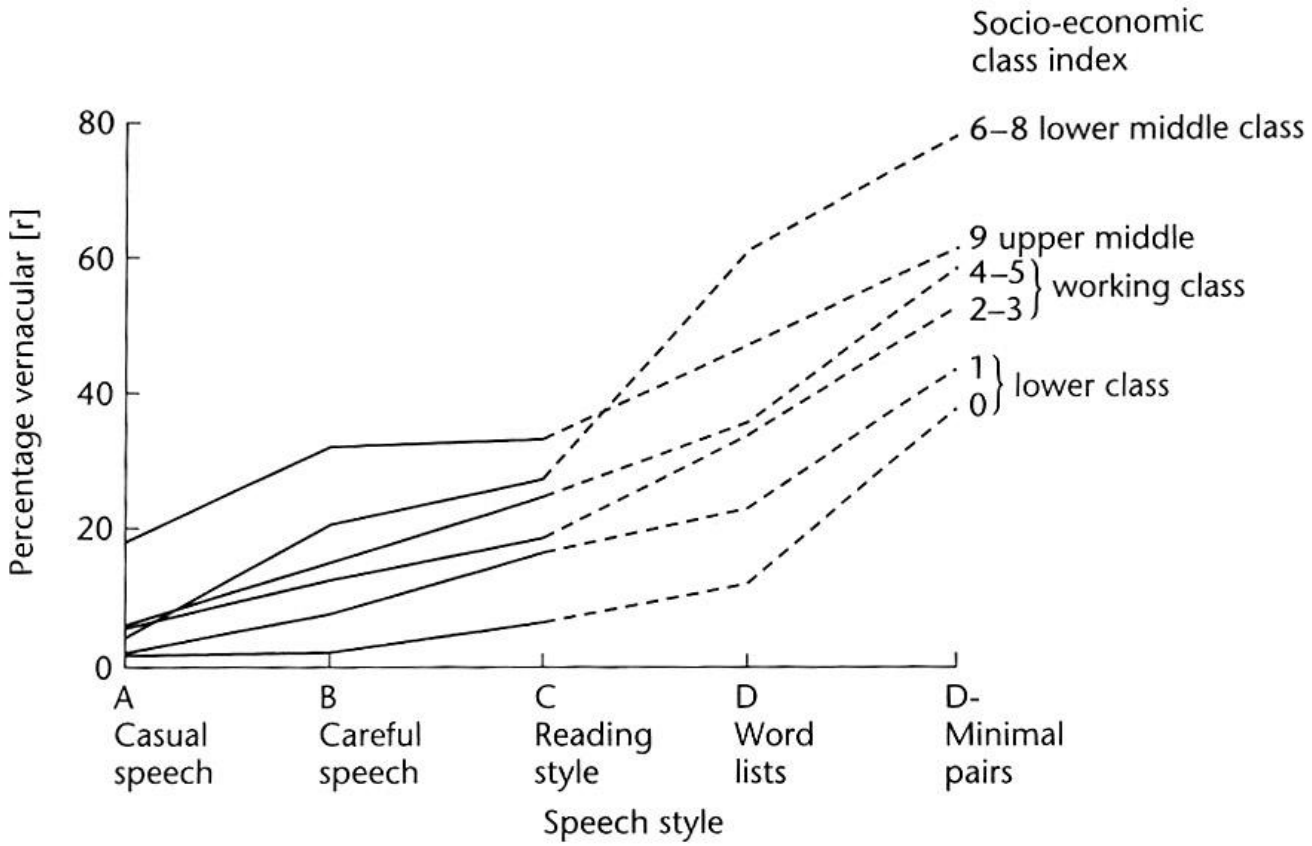
[d]Laboratory of Social Science of Tianjin, Nankai University, Tianjin 300071, China
*To whom correspondence should be addressed: Email: xiaqsh@nankai.edu.cn (Q. Xia); ranqibin@126.com (Q. Ran)
Edited By: Emilio Moran

Table 1. Sonority scale adapted and supplemented from Parker (34, 35).

Natural class	Index
Voiceless plosives and clicks	1
Voiceless affricates	2
Voiceless fricatives	3
Voiced plosives	4
Voiced affricates	5
Voiced fricatives	6
Nasals	7
Laterals	9
Rhotics	10
Semivowels	12
Interior vowels	13
High peripheral vowels	15
Mid peripheral vowels	16
Low vowels	17






Socio-economic class index
6–8 lower middle class
9 upper middle
4–5
2–3
working class
1
0
lower class
Percentage vernacular [r]
80
60
40
20
0
A Casual speech
B Careful speech
C Reading style
D Word lists
D- Minimal pairs
Speech style


DID YOU KNOW THAT SUBURBAN WHITE MALES HAVE OVER 100 WORDS FOR "LAWN"?
7-29
SPEEDBUMP.COM
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		Singular	*Plural*
1.	*teacher*	murutani	arutani
2.	*girl*	muiretu	airetu
3.	*woman*	mutumia	atumia
4.	*buyer*	muguri	aguri
5.	*root*	muri	miri
6.	*tree*	muti	miti
7.	*lion*	muroodi	miroodi
8.	*mattress*	muuto	miuto
9.	*chair*	geti	eti
10.	*yam*	gikoa	ikoa
11.	*tray*	gitaruru	itaruru

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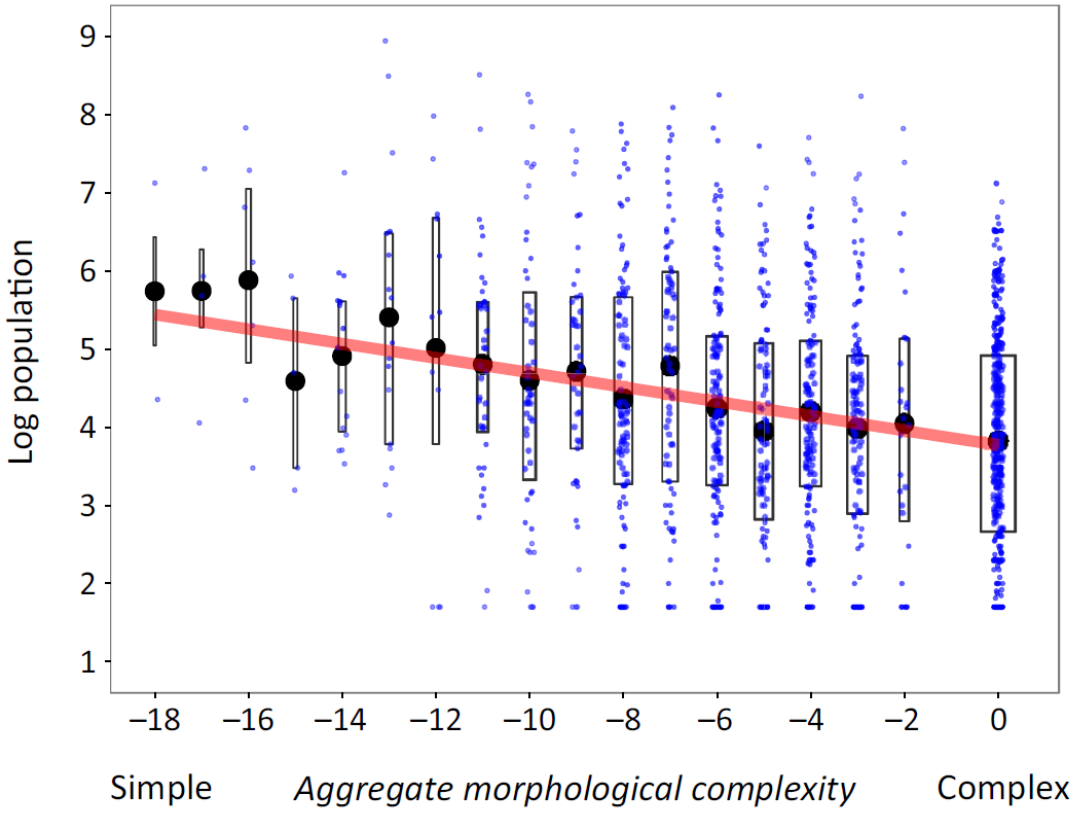
PLoS one

Language Structure Is Partly Determined by Social Structure

Gary Lupyan[1]*, **Rick Dale**[2]

1 Institute for Research on Cognitive Science and Center for Cognitive Neuroscience, University of Pennsylvania, Philadelphia, Pennsylvania, United States of America,
2 Department of Psychology, The University of Memphis, Memphis, Tennessee, United States of America



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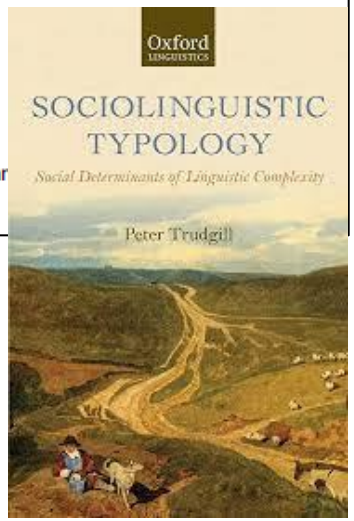

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Lingua

Lingua 117 (2007) 543–578

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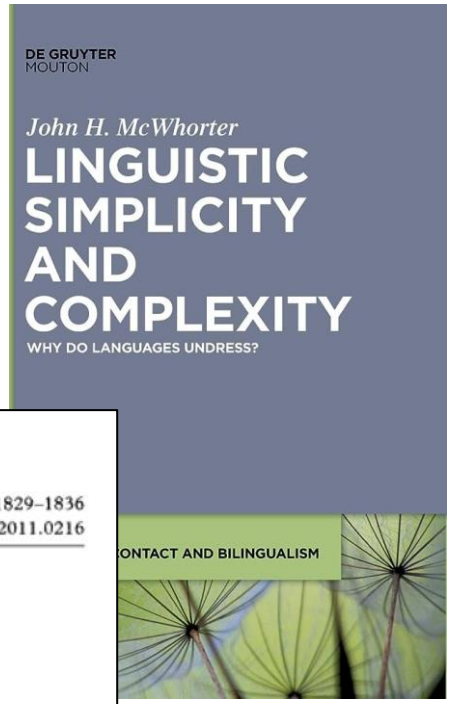
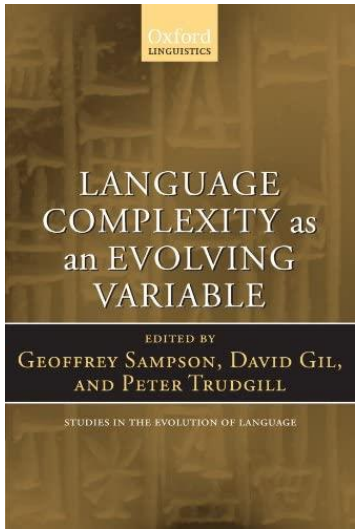
The consequences of talking to strangers: Evolutionary corollaries of socio-cultural influences on linguistic form

Alison Wray [a,*], George W. Grace [b]





PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Phil. Trans. R. Soc. B (2012) **367**, 1829–1836
doi:10.1098/rstb.2011.0216

Review

Social scale and structural complexity in human languages

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Centre for Behaviour and Evolution and Institute of Neuroscience, Newcastle University, Henry Wellcome Building, Framlington Place, Newcastle NE2 4HH, UK

PLOS ONE

RESEARCH ARTICLE

Linguistic correlates of societal variation: A quantitative analysis

Sihan Chen[1☯], David Gil[2☯], Sergey Gaponov[3], Jana Reifegerste[4], Tessa Yuditha[5], Tatiana Tatarinova[3], Ljiljana Progovac[6‡], Antonio Benítez-Burraco[5‡*]

1 Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, MA, United States of America, **2** Department of Linguistic and Cultural Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany, **3** Department of Biology and Computational Biology, University of LaVerne, LaVerne, CA, United States of America, **4** Department of Neurology, Georgetown University, Washington, DC, United States of America, **5** Department of Spanish, Linguistics & Theory of Literature, University of Seville, Seville, Spain, **6** Linguistics Program, Wayne State University, Detroit, MI, United States of America

☯ These authors contributed equally to this work.
‡ LP and ABB also contributed equally to this work.
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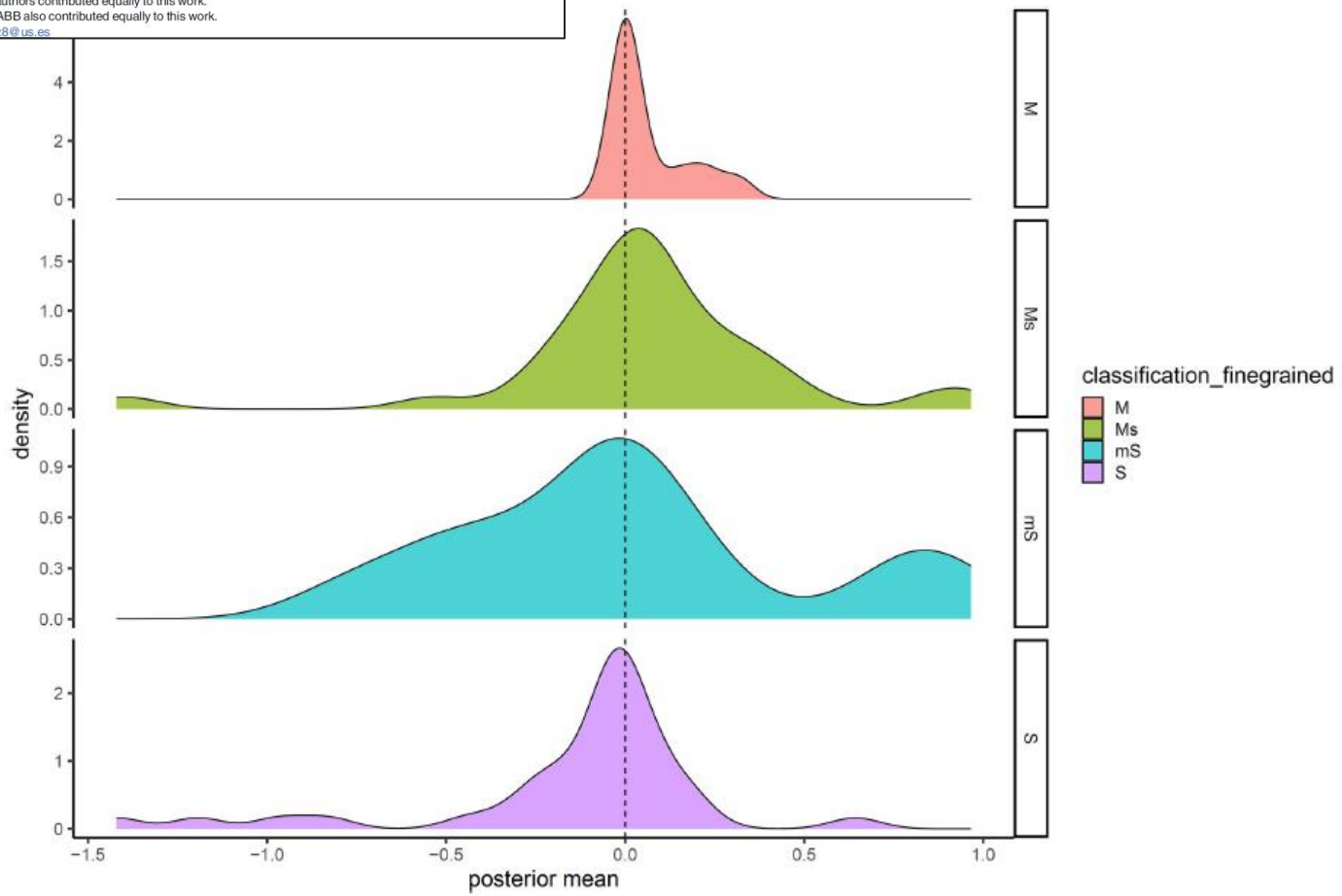

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The consequences of talking to strangers: Evolutionary corollaries of socio-cultural influences on linguistic form

Alison Wray [a,*], George W. Grace [b]

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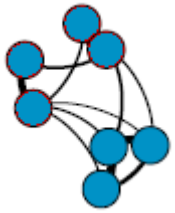
[b] Department of Linguistics, 569 Moore Hall, 1890 East-West Road, Honolulu, HI 96822, USA



- complex phonologies
- opaque morphologies
- limited semantic transparency
- limited compositional structure
- less sophisticated syntax

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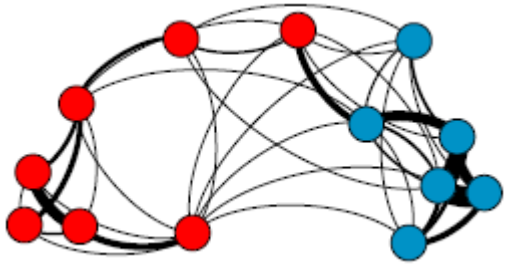

- complex phonologies
- opaque morphologies
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- limited compositional structure
- less sophisticated syntax

- expanded vocabularies
- increased syntactic complexity
- simpler sound combinations
- More transparent/regular morphologies
- greater compositionality
- enhanced semantic transparency

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The consequences of talking to strangers: Evolutionary corollaries of socio-cultural influences on linguistic form

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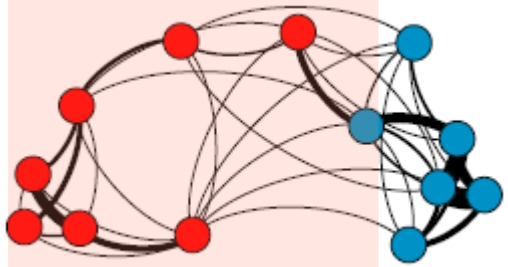
[b] Department of Linguistics, 569 Moore Hall, 1890 East-West Road, Honolulu, HI 96822, USA

Shared knowldege

- complex phonologies
- opaque morphologies
- limited semantic transparency
- limited compositional structure
- less sophisticated syntax

Non-shared knowldege



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The consequences of talking to strangers: Evolutionary corollaries of socio-cultural influences on linguistic form

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[b] Department of Linguistics, 569 Moore Hall, 1890 East-West Road, Honolulu, HI 96822, USA

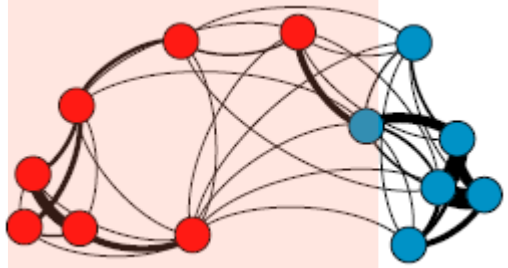
(e)S(oteric) languages

Shared knowldege

- complex phonologies
- opaque morphologies
- limited semantic transparency
- limited compositional structure
- less sophisticated syntax

(e)X(oteric) languages

Non-shared knowldege



- expanded vocabularies
- increased syntactic complexity
- simpler sound combinations
- more transparent/regular morphologies
- greater compositionality
- enhanced semantic transparency

Cognition 141 (2015) 87–102

Contents lists available at ScienceDirect

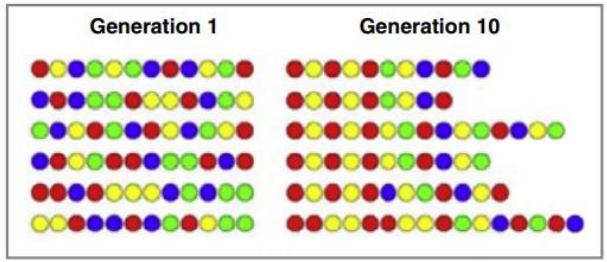
Cognition

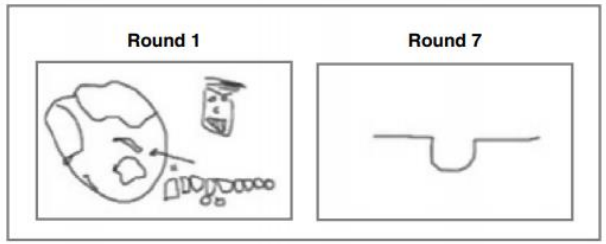
journal homepage: www.elsevier.com/locate/COGNIT

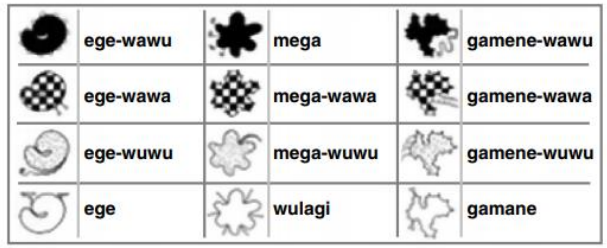
Compression and communication in the cultural evolution of linguistic structure

Simon Kirby [a,*], Monica Tamariz [a], Hannah Cornish [b], Kenny Smith [a]

[a] School of Philosophy, Psychology and Language Sciences, University of Edinburgh, Edinburgh, United Kingdom
[b] School of Psychology, University of Stirling, Stirling, United Kingdom







ELSEVIER

The cultural evolution of language

Monica Tamariz and Simon Kirby

Human language has unusual structural properties that enable open-ended communication. In recent years, researchers have begun to appeal to cultural evolution to explain the emergence of these structural properties. A particularly fruitful approach to this kind of explanation has been the use of laboratory experiments. These typically involve participants learning and interacting using artificially constructed communication systems. By observing the evolution of these systems in the lab, researchers have been able to build a bridge between individual cognition and population-wide emergent structure. We review these advances, and show how cultural evolution has been used to explain the origins of structure in linguistic signals, and in the mapping between signals and meanings.

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Corresponding author: Kirby, Simon (simon@ling.ed.ac.uk)

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For a complete overview see the Issue and the Editorial

Available online 14th September 2015

http://dx.doi.org/10.1016/j.copsyc.2015.09.003

PNAS

SEE COMMENTARY

The emergence of grammar: Systematic structure in a new language

Wendy Sandler*, Irit Meir†, Carol Padden‡§, and Mark Aronoff¶

*Department of English Language and Literature and †Departments of Hebrew Language and Communication Disorders and Language Sciences, University of Haifa, 31905 Haifa, Israel; ‡Department of Communication, University of California at San Diego, La Jolla, CA 92093; and ¶Department of Linguistics, Stony Brook University, Stony Brook, NY 11794

Edited by Jeremy A. Sabloff, University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia, PA, and approved January 3, 2005 (received for review August 2, 2004)

CURRENT ANTHROPOLOGY Volume 46, Number 4, August–October 2005

KEIO/2

Cultural Constraints on Grammar and Cognition in Pirahã

Another Look at the Design Features of Human Language

by Daniel L. Everett

ti	*kobai*	*-baí*	*'áoói*	*hi*
I	see	-intensive	foreigner	he
'íkao	*-ap*	*-áp*	*-iig*	*-á*
mouth	-pull	-up	-continuative	-declarative

"I really watch[ed] the foreigner fishing [with line and hook]." (lit. "I watch the foreigner intently. He was pulling [fish] out by [their] mouths.")

Human linguisticality

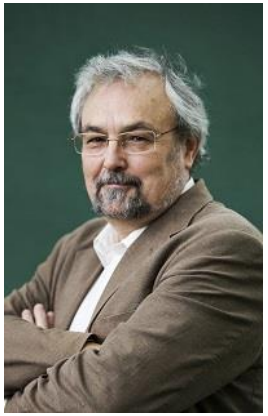
Languages

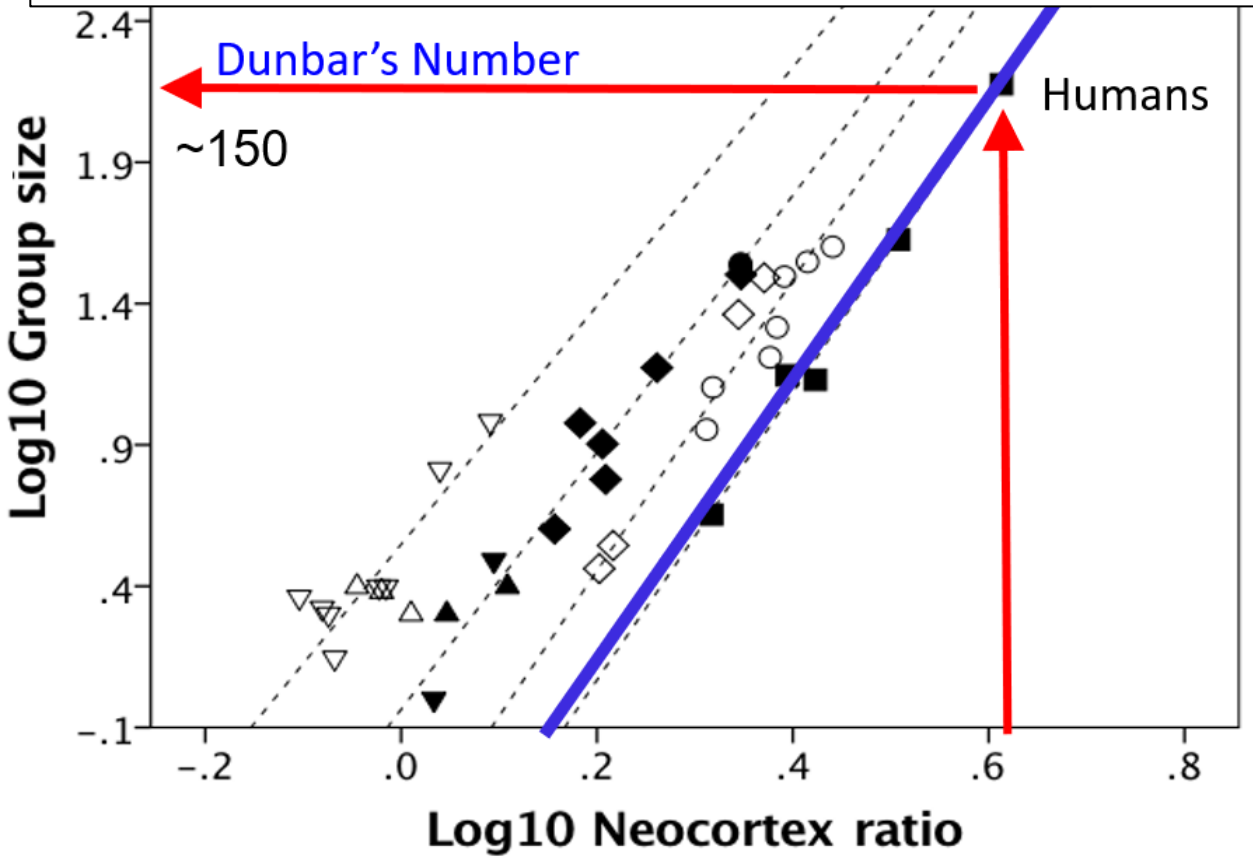
178 Evolutionary Anthropology

ARTICLES

The Social Brain Hypothesis

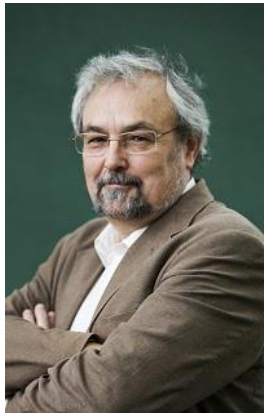
Robin I.M. Dunbar

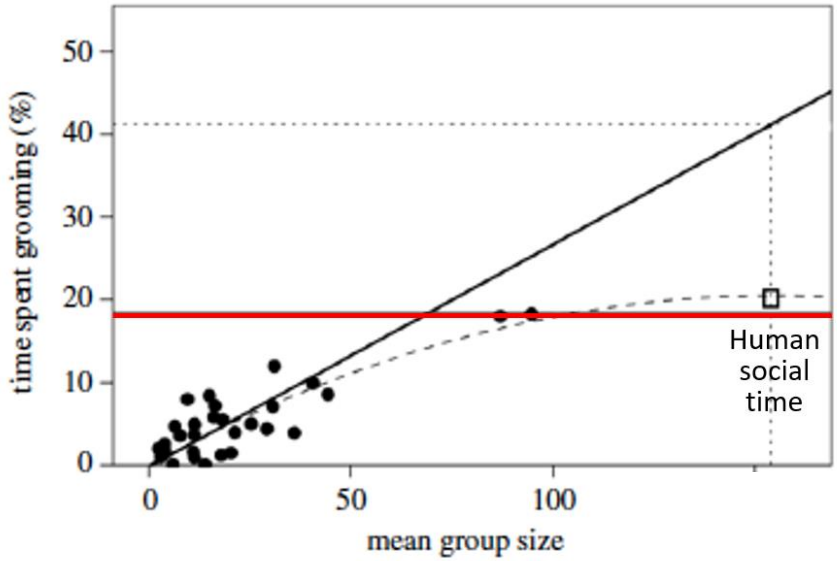




Social Bonding Primate-Style

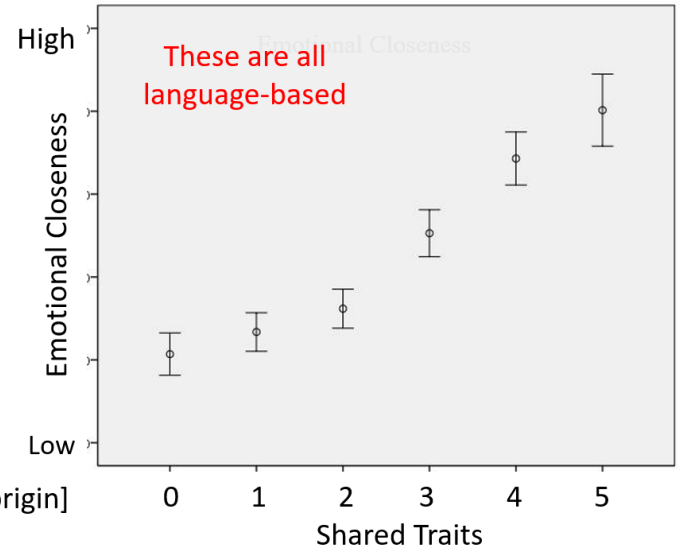
ARTICLES





- Same language/dialect
- Same place of origin
- Same career trajectory
- Same hobbies/interests
- Same worldview
- Same musical tastes
- Same sense of humour

[all are cues of community of origin]



178 Evolutionary Anthropology

ARTICLES

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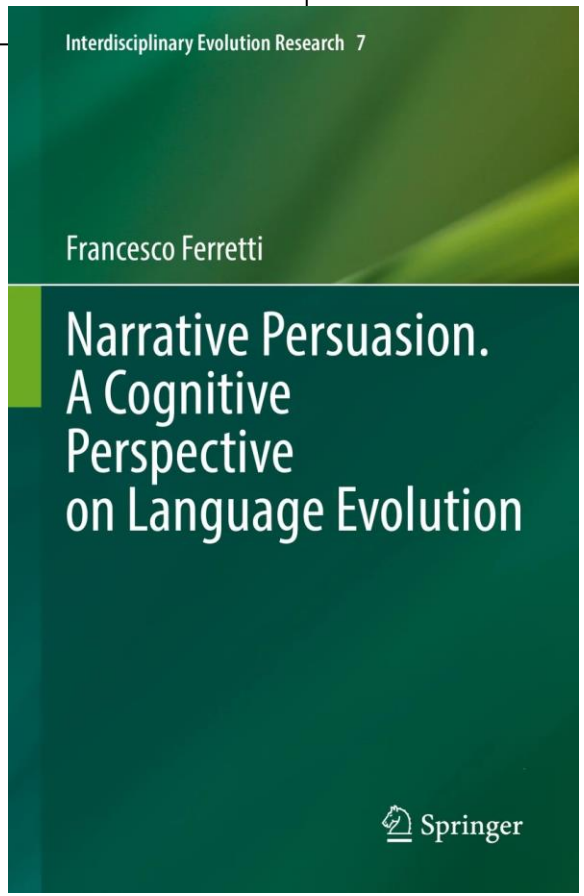


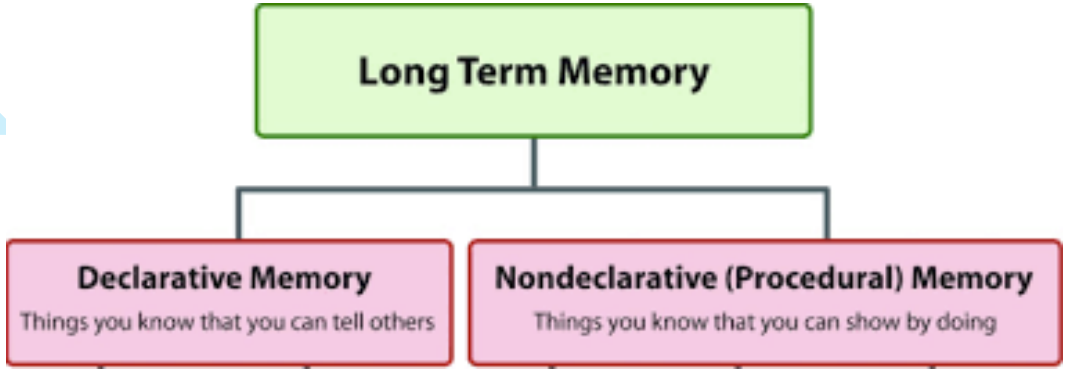
Human linguisticality

Languages

S-languages

Shared knowldege

↑ declarative memory
↓ procedural memory



- complex phonologies
- opaque morphologies
- limited semantic transparency
- limited compositional structure
- less sophisticated syntax

CHAPTER
76

The Declarative/Procedural Model:
A Neurobiological Model of Language
Learning, Knowledge, and Use

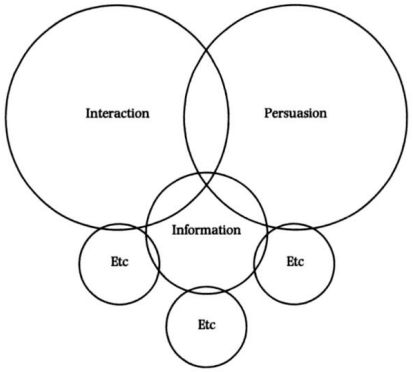
Michael T. Ullman
Brain and Language Laboratory, Department of Neuroscience, Georgetown University, Washington, DC, USA

S-languages

Shared knowldege

↑ declarative memory
↓ procedural memory
↓ working memory
↓ executive function
↑ perception, emotion, or sensorimotor

- complex phonologies
- opaque morphologies
- limited semantic transparency
- limited compositional structure
- less sophisticated syntax



Human linguisticality

Languages

S-languages

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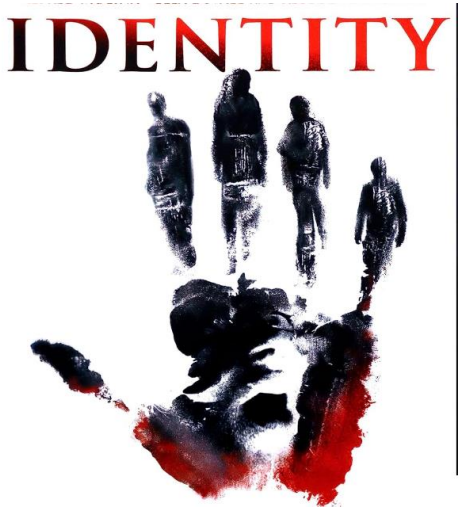
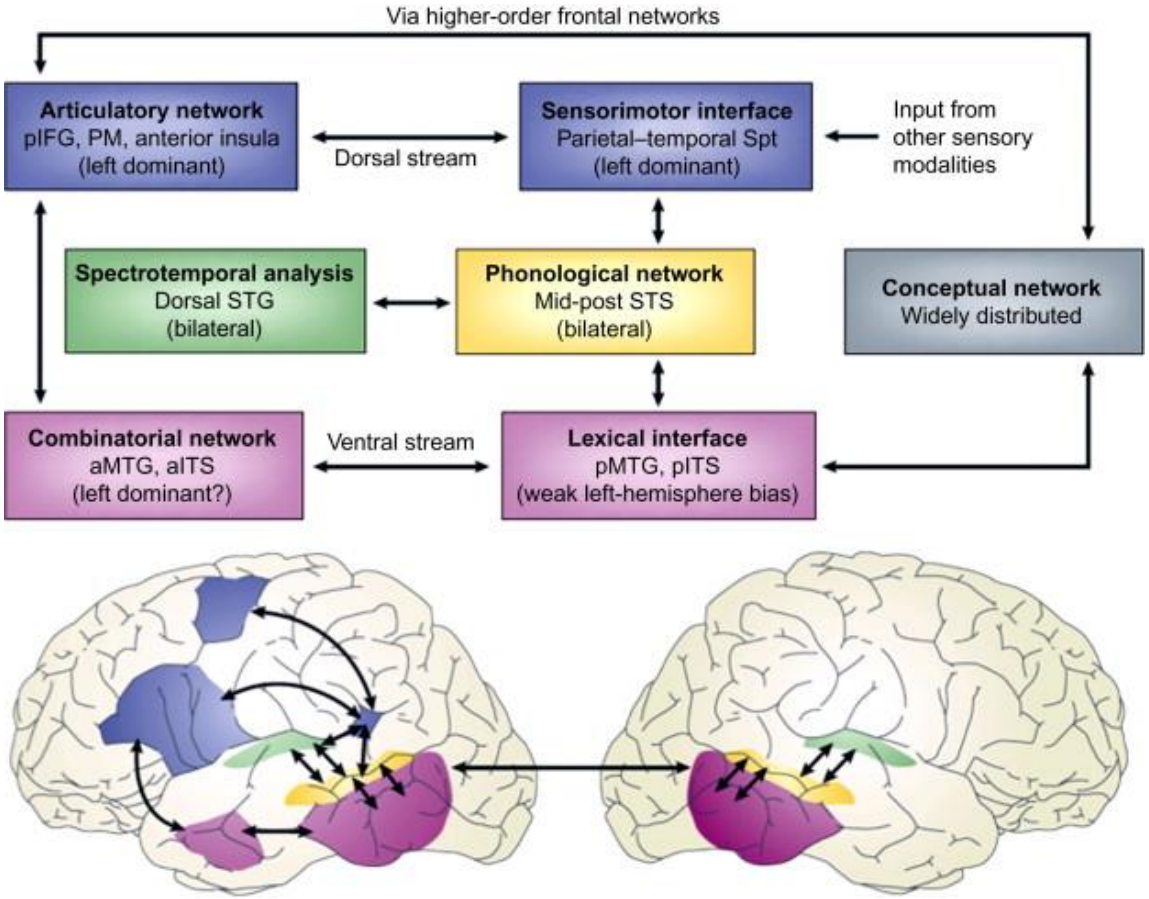
I	see	-intensive	foreigner	he
'íkao	*-ap*	*-áp*	*-iig*	*-á*
mouth	-pull	-up	-continuative	-declarative

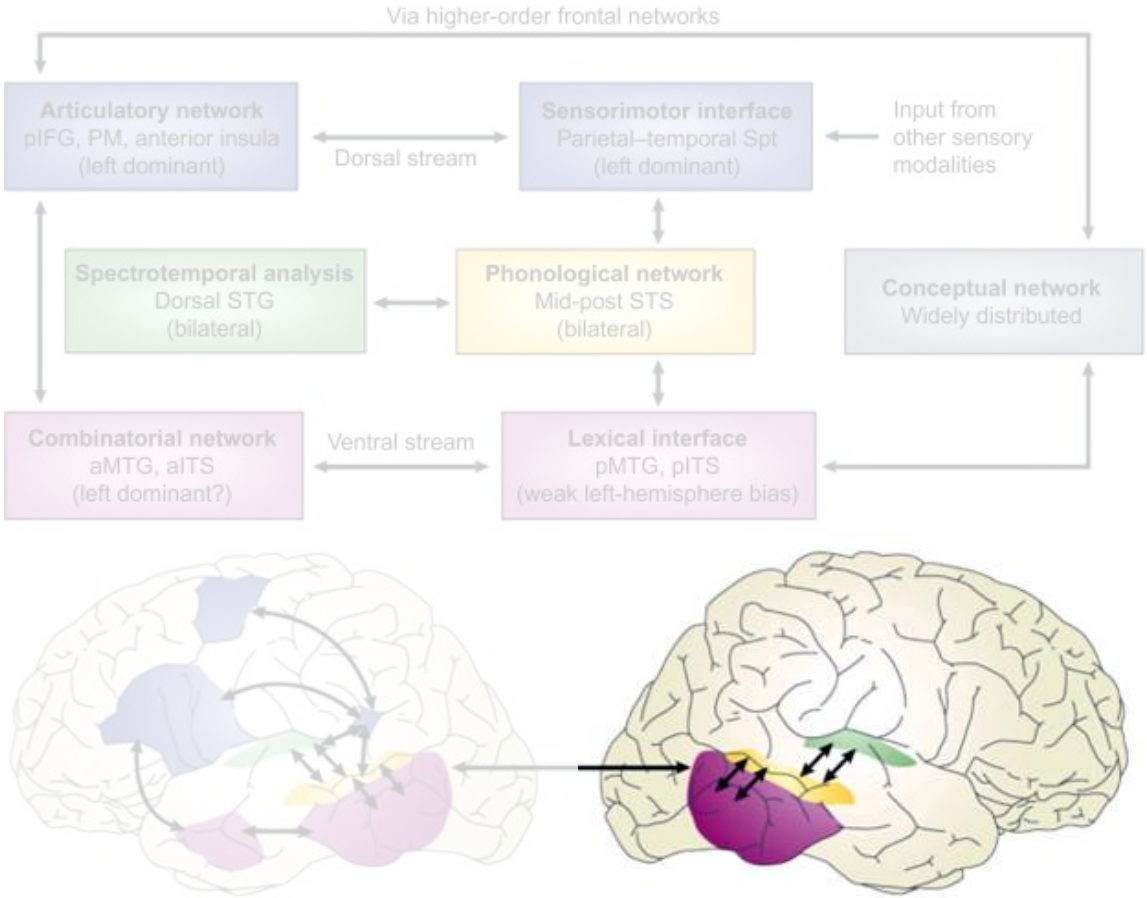
"I really watch[ed] the foreigner fishing [with line and hook]." (lit. "I watch the foreigner intently. He was pulling [fish] out by [their] mouths.")

X-languages

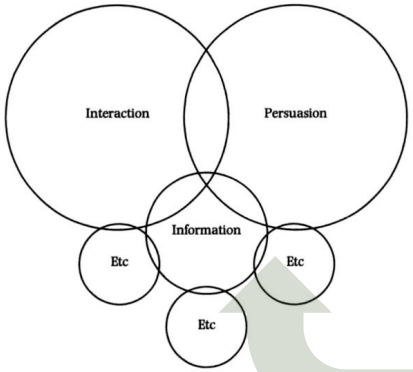
When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.




Via higher-order frontal networks
Articulatory network
pIFG, PM, anterior insula
(left dominant)
Dorsal stream
Sensorimotor interface
Parietal–temporal Spt
(left dominant)
Input from
other sensory
modalities
Spectrotemporal analysis
Dorsal STG
(bilateral)
Phonological network
Mid-post STS
(bilateral)
Conceptual network
Widely distributed
Combinatorial network
aMTG, aITS
(left dominant?)
Ventral stream
Lexical interface
pMTG, pITS
(weak left-hemisphere bias)



More involved in:
- figurative language
- implicit meanings
- background knowledge
- discourse contexts
- pragmatic interpretations



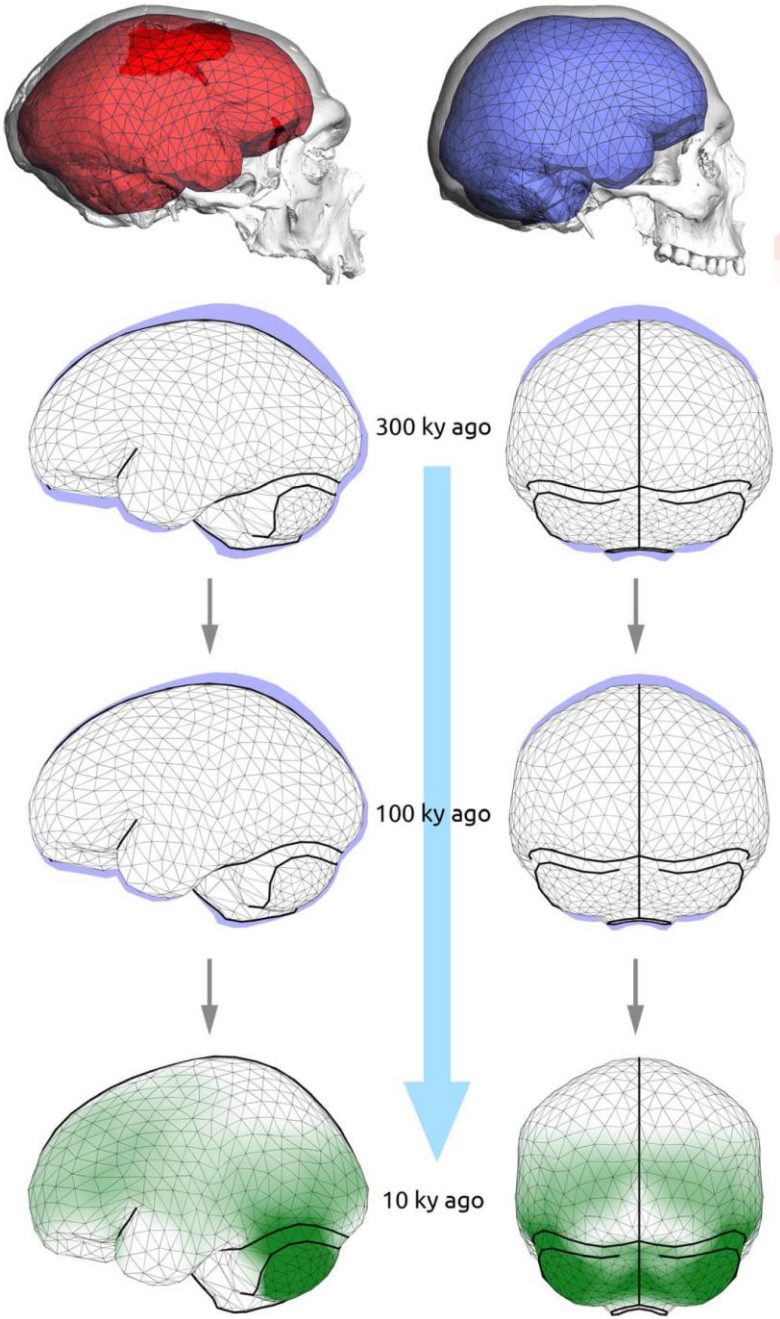
Human linguisticality

Languages

Biological modernity (evolving progresively)

Behavioral modernity (evolving progresively)

Linguistic modernity (evolving progresively)



SCIENCE ADVANCES | RESEARCH ARTICLE

PALEONTOLOGY

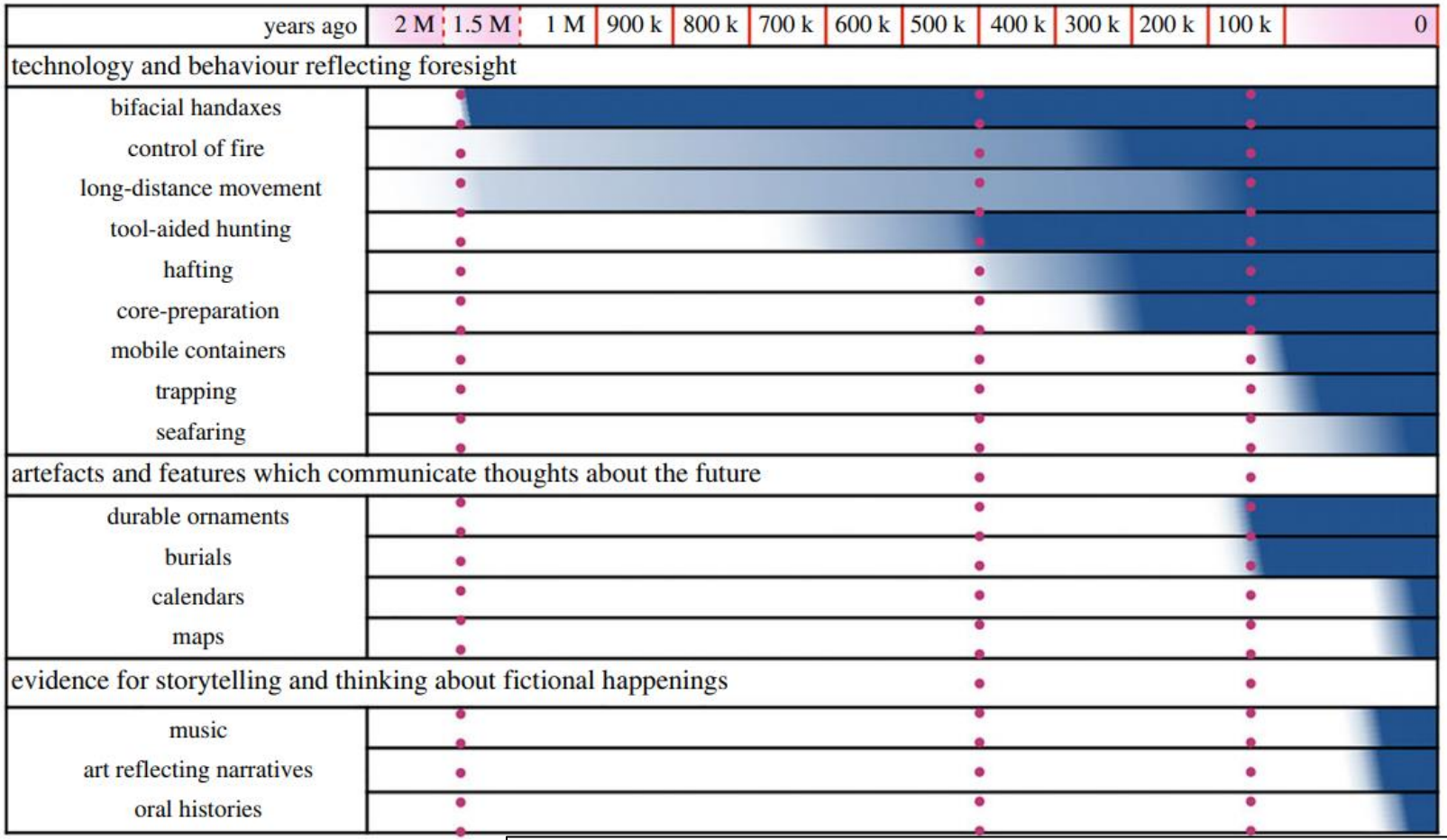
The evolution of modern human brain shape

Simon Neubauer,* Jean-Jacques Hublin, Philipp Gunz

Modern humans have large and globular brains that distinguish them from their extinct *Homo* relatives. The characteristic globularity develops during a prenatal and early postnatal period of rapid brain growth critical for neural wiring and cognitive development. However, it remains unknown when and how brain globularity evolved and how it relates to evolutionary brain size increase. On the basis of computed tomographic scans and geometric morphometric analyses, we analyzed endocranial casts of *Homo sapiens* fossils ($N = 20$) from different time periods. Our data show that, 300,000 years ago, brain size in early *H. sapiens* already fell within the range of present-day humans. Brain shape, however, evolved gradually within the *H. sapiens* lineage, reaching present-day human variation between about 100,000 and 35,000 years ago. This process started only after other key features of craniofacial morphology appeared modern and paralleled the emergence of behavioral modernity as seen from the archeological record. Our findings are consistent with important genetic changes affecting early brain development within the *H. sapiens* lineage since the origin of the species and before the transition to the Later Stone Age and the Upper Paleolithic that mark full behavioral modernity.

nity (evolving progresively)

EIO/2



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PHILOSOPHICAL TRANSACTIONS B

royalsocietypublishing.org/journal/rstb

Research

Cite this article: Langley MC, Suddendorf T. 2022 Archaeological evidence for thinking about possibilities in hominin evolution. *Phil. Trans. R. Soc. B* **377**: 20210350. https://doi.org/10.1098/rstb.2021.0350

Archaeological evidence for thinking about possibilities in hominin evolution

Michelle C. Langley[1,2] and Thomas Suddendorf[3]

[1]Australian Research Centre for Human Evolution, and [2]Archaeology, School of Environment and Science, Griffith University, Brisbane, 4111 Queensland, Australia
[3]School of Psychology, The University of Queensland, 4072 Queensland, Australia

MCL, 0000-0002-0299-5561; TS, 0000-0003-3328-7442

The emergence of the ability to think about future possibilities must have played an influential role in human evolution, driving a range of foresightful behaviours, including preparation, communication and technological inno-

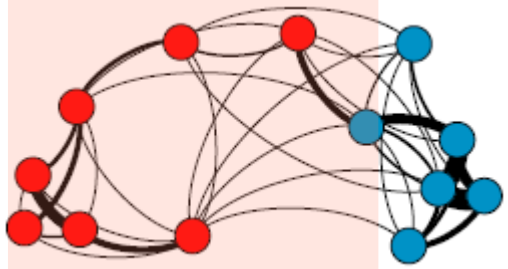
Prehistory

Biological modernity (evolving progresively)

S-languages

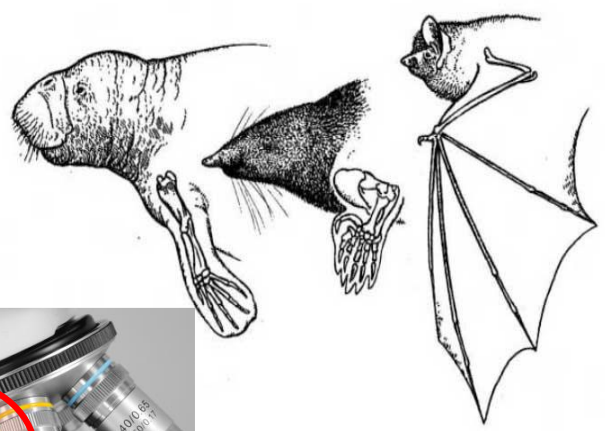
- complex phonologies
- opaque morphologies
- limited semantic transparency
- limited compositional structure
- less sophisticated syntax

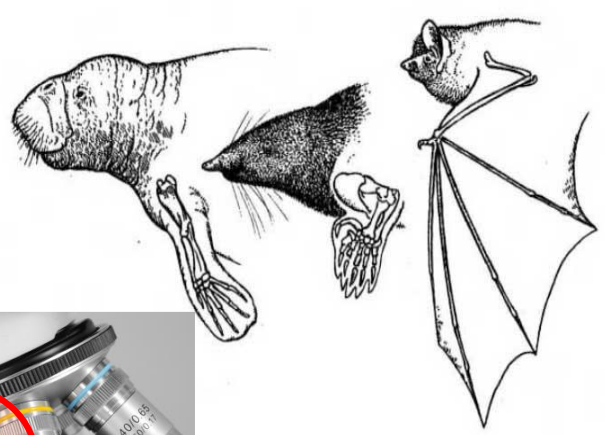
X-languages

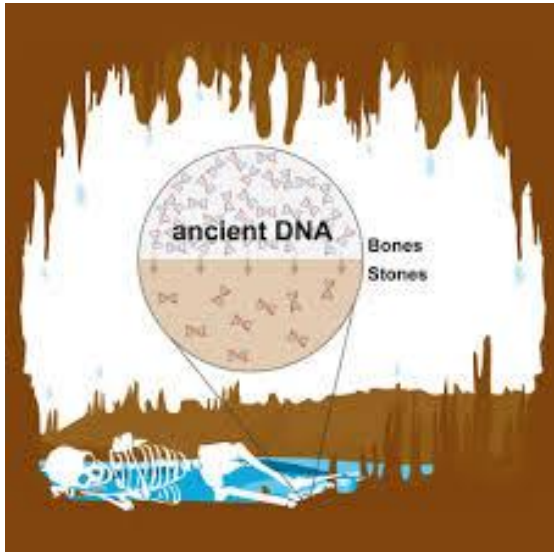


- expanded vocabularies
- increased syntactic complexity
- simpler sound combinations
- more transparent/regular morphologies
- greater compositionality
- enhanced semantic transparency


LANGUAGE

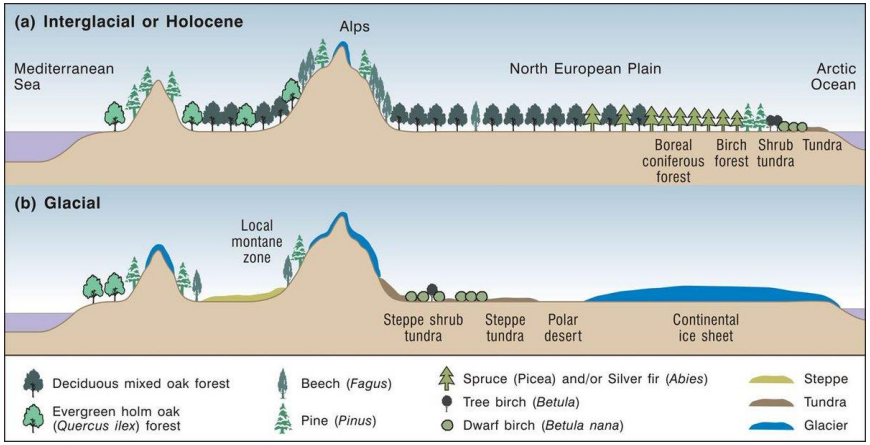






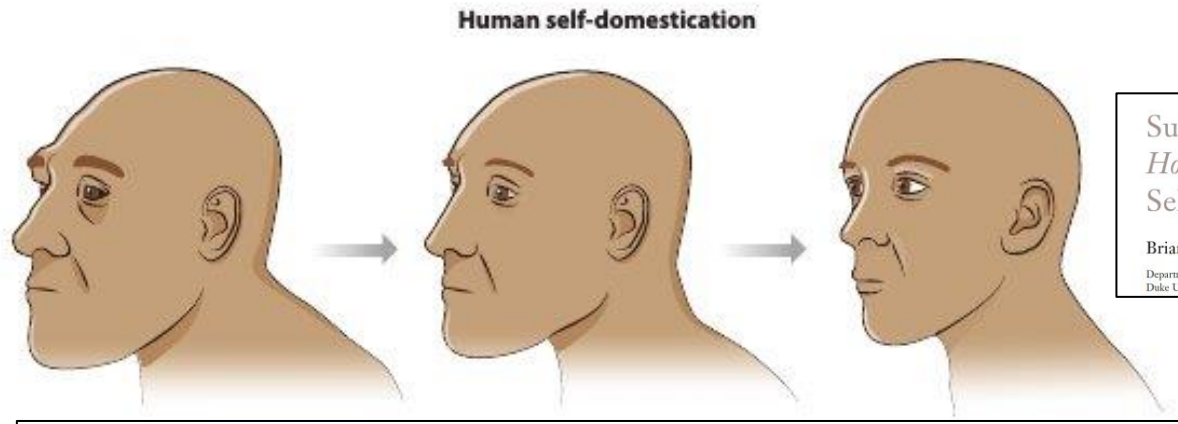
NEANDERTHAL-LIKE 'MINI-BRAINS' CREATED IN THE LAB WITH CRISPR

Organoids with an ancient gene variant are smaller and bumpier than those with human genes.



HOW I HAVE STRUCTURED MY TALK

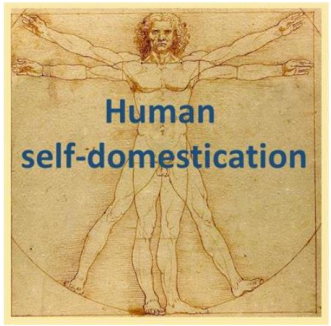
1. Introduction
2. Language(s) evolution (research): an outline
3. The self-domestication account of human evolution
4. Conclusions and future prospects



Survival of the Friendliest:
Homo sapiens Evolved via
Selection for Prosociality

Brian Hare

Department of Evolutionary Anthropology and Center for Cognitive Neuroscience, Duke University, Durham, North Carolina 27708; email: b.hare@duke.edu



Research Topic

Self-Domestication and Human Evolution

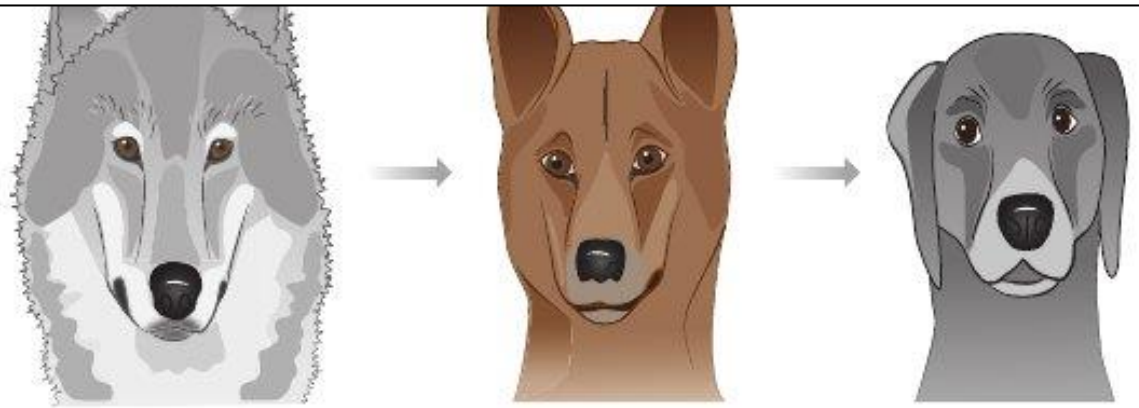
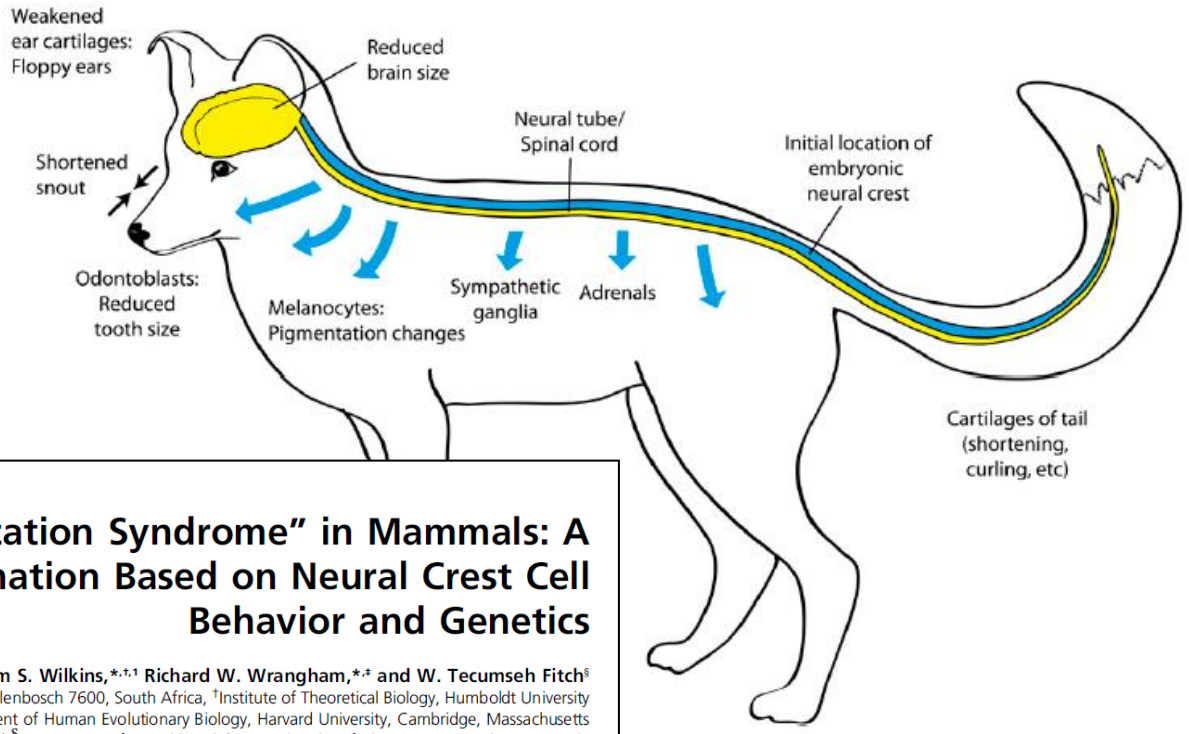


Figure 1

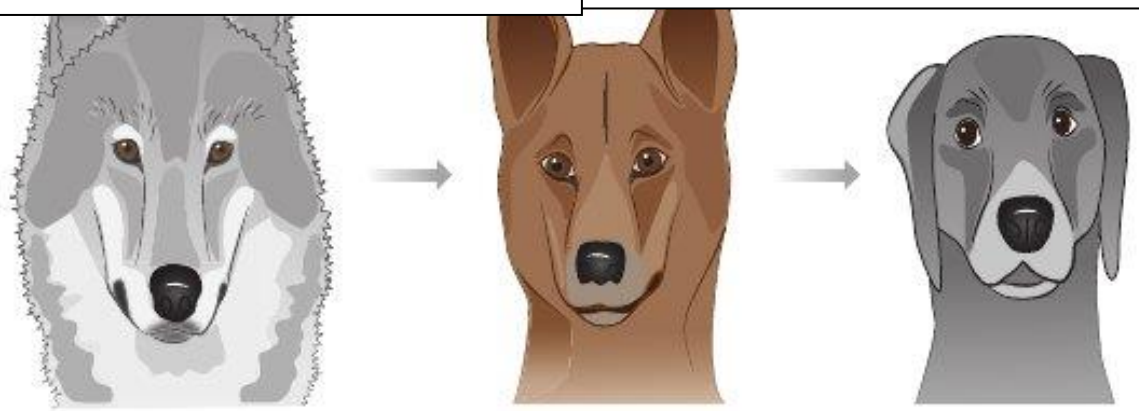
Homo sapiens evolved, in part, as a result of selection for increased in-group prosociality during the Paleolithic, leading to a variety of morphological, physiological, and cognitive changes also observed in domestic animals such as *Canis familiaris*.



The "Domestication Syndrome" in Mammals: A Unified Explanation Based on Neural Crest Cell Behavior and Genetics

Adam S. Wilkins,*,†,1 Richard W. Wrangham,*,‡ and W. Tecumseh Fitch§

*Stellenbosch Institute of Advanced Study, Stellenbosch 7600, South Africa, †Institute of Theoretical Biology, Humboldt University zu Berlin, Berlin 10115, Germany, ‡Department of Human Evolutionary Biology, Harvard University, Cambridge, Massachusetts 02138, and §Department of Cognitive Biology, University of Vienna, A-1090 Vienna, Austria



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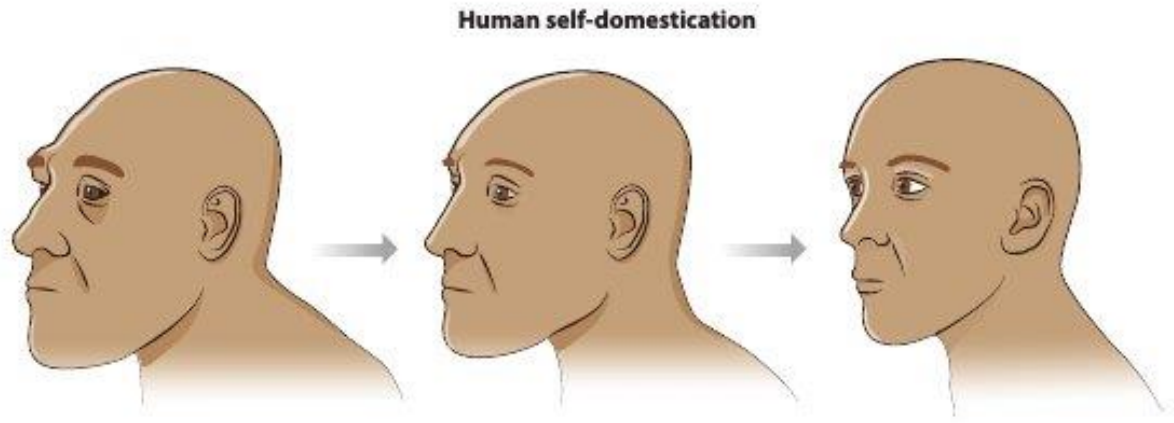
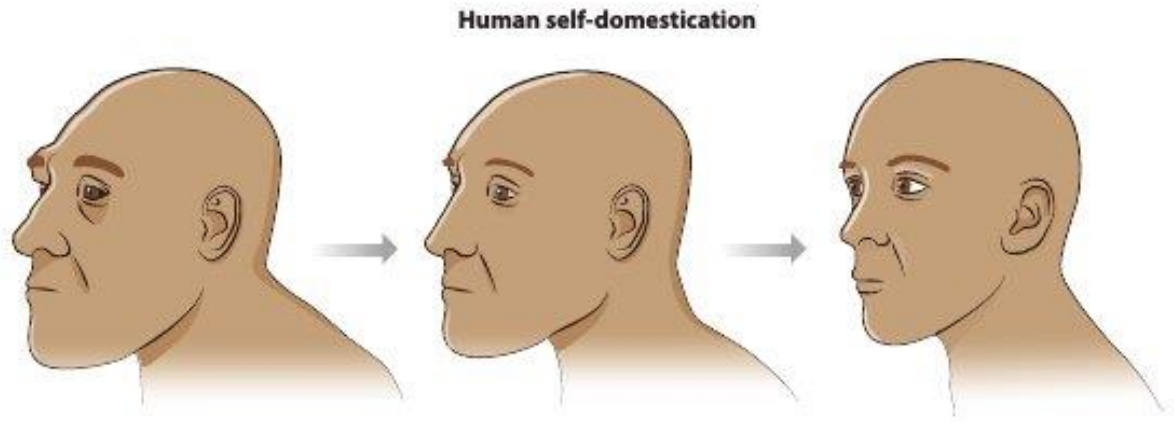


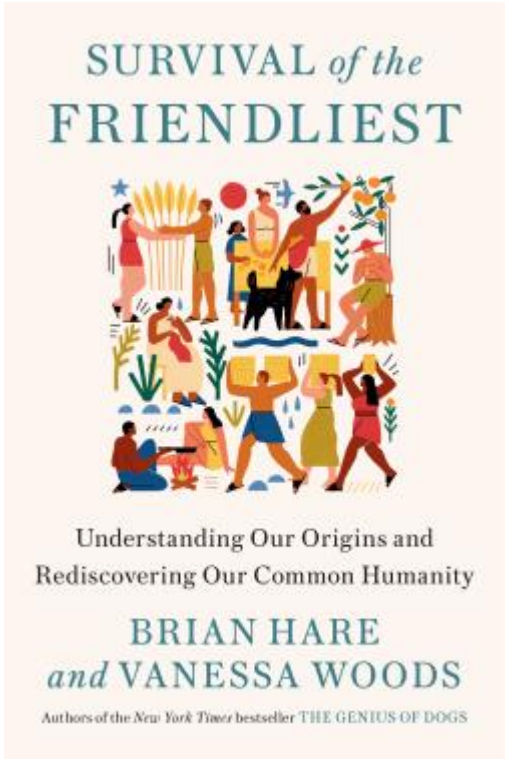
JOURNAL ARTICLE

Craniofacial Feminization, Social Tolerance, and the Origins of Behavioral Modernity

Robert L. Cieri, Steven E. Churchill, Robert G. Franciscus, Jingzhi Tan and Brian Hare

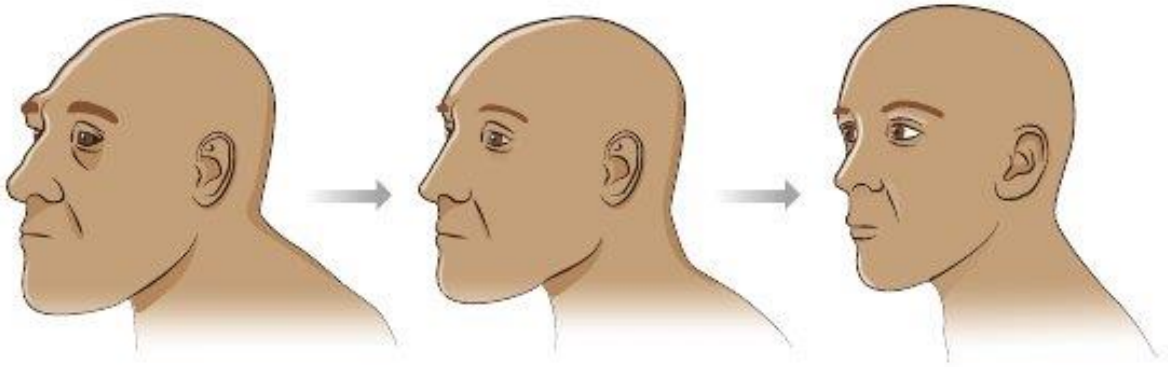
Current Anthropology
Vol. 55, No. 4 (August 2014), pp. 419-443

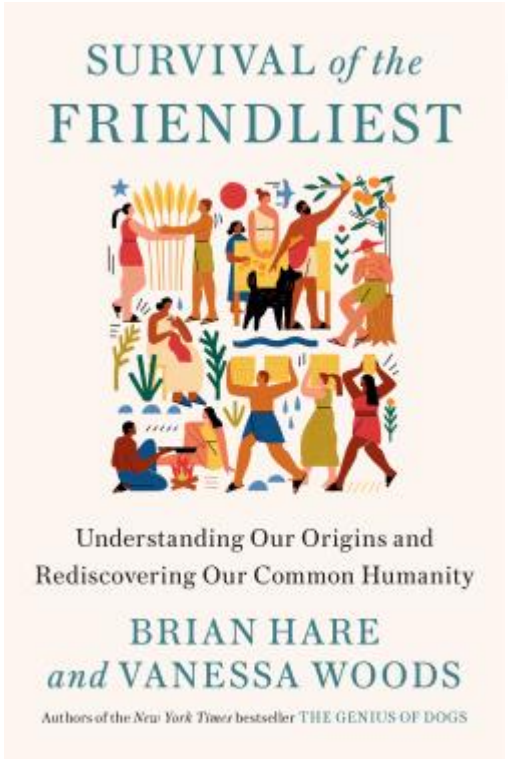




- rise of community living
- advent of co-parenting (as human children demand more attention during longer periods)
- changes in our foraging ecology
- increasingly harsh environments
- moving to new territories

Human self-domestication





Increased tolerance and prosociality
Increased serotonin and oxytocin
Expanded developmental windows
Feminized or juvenilized morphology
Increased cooperative communication

Psychon Bull Rev (2017) 24:106–110
DOI 10.3758/s13423-016-1165-8

BRIEF REPORT

Sexual communication and domestication may give rise to the signal complexity necessary for the emergence of language: An indication from songbird studies

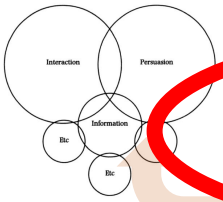
Kazuo Okanoya[1]

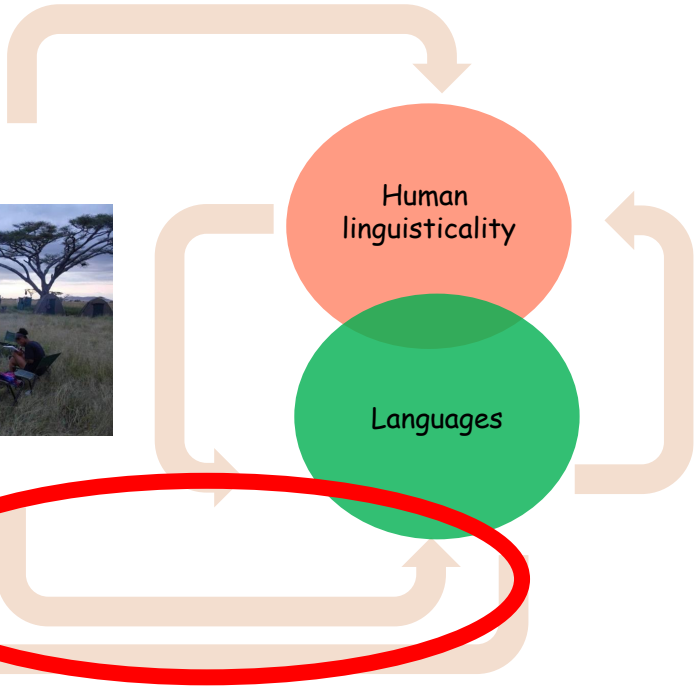
Biol Philos (2018) 33:9
https://doi.org/10.1007/s10539-018-9612-8

Self domestication and the evolution of language

James Thomas[1] · **Simon Kirby**[1]

A self-domestication account of language evolution





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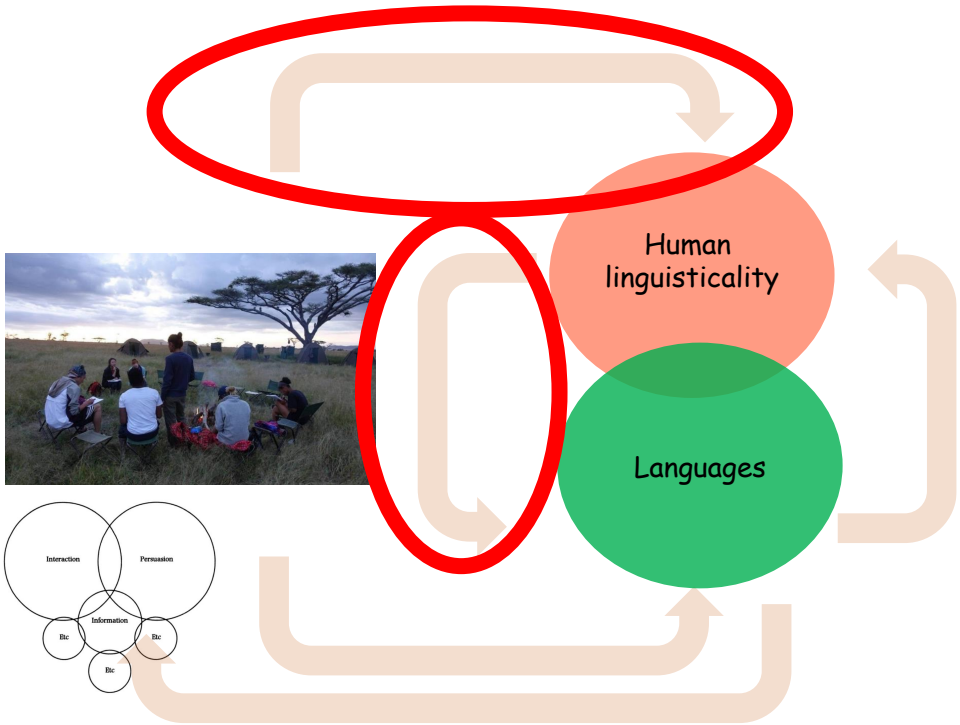

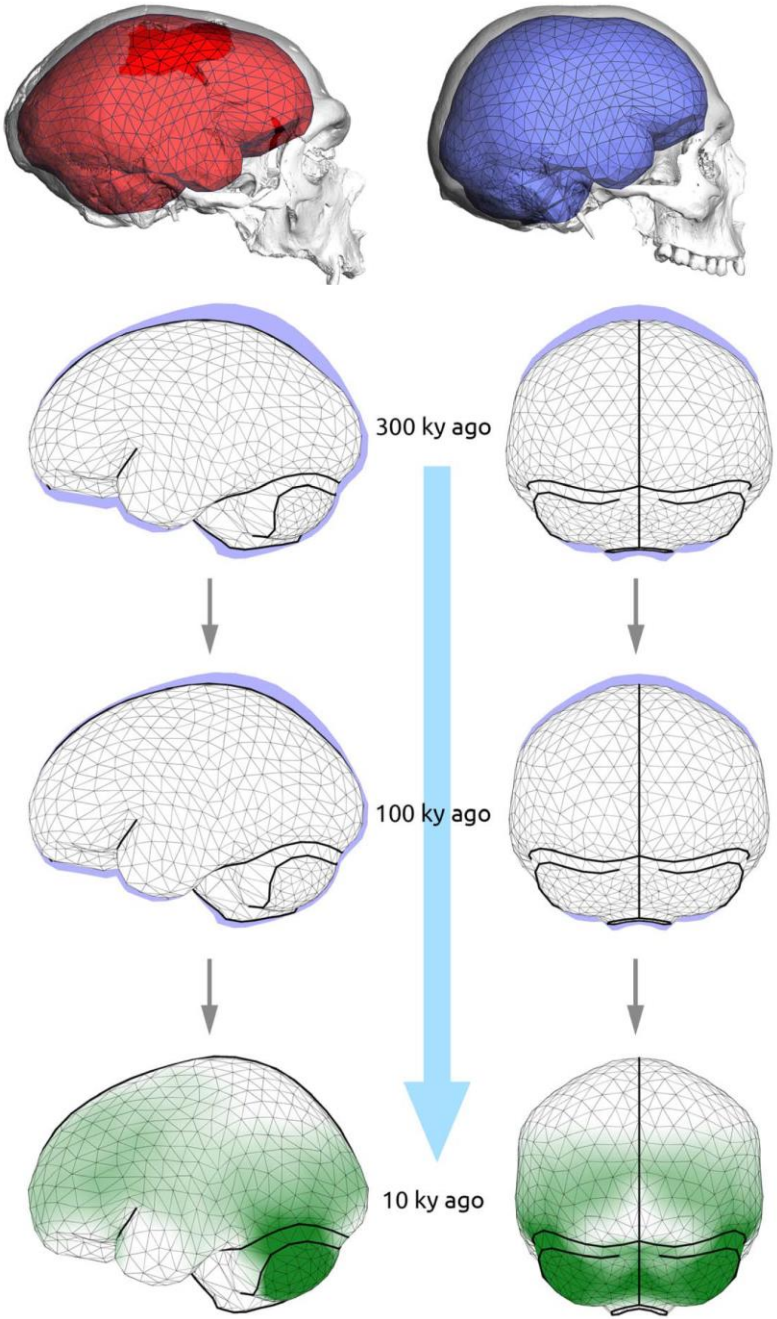

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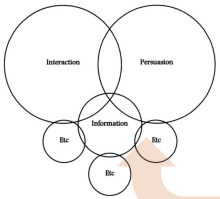
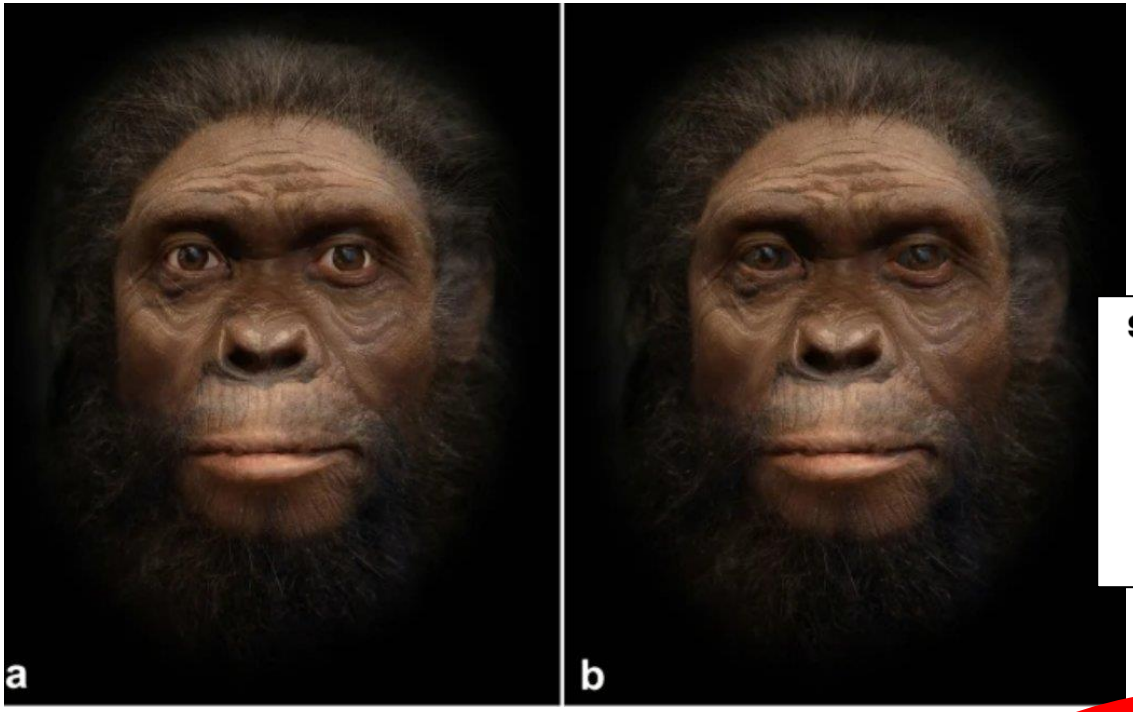




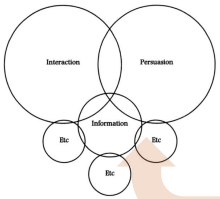
scientific reports

Check for updates

OPEN

The adaptive significance of human scleral brightness: an experimental study

Slawomir Wacewicz[1✉], Juan Olvido Perea-García[2], Zdzisław Lewandowski[3] & Dariusz P. Danel[4]



Human linguisticality

Languages

A self-domestication account of language evolution

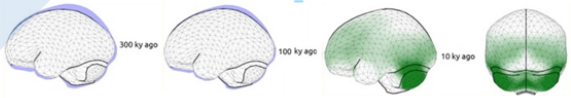
Neanderthals

Anatomically-modern humans

Genetic changes

Selected changes in genes related to language-readiness

Selected changes in candidate genes for domestication



Physiological / behavioral changes

Changes in brain and cognition
Increased social complexity
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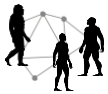
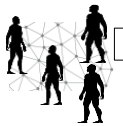
Enhanced playing behavior

Stage 1

Stage 2



Stage 3



Stage 4

- two-slot grammars/compounds
- early language solidifies
- basic hierarchical syntax
- greater compositionality
- increased syntactic complexity

before 200 kya
self-domestication starts to emerge
reactive physical aggression high

200 – 50 kya
increased self-domestication
accelerated feedback loop
decline in reactive aggression
rise of verbal aggression

50 – 10 kya
self-domestication at its peak
reactive aggression at its low

10 kya onward
Variable presentation of self-domestication
Increase in pro-active aggression (in some contexts)

A self-domestication account of language evolution

(1) Run! Go! Move! Up! Down! Look! Bite! Fire! Snake! Eagle!

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A self-domestication account of language evolution

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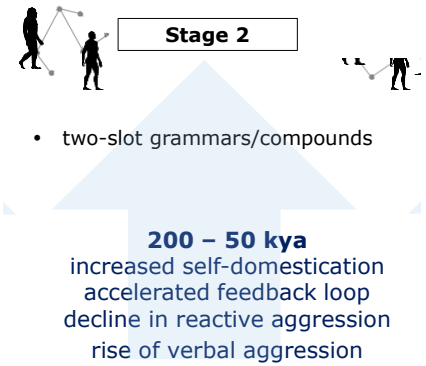

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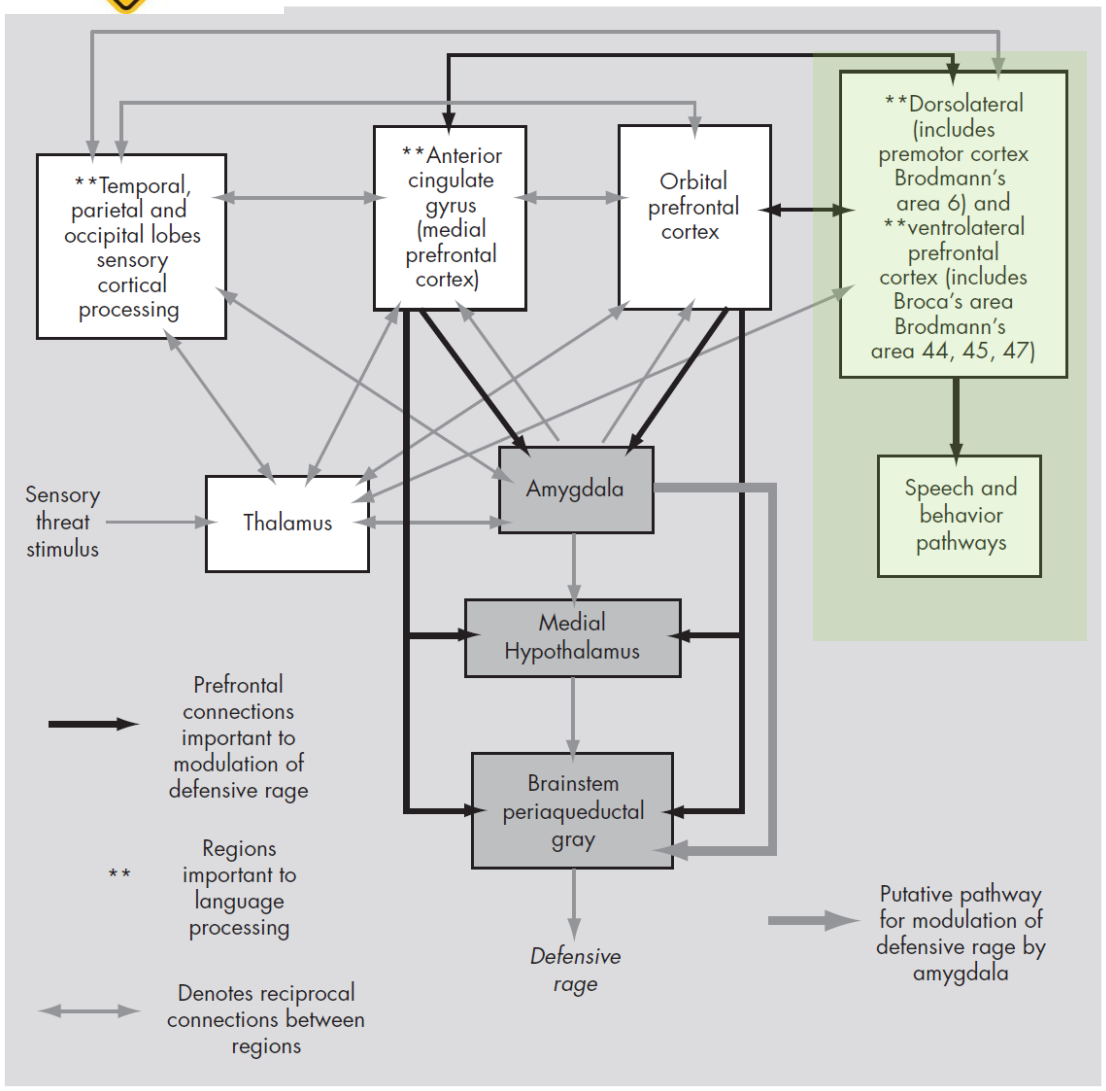
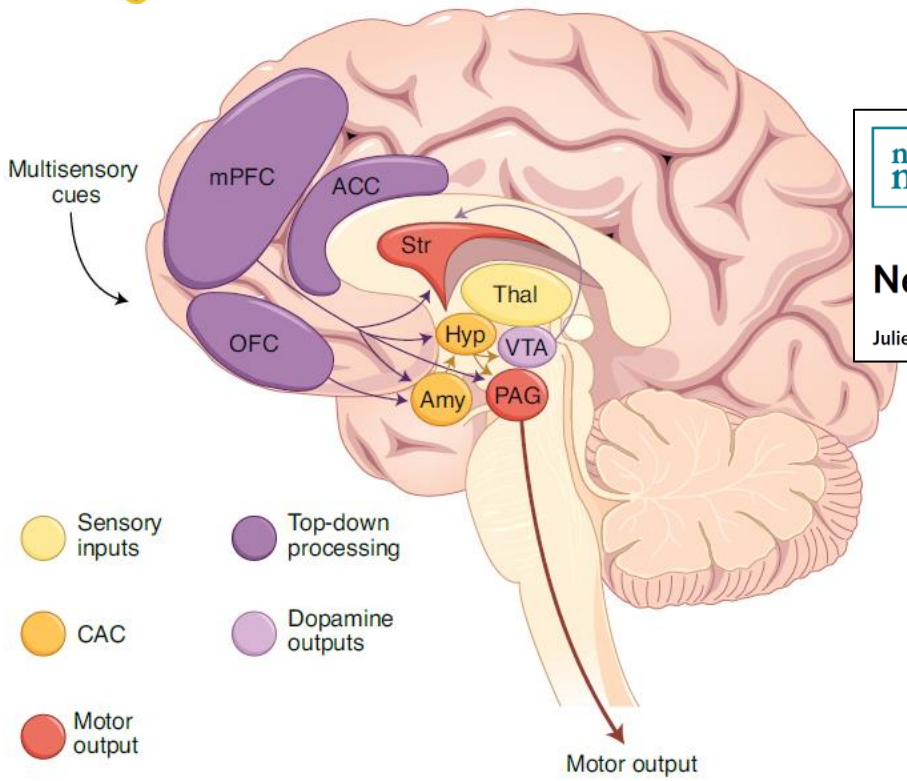


SPECIAL ARTICLES

Language and the Modulation of Impulsive Aggression

Lisa A. Miller, M.D.
Robert L. Collins, Ph.D.
Thomas A. Kent, M.D.

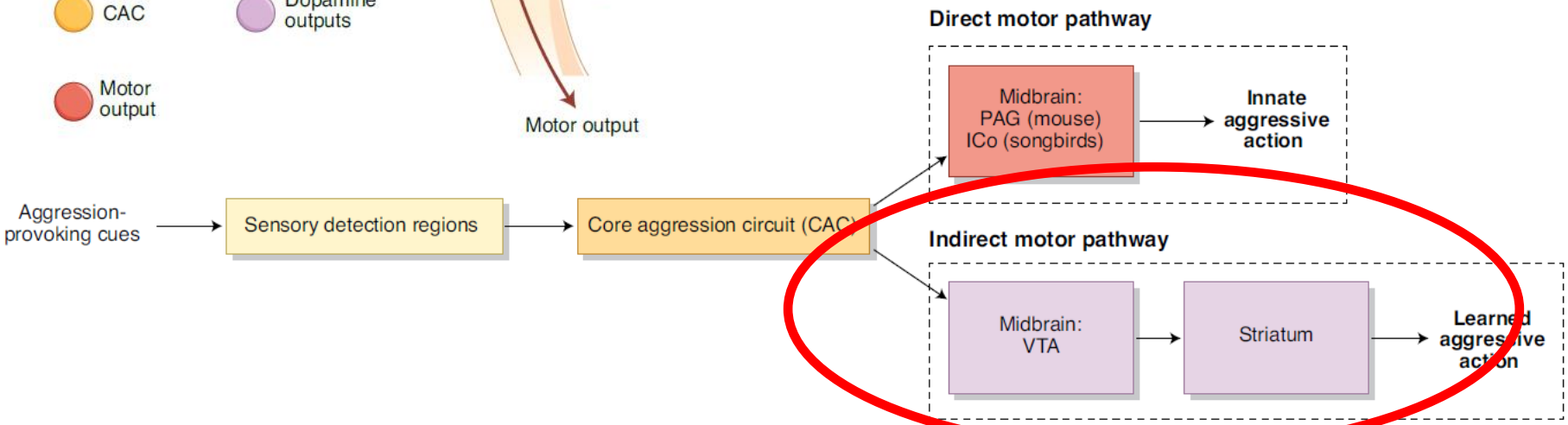
A self-domestication account of language evolution



nature neuroscience
REVIEW ARTICLE
https://doi.org/10.1038/s41593-020-00715-2
Check for updates

Neural mechanisms of aggression across species

Julieta E. Lischinsky[1] and Dayu Lin[1,2,3]



A self-domestication account of language evolution

A feedback loop

Self-domestication

Grammar

Cross-modality

Modern humans excel at unifying and combining conceptual units that belong to distinct 'core knowledge systems' (Spelke, 1994, 2000, 2003)

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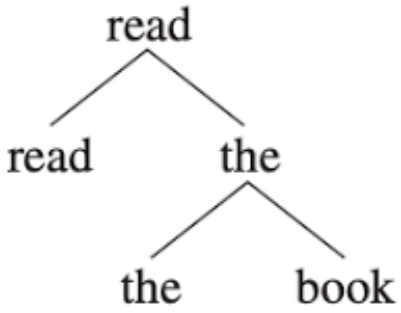

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A self-domestication account of language evolution

frontiers

From physical aggression to verbal behavior: Language evolution and self-domestication feedback loop

Ljiljana Progovac[1], Antonio Benítez-Burraco[2*]

A feedback loop

"The first human who hurled an insult instead of a stone was the founder of civilization."

Freud

The Urge to Merge:
Ritual Insult and the Evolution of Syntax

Ljiljana Progovac & John L. Locke

Cross-modality

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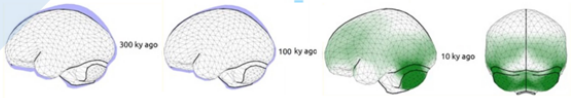

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a. $[_{SC/VP}$ roll balls] →
b. $[_{vP}$ cats $[_{SC/VP}$ roll balls]]

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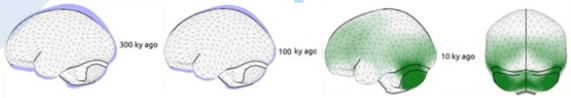

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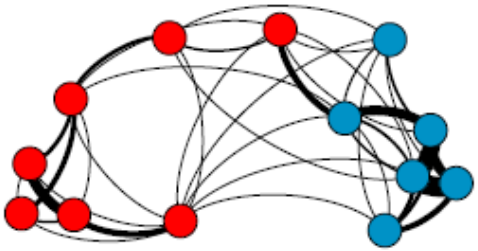

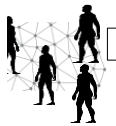

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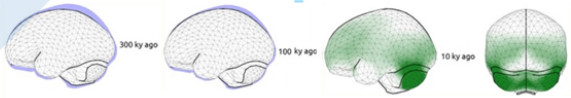

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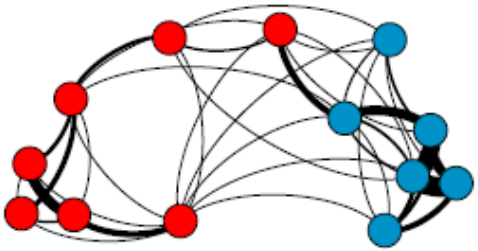

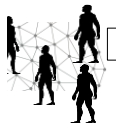

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self
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Received: 29 June 2018 | Revised: 8 October 2018 | Accepted: 21 October 2018
DOI: 10.1002/ajpa.23751

WILEY PHYSICAL ANTHROPOLOGY

YEARBOOK OF PHYSICAL ANTHROPOLOGY ARTICLE

The emergence of human warfare: Current perspectives

Marc Kissel[1] | Nam C. Kim[2]

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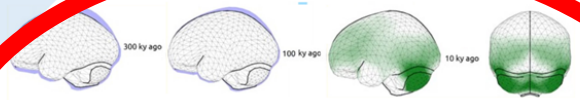

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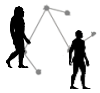
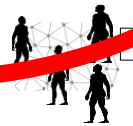
Feedback Loop

Stage 1



Stage 2

Stage 3



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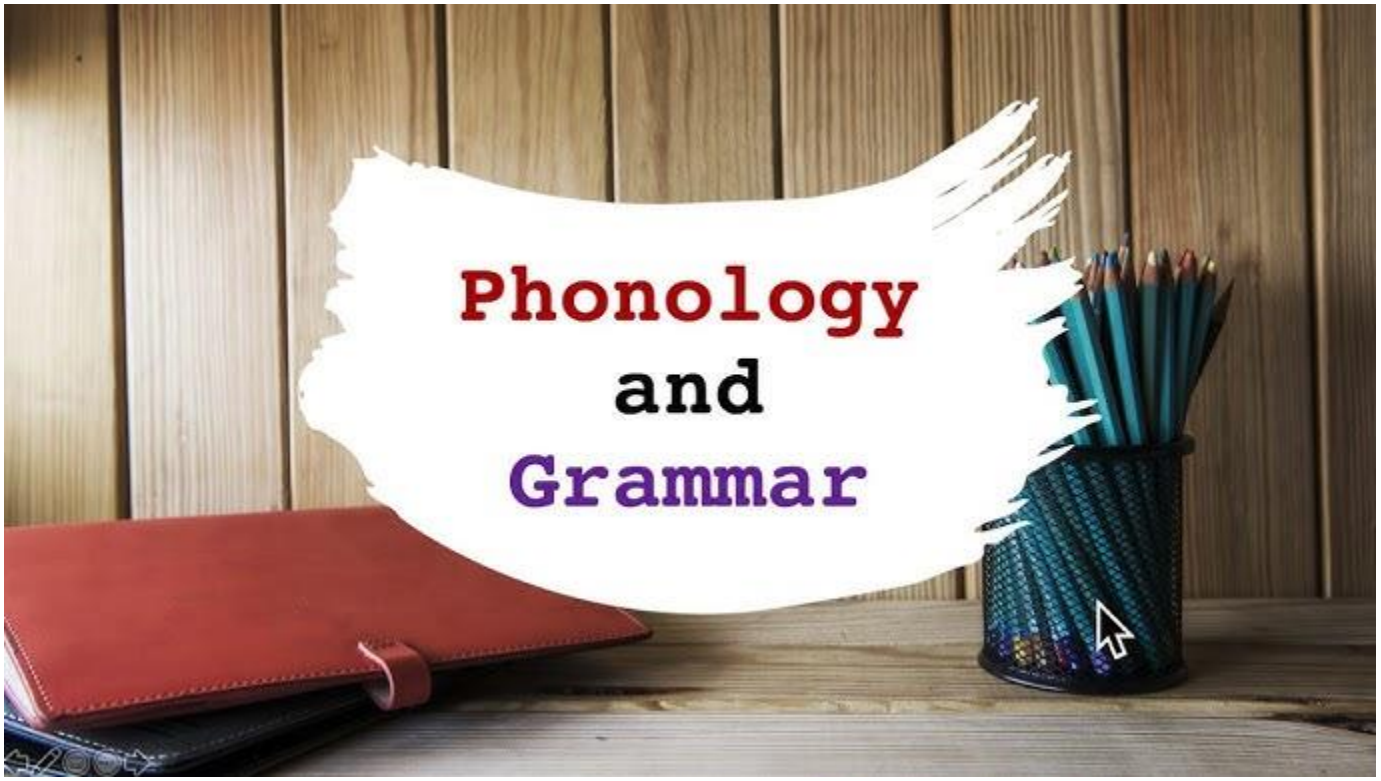

A self-domestication account of language evolution

1. Changes in the speech organs?

JOURNAL ARTICLE

Craniofacial Feminization, Social Tolerance, and the Origins of Behavioral Modernity

Robert L. Cieri, Steven E. Churchill, Robert G. Franciscus, Jingzhi Tan and Brian Hare

Current Anthropology

Vol. 55, No. 4 (August 2014), pp. 419-443

A self-domestication account of language evolution

1. Changes in the speech organs?

2. Increased signal complexity in domesticated animals

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A self-domestication account of language evolution

Received: 12 October 2022 | Revised: 28 March 2023 | Accepted: 11 April 2023

DOI: 10.1111/lnc3.12485

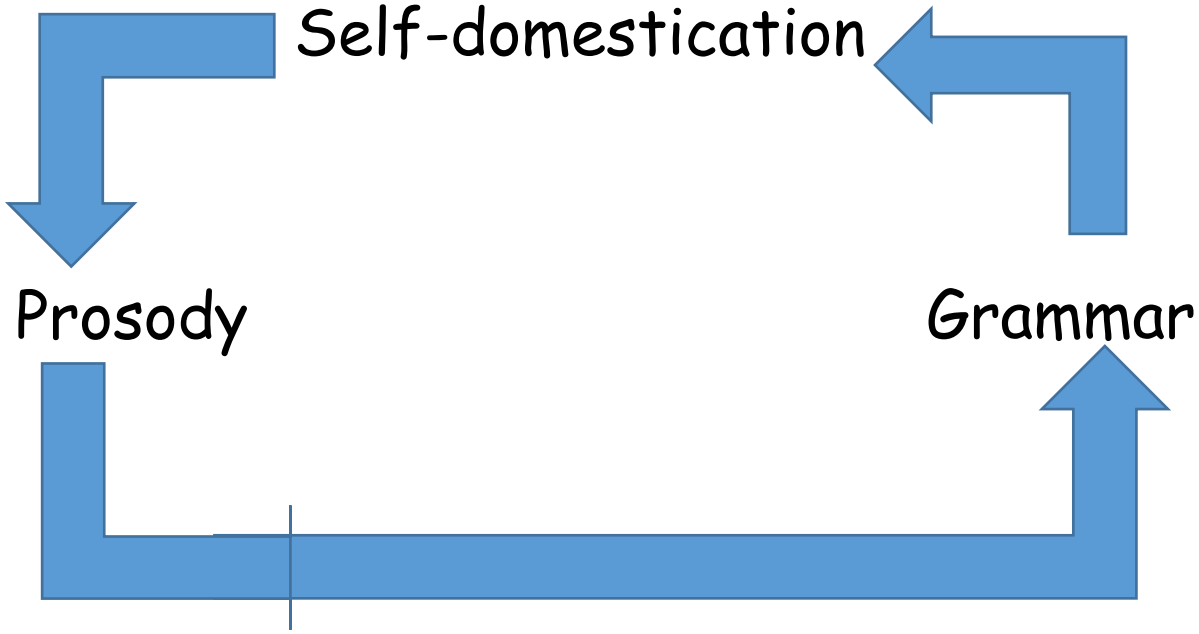
REVIEW ARTICLE

WILEY

Human self-domestication and the evolution of prosody

Antonio Benítez-Burraco[1] | Wendy Elvira-García[2]

A feedback loop



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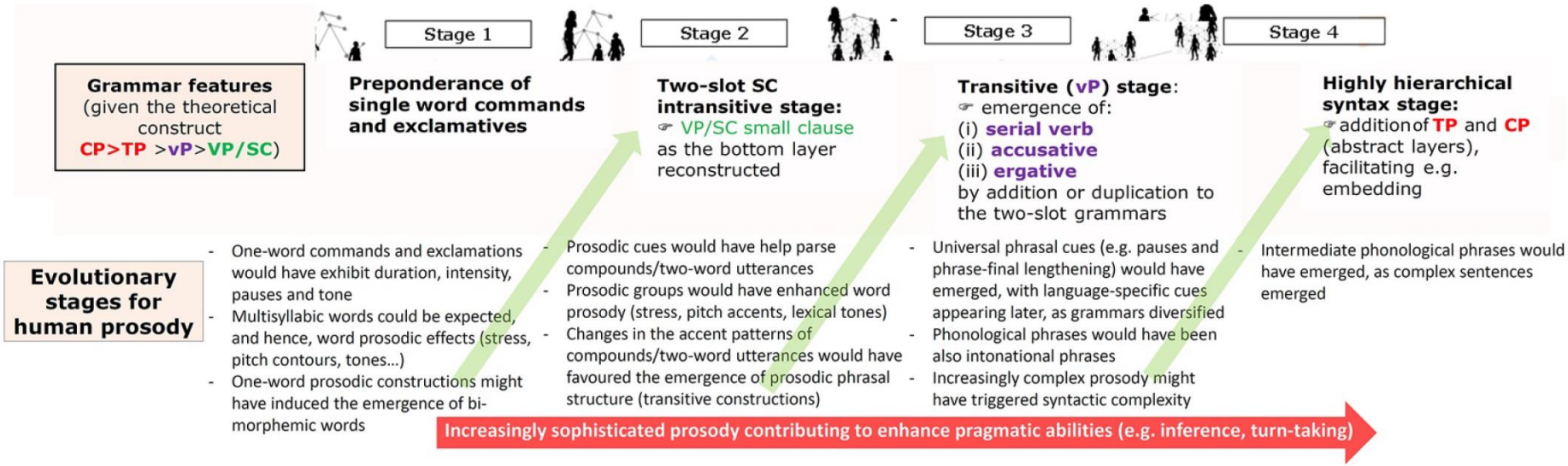

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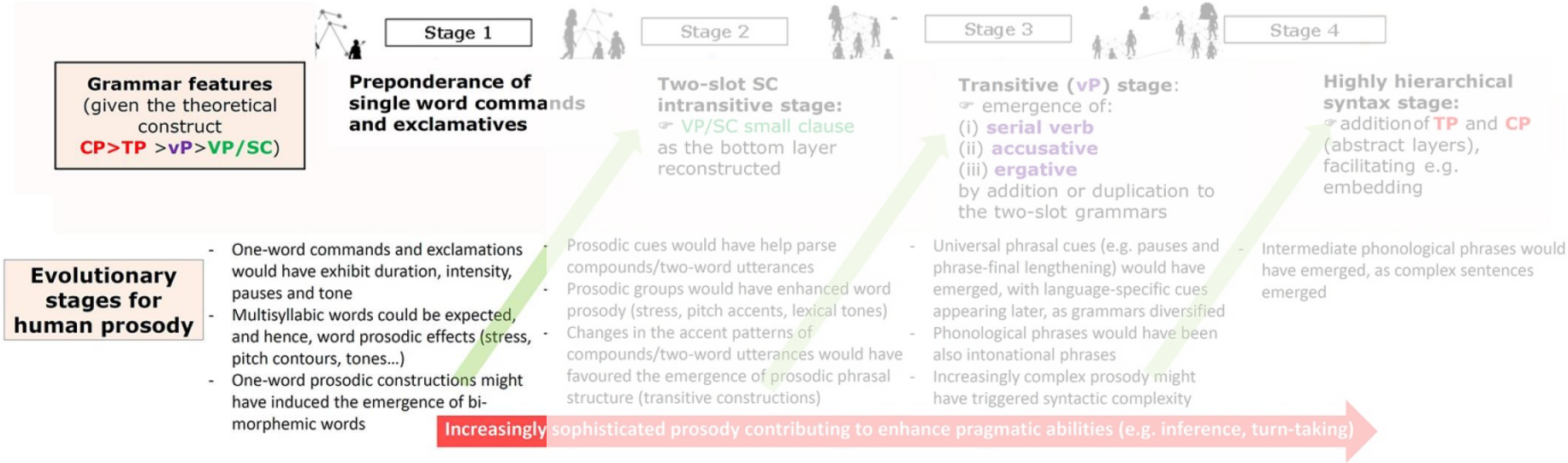

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Human self-domestication and the evolution of prosody

Antonio Benítez-Burraco[1] | Wendy Elvira-García[2]

Grammar features (given the theoretical construct CP>TP >vP>VP/SC)

Preponderance of single word commands and exclamatives

Two-slot SC intransitive stage:
☞ VP/SC small clause as the bottom layer reconstructed

Transitive (vP) stage:
☞ emergence of:
(i) **serial verb**
(ii) **accusative**
(iii) **ergative**
by addition or duplication to the two-slot grammars

Highly hierarchical syntax stage:
☞ addition of TP and CP (abstract layers), facilitating e.g. embedding

Evolutionary stages for human prosody

- One-word commands and exclamations would have exhibit duration, intensity, pauses and tone
- Multisyllabic words could be expected, and hence, word prosodic effects (stress, pitch contours, tones…)
- One-word prosodic constructions might have induced the emergence of bi-morphemic words

- Prosodic cues would have help parse compounds/two-word utterances
- Prosodic groups would have enhanced word prosody (stress, pitch accents, lexical tones)
- Changes in the accent patterns of compounds/two-word utterances would have favoured the emergence of prosodic phrasal structure (transitive constructions)

- Universal phrasal cues (e.g. pauses and phrase-final lengthening) would have emerged, with language-specific cues appearing later, as grammars diversified
- Phonological phrases would have been also intonational phrases
- Increasingly complex prosody might have triggered syntactic complexity

- Intermediate phonological phrases would have emerged, as complex sentences emerged

Increasingly sophisticated prosody contributing to enhance pragmatic abilities (e.g. inference, turn-taking)

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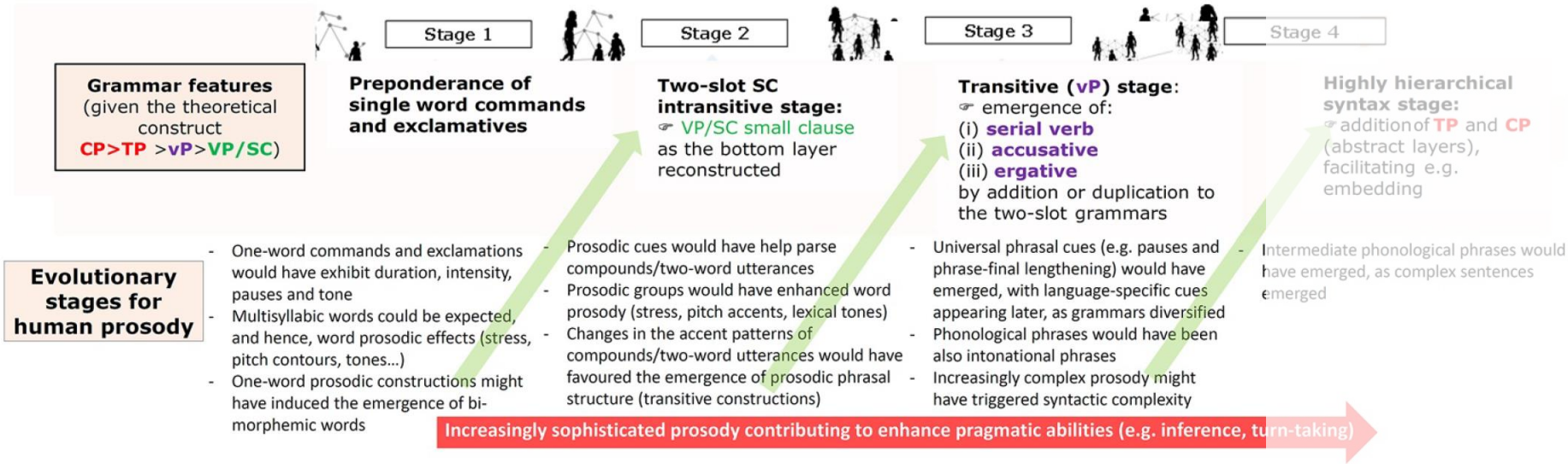

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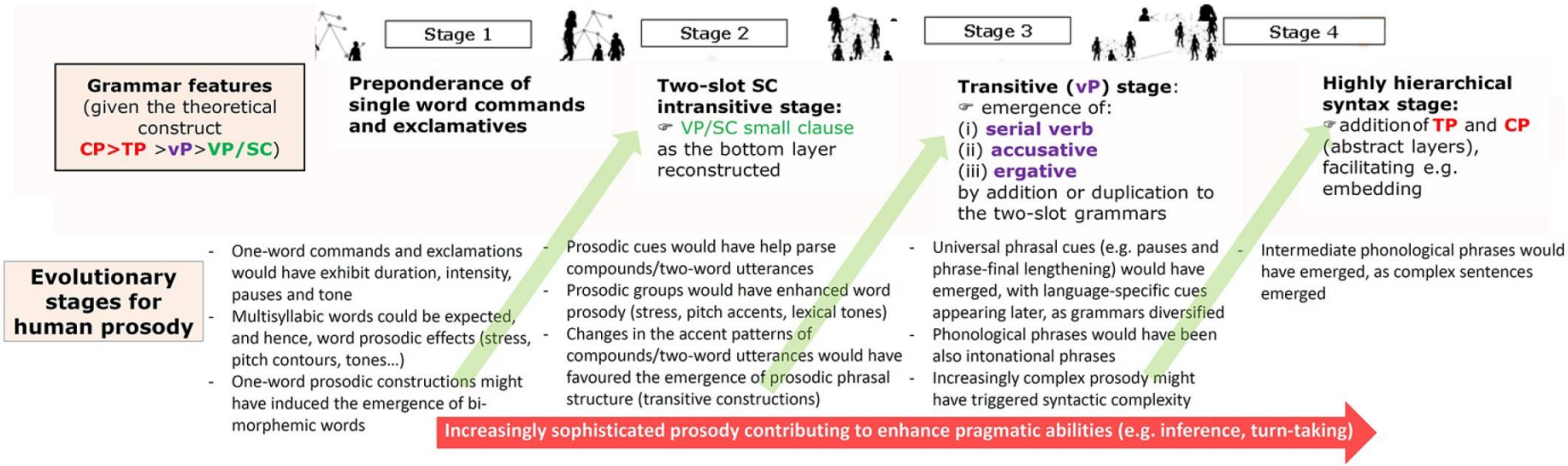
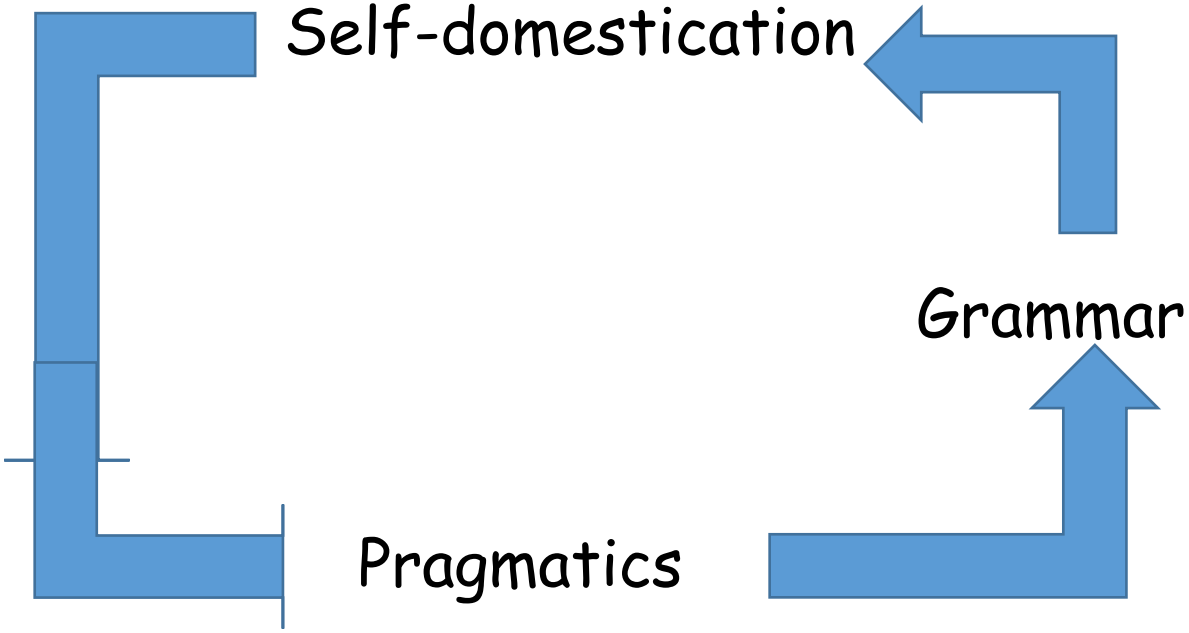


A self-domestication account of language evolution

- **Behavioral changes**
- **Cognitive changes**

A feedback loop



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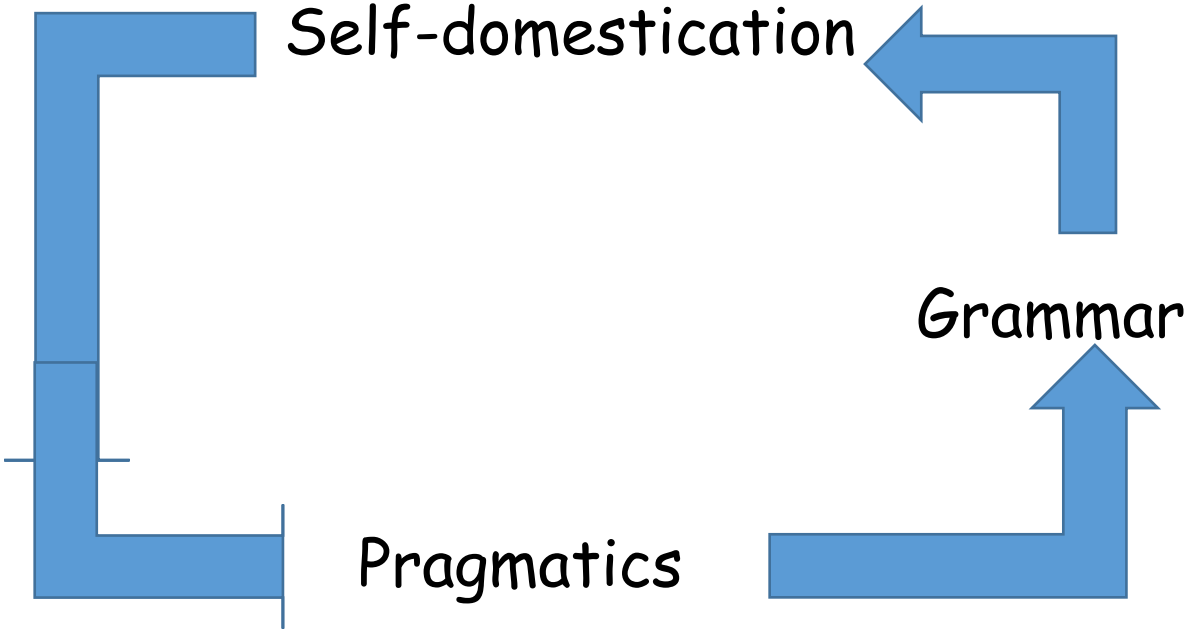

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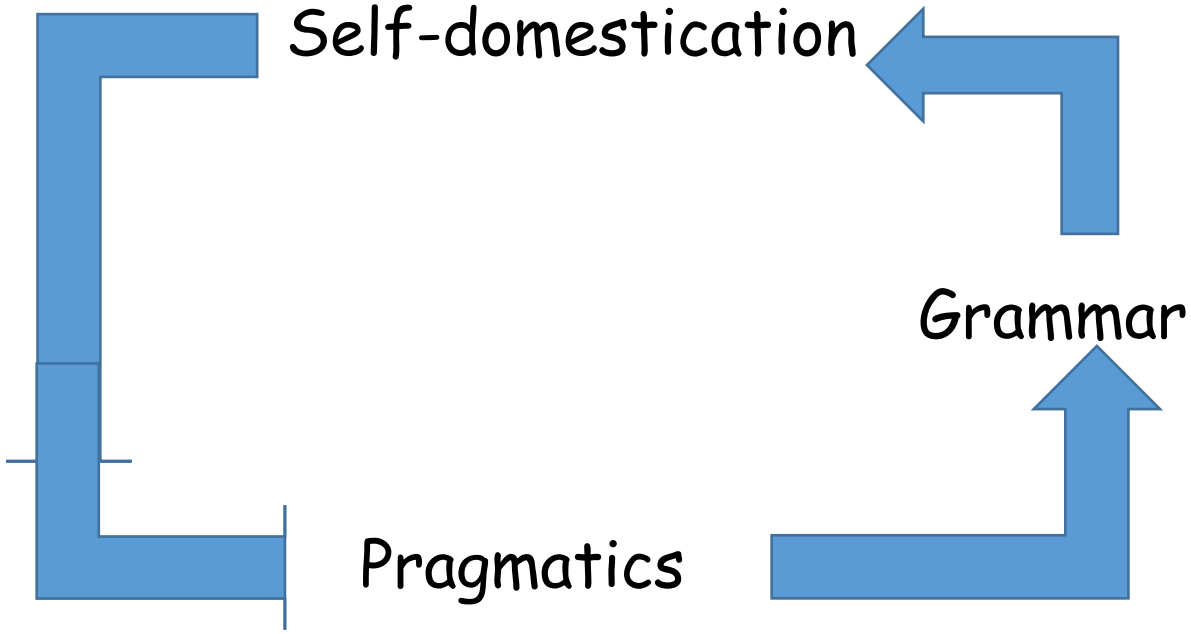


A self-domestication account of language evolution

COGNITIVE SCIENCE
A Multidisciplinary Journal

Cognitive Science 45 (2021) e12987

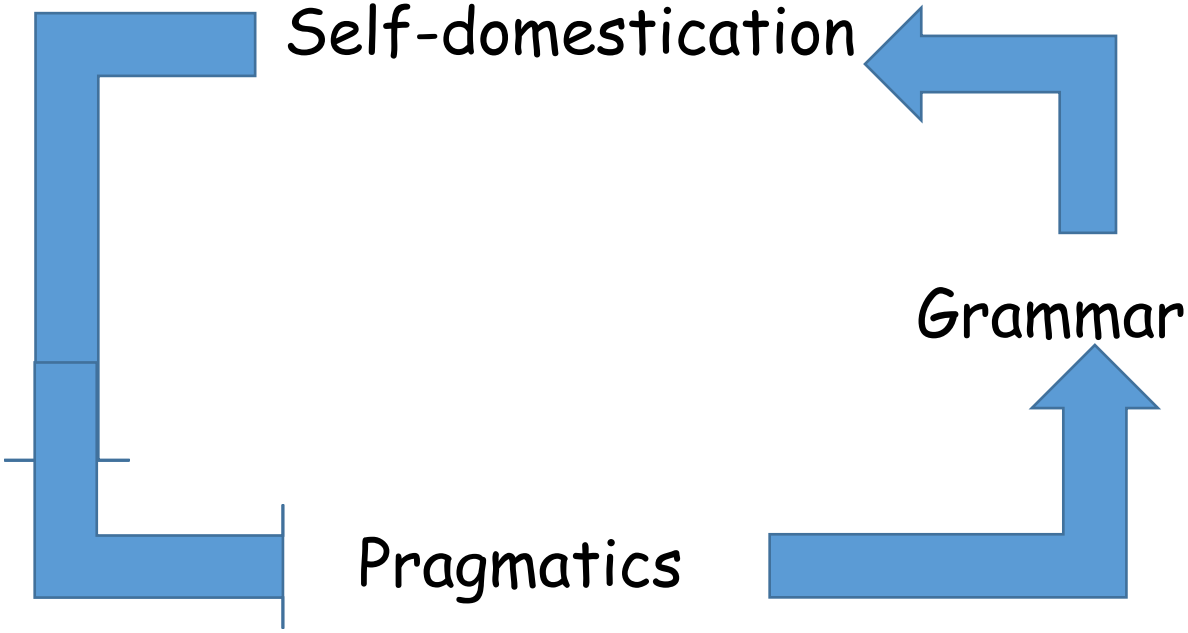
ISSN: 1551-6709 online
DOI: 10.1111/cogs.12987

Human Self-Domestication and the Evolution of Pragmatics

Antonio Benítez-Burraco,[a] Francesco Ferretti,[b] Ljiljana Progovac[c]

[a]*Department of Spanish, Linguistics and Theory of Literature (Linguistics), Faculty of Philology, University of Seville*
[b]*Department of Philosophy, Communication and Performing Arts. Roma Tre University*
[c]*Department of English, Linguistics Program, Wayne State University*

Received 3 November 2020; received in revised form 25 April 2021; accepted 26 April 2021



A self-domestication account of language evolution

A feedback loop

Self-domestication

Prosody

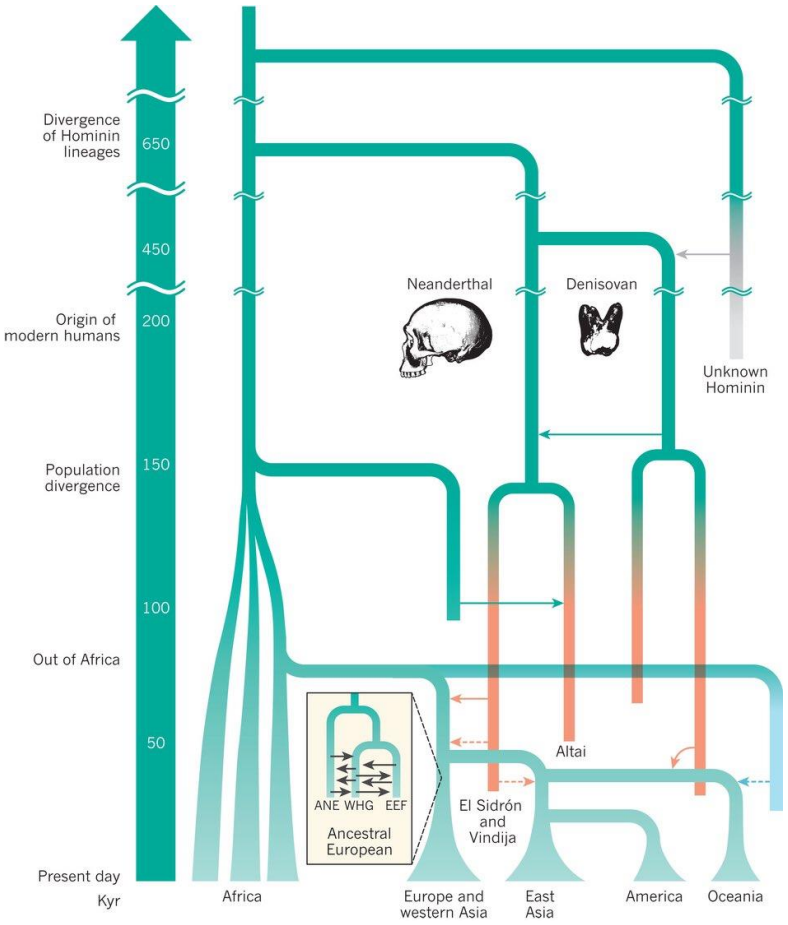
Grammar

Pragmatics

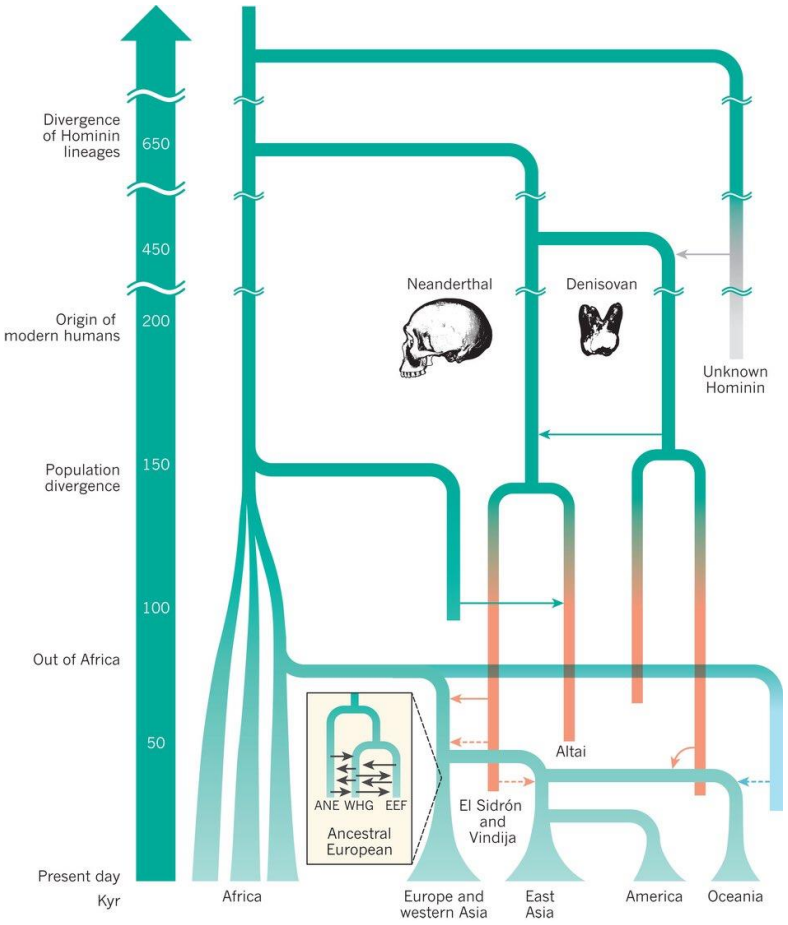
HOW I HAVE STRUCTURED MY TALK

1. Introduction
2. Language(s) evolution (research): an outline
3. The self-domestication account of human evolution
4. Conclusions and future prospects

❶


Divergence of Hominin lineages
650
450
Origin of modern humans
200
Population divergence
150
100
Out of Africa
50
Present day
Kyr
Neanderthal
Denisovan
Unknown Hominin
ANE WHG EEF
Ancestral European
Altai
El Sidrón and Vindija
Africa
Europe and western Asia
East Asia
America
Oceania

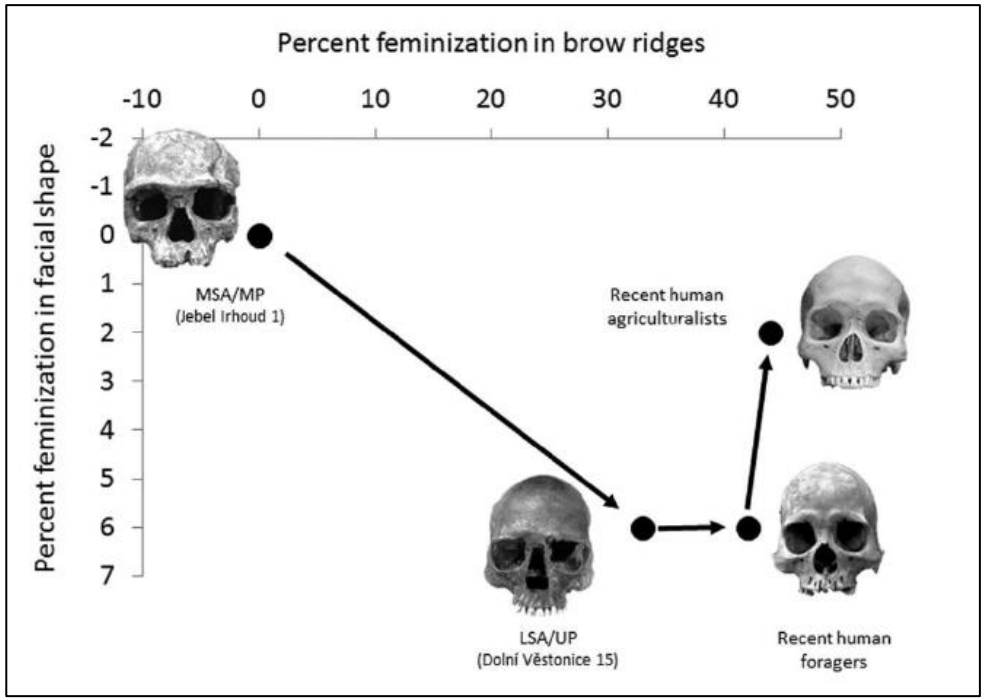
❶



Current Anthropology Volume 55, Number 4, August 2014

Craniofacial Feminization, Social Tolerance, and the Origins of Behavioral Modernity

by Robert L. Cieri, Steven E. Churchill, Robert G. Franciscus, Jingzhi Tan, and Brian Hare



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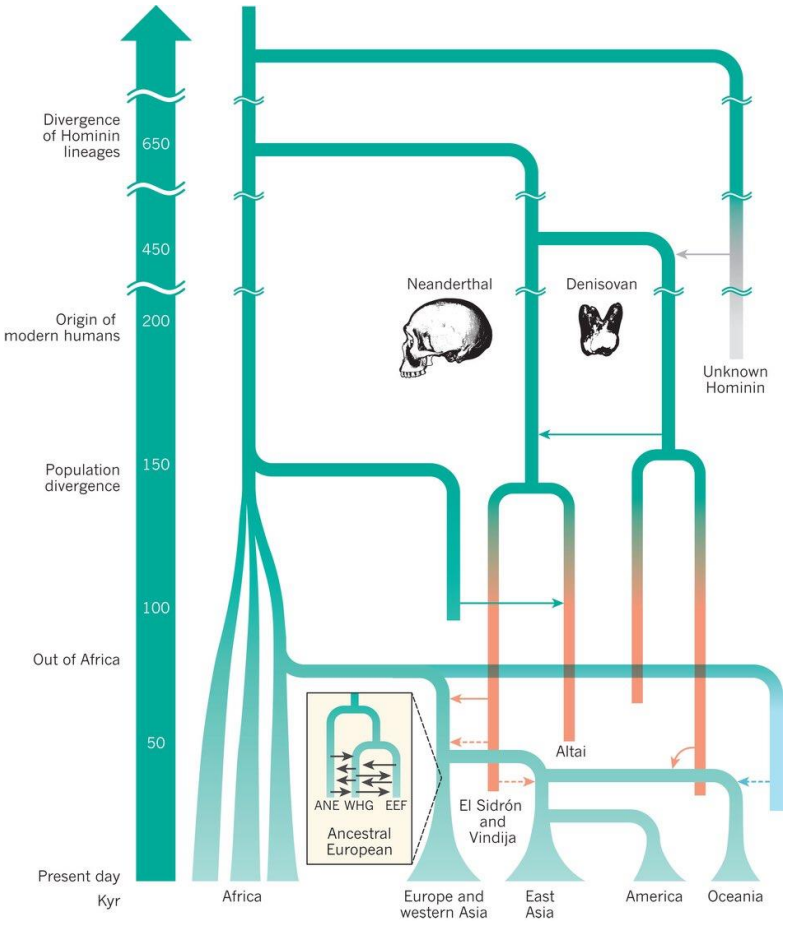
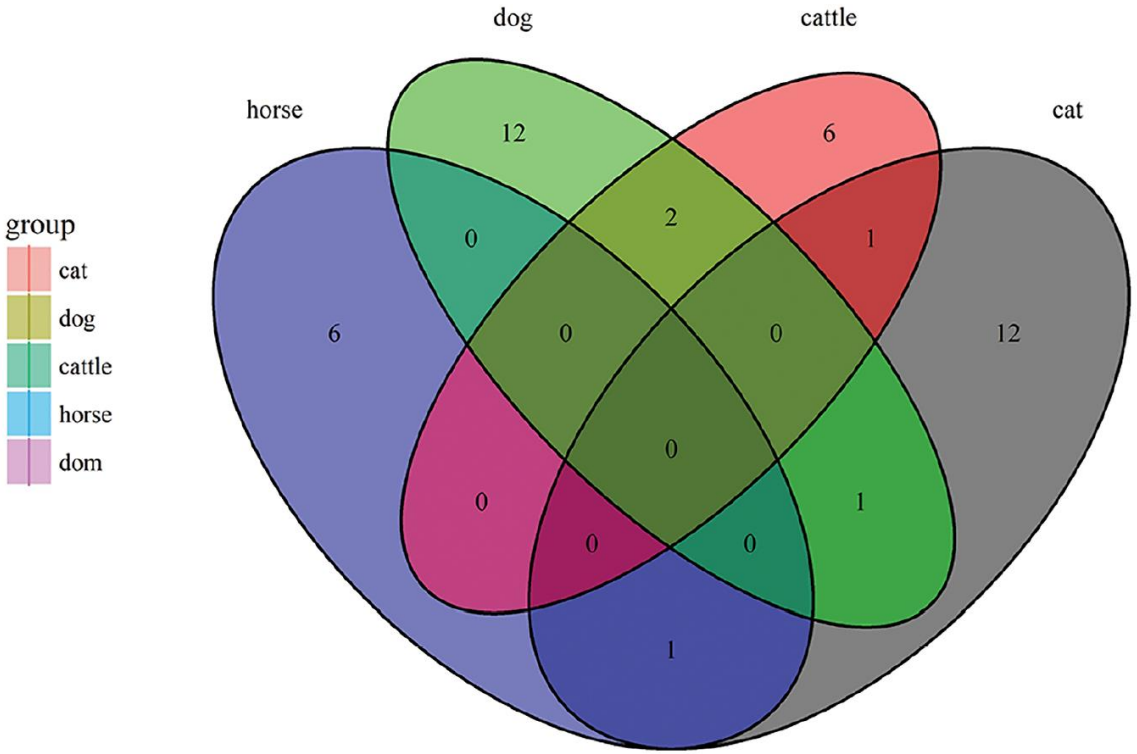

Divergence of Hominin lineages
650
450
Origin of modern humans
200
Population divergence
150
100
Out of Africa
50
Present day
Kyr
Neanderthal
Denisovan
Unknown Hominin
ANE WHG EEF
Ancestral European
Altai
El Sidrón and Vindija
Africa
Europe and western Asia
East Asia
America
Oceania

PLOS ONE

RESEARCH ARTICLE

Self-domestication in *Homo sapiens*: Insights from comparative genomics

Constantina Theofanopoulou[1,2☯], Simone Gastaldon[1,3☯], Thomas O'Rourke[1], Bridget D. Samuels[4], Angela Messner[1], Pedro Tiago Martins[1], Francesco Delogu[5], Saleh Alamri[1], Cedric Boeckx[1,2,6]*



KEIO/2

Recent selection of candidate genes for mammal domestication in Europeans and language change in Europe: a hypothesis

Antonio Benítez-Burraco, Evgeny Chekalin, Sergey Bruskin, Tatiana Tatarinova & Irina Morozova

To cite this article: Antonio Benítez-Burraco, Evgeny Chekalin, Sergey Bruskin, Tatiana Tatarinova & Irina Morozova (2021): Recent selection of candidate genes for mammal domestication in Europeans and language change in Europe: a hypothesis, Annals of Human Biology, DOI: 10.1080/03014460.2021.1936634

To link to this article: https://doi.org/10.1080/03014460.2021.1936634

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To link to this article: https://doi.org/10.1080/03014460.2021.1936634

Set of genes	Ancient SNPs count	Modern SNPs count	Enrichment score	p-value	p-value adjusted Bonferroni	Enriched Bonferroni 0.01 threshold
Synonymous SNPs						
Domestication	2165	3759	1.24	0.2138	1	No
Neural crest	194	315	1.19	0.2353	1	No
Domestication syndrome	49	76	0.98	0.326	1	No
Positive selection in AMH	144	268	-0.25	0.8012	1	No
Nonsynonymous SNPs						
Domestication	2440	4844	-4.32	1.58×10^{-5}	0.005	Modern
Neural_crest	213	240	5.01	5.36×10^{-7}	2×10^{-4}	Ancient
Domestication syndrome	61	73	2.49	0.0127	1	No
Positive selection in AMH	138	231	0.69	0.4885	1	No

Recent selection of candidate genes for mammal domestication in Europeans and language change in Europe: a hypothesis

Antonio Benítez-Burraco, Evgeny Chekalin, Sergey Bruskin, Tatiana Tatarinova & Irina Morozova

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Set of genes	Ancient SNPs count	Modern SNPs count	Enrichment score	p-value	p-value adjusted Bonferroni	Enriched Bonferroni 0.01 threshold
D						No
						No
Domes						No
Positive						No
D					5	Modern
Neural_crest	215	240	3.01	3.56×10	2×10^{-4}	Ancient
Domestication syndrome	61	73	2.49	0.0127	1	No
Positive selection in AMH	138	231	0.69	0.4885	1	No

PLOS ONE

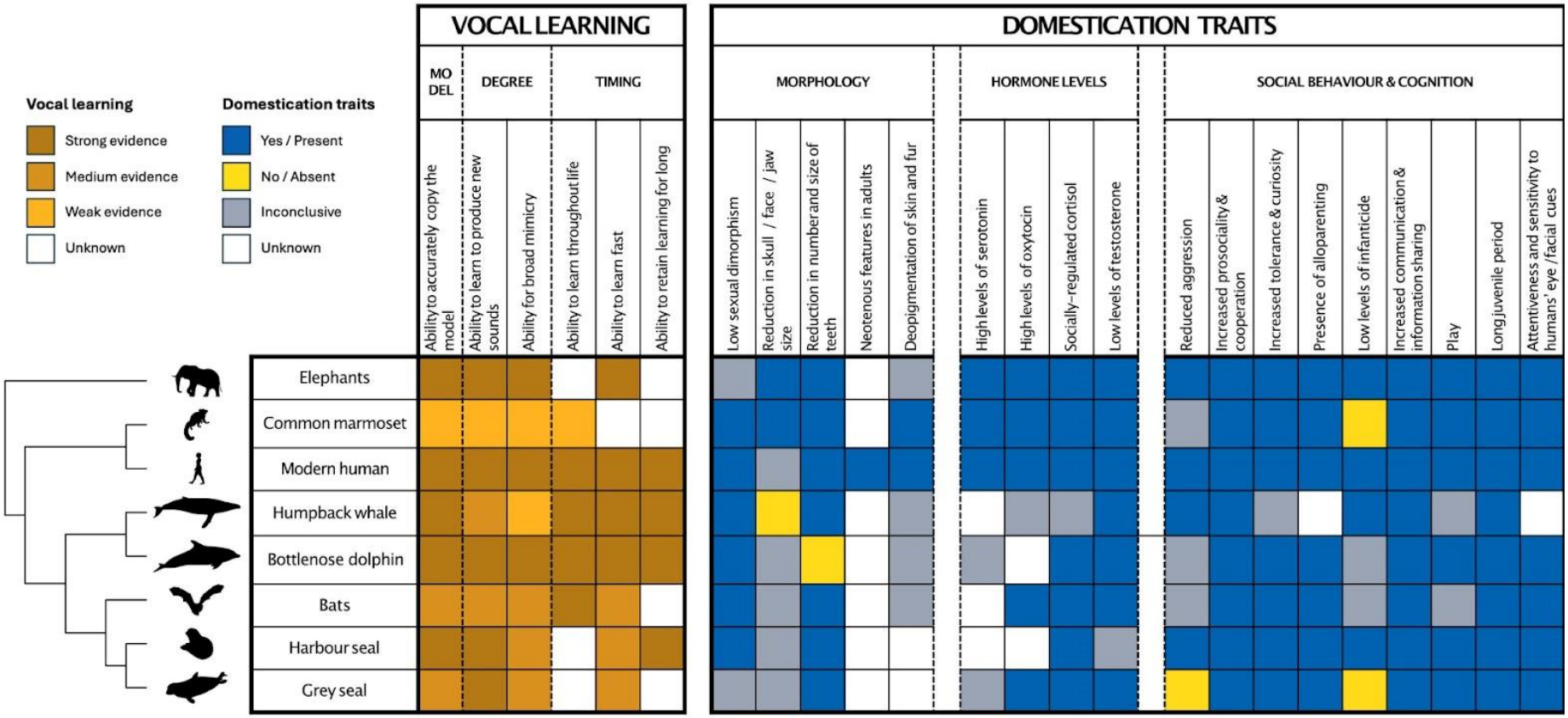
RESEARCH ARTICLE

Self-domestication in *Homo sapiens*: Insights from comparative genomics

Constantina Theofanopoulou[1,2☯], Simone Gastaldon[1,3☯], Thomas O'Rourke[1], Bridget D. Samuels[4], Angela Messner[1], Pedro Tiago Martins[1], Francesco Delogu[5], Saleh Alamri[1], Cedric Boeckx[1,2,6*]

❷

❷


Vocal learning
Strong evidence
Medium evidence
Weak evidence
Unknown
Domestication traits
Yes / Present
No / Absent
Inconclusive
Unknown
VOCAL LEARNING
MODEL
DEGREE
TIMING
Ability to accurately copy the model
Ability to learn to produce new sounds
Ability for broad mimicry
Ability to learn throughout life
Ability to learn fast
Ability to retain learning for long
DOMESTICATION TRAITS
MORPHOLOGY
HORMONE LEVELS
SOCIAL BEHAVIOUR & COGNITION
Low sexual dimorphism
Reduction in skull / face / jaw size
Reduction in number and size of teeth
Neotenous features in adults
Depigmentation of skin and fur
High levels of serotonin
High levels of oxytocin
Socially-regulated cortisol
Low levels of testosterone
Reduced aggression
Increased prosociality & cooperation
Increased tolerance & curiosity
Presence of alloparenting
Low levels of infanticide
Increased communication & information sharing
Play
Long juvenile period
Attentiveness and sensitivity to humans' eye /facial cues
Elephants
Common marmoset
Modern human
Humpback whale
Bottlenose dolphin
Bats
Harbour seal
Grey seal

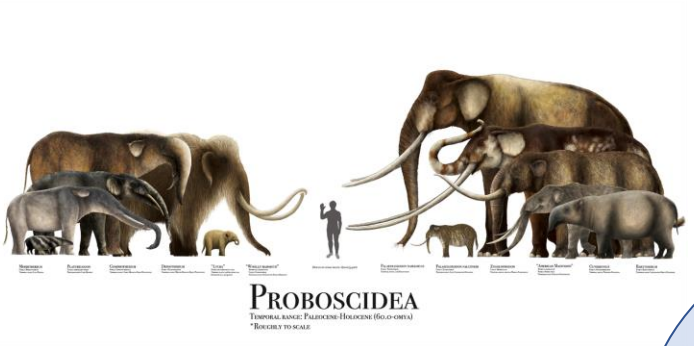
❷

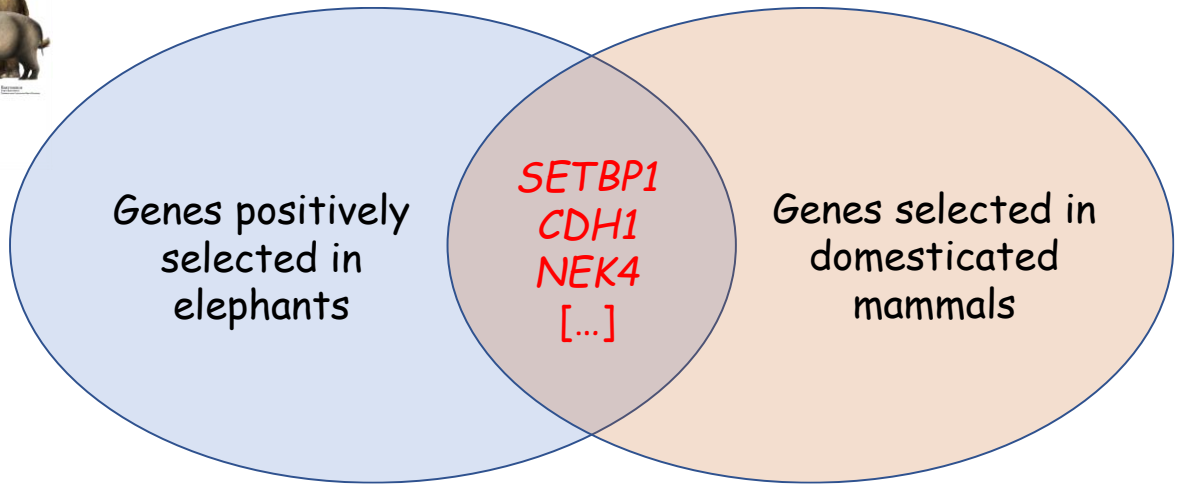
PNAS RESEARCH ARTICLE | EVOLUTION
PSYCHOLOGICAL AND COGNITIVE SCIENCES OPEN ACCESS

Elephants as an animal model for self-domestication

Limor Raviv[a,b,c,1], Sarah L. Jacobson[d,e], Joshua M. Plotnik[d,e], Jacob Bowman[f], Vincent Lynch[f], and Antonio Benítez-Burraco[g]

Edited by Marcus Feldman, Stanford University, Stanford, CA; received May 24, 2022; accepted February 27, 2023





SETBP1

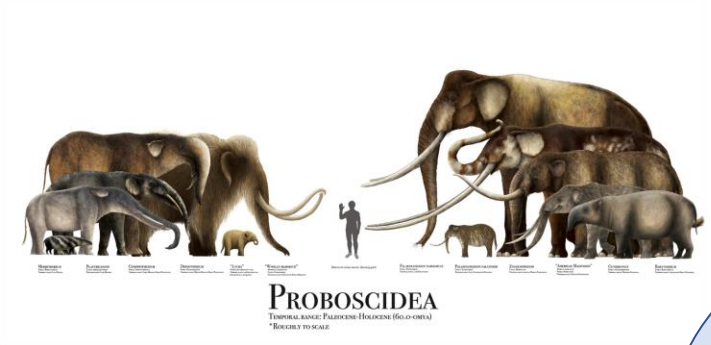
- associated to language deficits
- associated to phonological working memory dysfunction
- associated to social and behavioural disturbances

CDH1

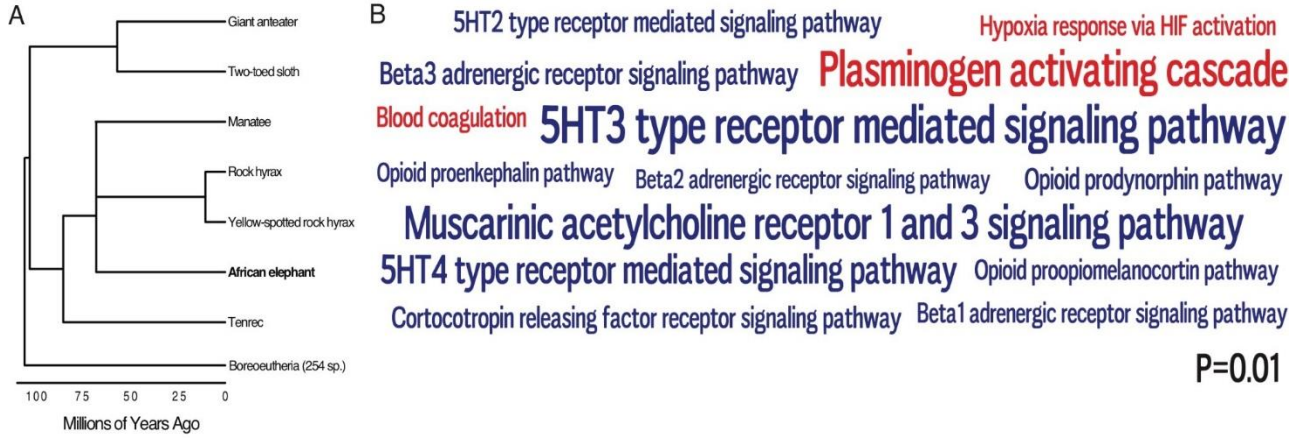
- involved in cortical neurogenesis
- involved in neural connectivity

NEK4

- associated to autism, schizophrenia, and bipolar disorder ← abnormal features of self-domestication



Genes positively selected in elephants



❸

Body Traits

Wild animals

Common features

- Straight ears (dingoes)
- Larger carnassial teeth and longer canine teeth in dingoes
- Tooth morphology (feral pigs)
- Less frequent estrous cycles (dingoes)
- Delayed onset of sexual maturation
- absence of dew claws (dingoes)

Feral animals

Common Features

- Coloration (feral pigeons, pigs, dogs)
- Horn size (sheep)
- Shorter snouts

Domesticated Animals

Behavior

Wild animals

Common features

- High levels of aggressive behavior
- Avoidance behavior towards humans
- Limited eye contact with humans
- Vocalization amount and patterns
- High reactivity to predators

Feral animals

Common Features

- Reduced hunting abilities
- Low responsiveness to environmental threats

Domesticated Animals

The brain

Wild animals

Common features

- Large olfactory system
- Large hippocampus

Feral animals

Common Features

- Reduced brain size

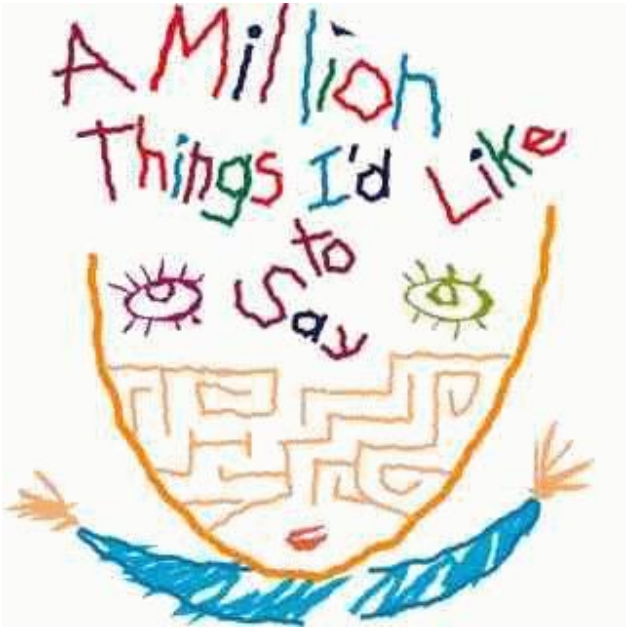
Domesticated Animals

Genes selected in domesticated mammals

27 genes of interest

Genes selected in feralized mammals

❹

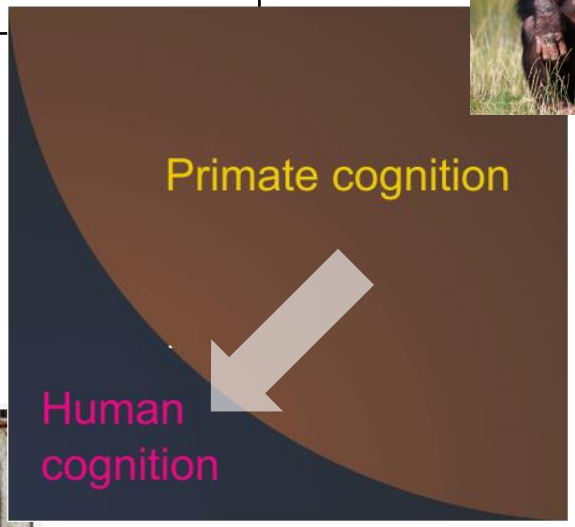


PERSPECTIVES

OPINION

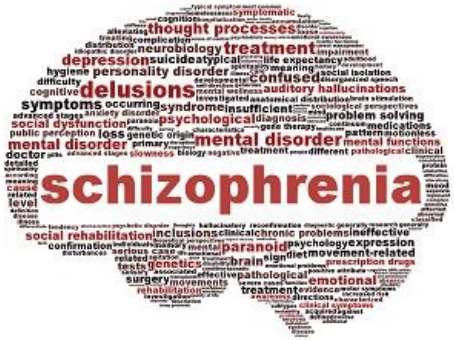
Decanalization and the origin of complex disease

Greg Gibson



- demography
- DNA
- culture


autism
genetic
daily activities
abnormalities
developmental
restricted
behavior
interest
disorder
affected
superior skills
factors
Self-injury
perception
ritualistic behavior
severity
dressing ritual
help
compulsive behavior
relative
associated
health
evidence
attention
symptoms
repetitive
activity
focus
brain disorders
nervous system
repetitive movement
behavior
communication
head rolling
unchanging
menu
hand biting
Compulsive behavior
complex
limited
occurrence
sensory symptoms


schizophrenia
thought processes
treatment
depression
suicide
atypical
personality disorder
confused
delusions
auditory hallucinations
symptoms
psychological
problem solving
social dysfunction
mental disorder
mental functions
social rehabilitation
inclusions
paranoid
emotional
genetics
brain
movement-related
pathological
chronic problems
ineffective
expression
prescription drugs

KEIO/2

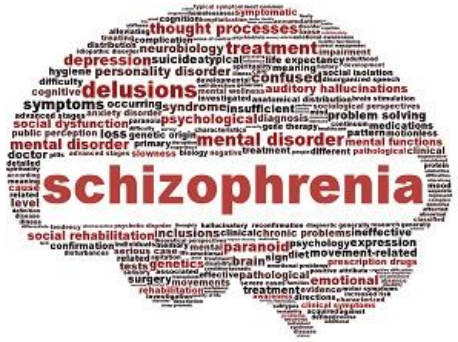
PLOS | GENETICS

RESEARCH ARTICLE

Widespread signatures of positive selection in common risk alleles associated to autism spectrum disorder

Renato Polimanti[1,2]*, **Joel Gelernter**[1,2,3,4]

1 Department of Psychiatry, Yale School of Medicine, West Haven, Connecticut, United States of America, **2** VA CT Healthcare Center, West Haven, Connecticut, United States of America, **3** Departments of Genetics, Yale School of Medicine, New Haven, Connecticut, United States of America, **4** Department of Neuroscience, Yale University School of Medicine, New Haven, Connecticut, United States of America

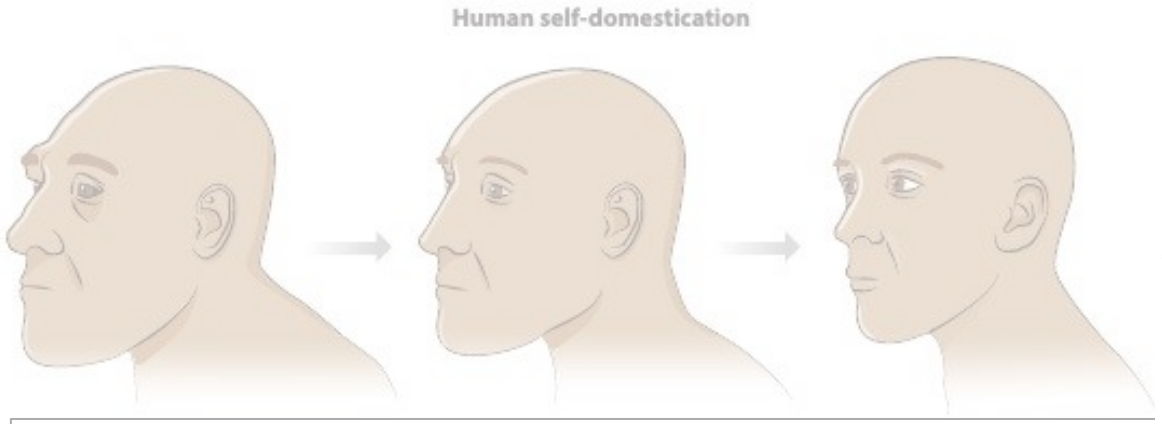


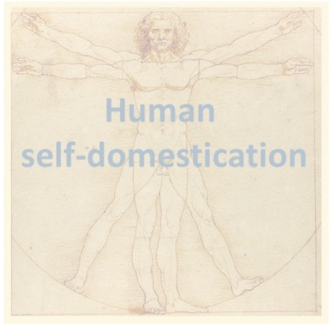
Archival Report

Biological Psychiatry

Genetic Markers of Human Evolution Are Enriched in Schizophrenia

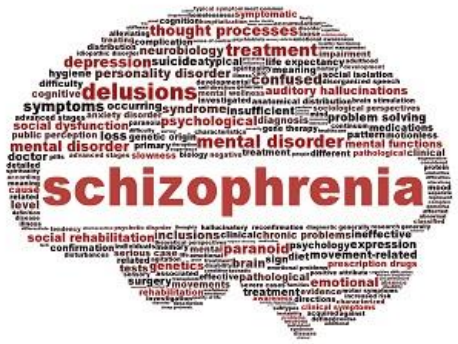
Saurabh Srinivasan, Francesco Bettella, Morten Mattingsdal, Yunpeng Wang, Aree Witoelar, Andrew J. Schork, Wesley K. Thompson, Verena Zuber, The Schizophrenia Working Group of the Psychiatric Genomics Consortium, The International Headache Genetics Consortium, Bendik S. Winsvold, John-Anker Zwart, David A. Collier, Rahul S. Desikan, Ingrid Melle, Thomas Werge, Anders M. Dale, Srdjan Djurovic, and Ole A. Andreassen





Research Topic

Self-Domestication and Human Evolution



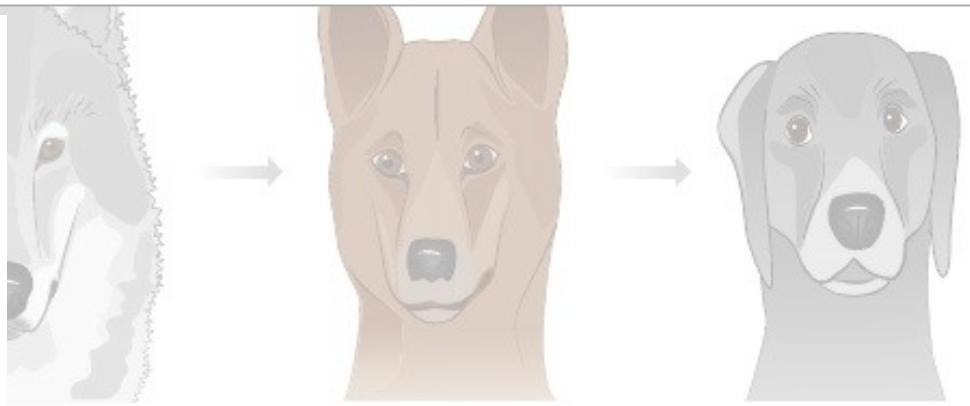


Figure 1

Homo sapiens evolved, in part, as a result of selection for increased in-group prosociality during the Paleolithic, leading to a variety of morphological, physiological, and cognitive changes also observed in domestic animals such as *Canis familiaris*.

Problems with structural aspects of language

Problems with pragmatics

Cognitive deficits

Behavioral deficits

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Large head/brain size

Aggressive behavior
Irritability
Abnormal response to social cues
Anxiety disorders

Facial anomalies

Abnormal shape of the ears

Tooth problems

Abnormal response of the HPA axis

Generalized overgrowth in infancy

Adrenal gland hyperfunction

High levels of androgens

Occasionally linked to hypomelanosis


frontiers in Neuroscience

HYPOTHESIS AND THEORY
published: 29 August 2016
doi: 10.3389/fnins.2016.00373

Language Impairments in ASD Resulting from a Failed Domestication of the Human Brain

Antonio Benítez-Burraco[1], Wanda Lattanzi[2†] and Elliot Murphy[3†]*

[1] Department of Philology, University of Huelva, Huelva, Spain, [2] Institute of Anatomy and Cell Biology, Università Cattolica del

Domestication (p = 0.002)		
Gene name	logFC	FDR Pvalue
PAX3	-0,463	1,91E-02
ALDH1L2	-0,347	3,10E-02
LIN28B	-0,315	7,76E-03
ALDH16A1	-0,304	6,10E-04
IGF1	-0,299	9,37E-02
ABCG1	-0,296	6,62E-02
CCNT2	0,268	7,21E-02
IFT81	0,270	2,99E-02
PTPN4	0,299	5,35E-02
JPH3	0,302	1,79E-02
CASP7	0,317	4,12E-02
UBXN10	0,396	1,18E-02
TFCP2L1	0,441	7,40E-03
HOPX	0,477	4,56E-02


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Rigidity in autism spectrum disorder (ASD): A unified (evolutionary) account of linguistic and non-linguistic symptoms

AUTHORS
Antonio Benítez-Burraco and Ljiljana Progovac

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Behavioral and Brain Sciences

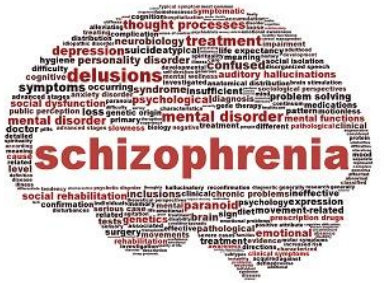
Article Metrics

Volume 31, Issue 3 June 2008 , pp. 241-261

Psychosis and autism as diametrical disorders of the social brain

Bernard Crespi [a1] and Christopher Badcock [a2]

https://doi.org/10.1017/S0140525X08004214 Published online: 26 June 2008



Neuroscience and Biobehavioral Reviews 83 (2017) 742–764

Contents lists available at ScienceDirect

Neuroscience and Biobehavioral Reviews

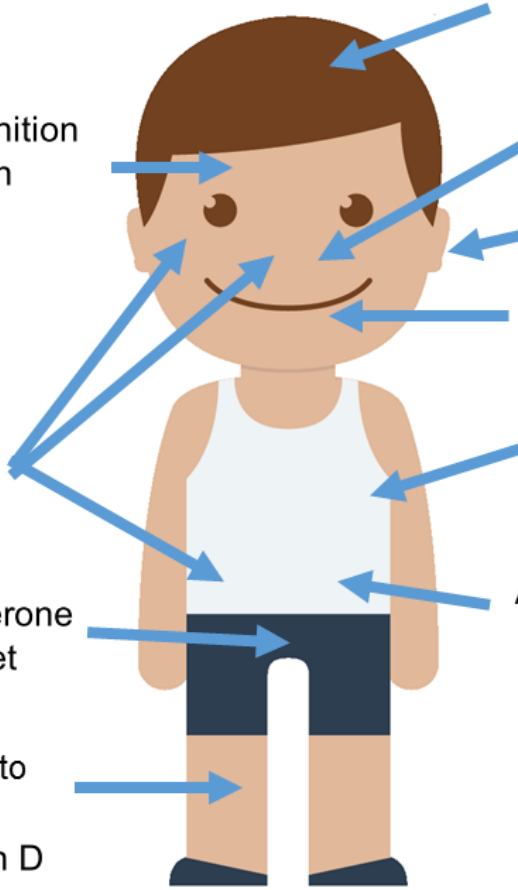
journal homepage: www.elsevier.com/locate/neubiorev

Review article

Language deficits in schizophrenia and autism as related oscillatory connectomopathies: An evolutionary account

Elliot Murphy [a,*], Antonio Benítez-Burraco [b]

[a] Division of Psychology and Language Sciences, University College London, London, United Kingdom
[b] Department of Philology, University of Huelva, Huelva, Spain



Shorter skull shape/
reduced brain volume

Aggressive behavior
Impairment of social cognition
High levels of oxytocin

Facial
anomalies

Abnormal shape of
the ears

Anomalies in the mouth/
decreased tooth size

Abnormal response of
the HPA axis
to social stress

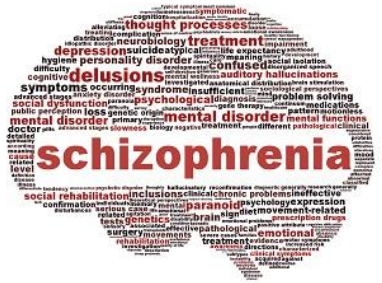
Low weight at birth
and slow growth in childho

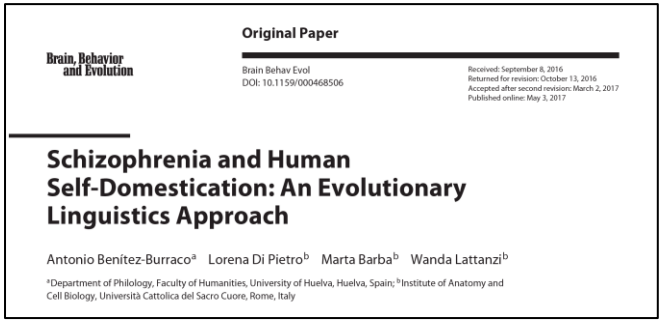
Adrenal gland hyperfunction

Low levels of testosterone
Delayed puberty onset

Occasionally linked to
hypomelanosis

Low levels of vitamin D





Brain, Behavior and Evolution

Original Paper

Brain Behav Evol
DOI: 10.1159/000468506

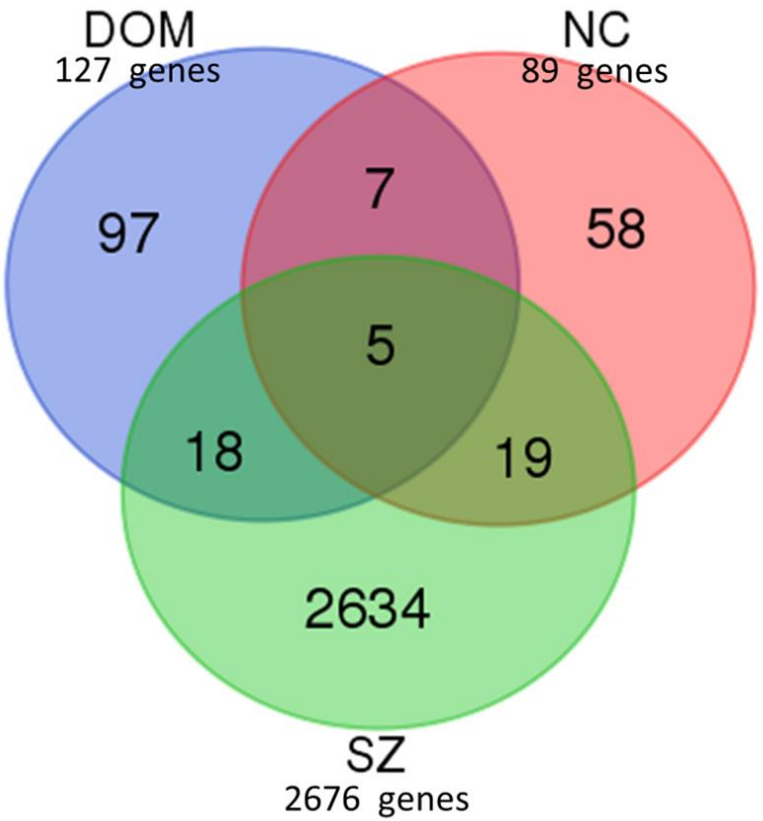
Received: September 8, 2016
Returned for revision: October 13, 2016
Accepted after second revision: March 2, 2017
Published online: May 3, 2017

Schizophrenia and Human Self-Domestication: An Evolutionary Linguistics Approach

Antonio Benítez-Burraco[a] Lorena Di Pietro[b] Marta Barba[b] Wanda Lattanzi[b]

[a]Department of Philology, Faculty of Humanities, University of Huelva, Huelva, Spain; [b]Institute of Anatomy and Cell Biology, Università Cattolica del Sacro Cuore, Rome, Italy

Gene Symbol	Entrez ID	SZ	DOM	NC
ABCG1	9619	+	+	
BDNF	627	+		+
BMPR1B	658	+	+	
CACNA1D	776	+	+	
CDH2	1000	+		+
COX4I1	1327	+	+	
CRKL	1399	+		+
DLGAP1	9229	+	+	
DLX5	1749	+		+
DLX6	1750	+		+
EVC2	132884	+	+	
FOXD3	27022	+	+	+
GDNF	2668	+	+	+
GFAP	2670	+		+
GLI3	2737	+		+
GRID1	2894	+	+	
HES1	3280	+		+
IMMP2L	83943	+	+	
JPH3	57338	+	+	
KDM6B	23135	+	+	
KIF1B	23095	+		+



Gene Symbol	Entrez ID	SZ	DOM	NC
MSX1	4487	+		+
NEUROG1	4762	+		+
NF1	4763	+		+
NIPBL	25836	+	+	
NTM	50863	+	+	
OLIG2	10215	+		+
POMT1	10585	+		+
RET	5979	+	+	+
RHOB	388	+		+
ROBO1	6091	+		+
ROBO2	6092	+		+
SKI	6497	+	+	
SOX10	6663	+	+	+
SOX9	6662	+	+	+
SYNJ2	8871	+	+	
TBX1	6899	+		+
TPH1	7166	+	+	
TRPM1	4308	+	+	
VDAC1	7416	+	+	
WNK2	65268	+	+	
ZEB2	9839	+		+

Original Paper

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Human self-domestication

Biological Psychiatry

Archival Report

Genetic Markers of Human Evolution Are Enriched in Schizophrenia

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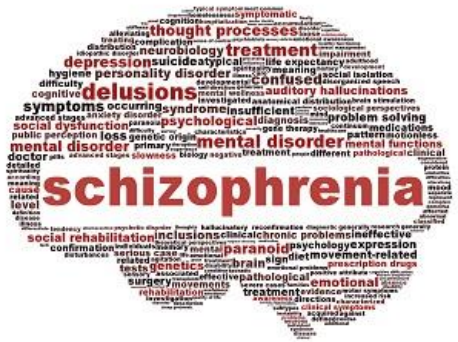

Figure 1

Homo sapiens evolved
Paleolithic, leading t
domestic animals such as *Canis familiaris*.

PLOS | GENETICS

RESEARCH ARTICLE

Widespread signatures of positive selection in common risk alleles associated to autism spectrum disorder

Renato Polimanti[1,2]*, **Joel Gelernter**[1,2,3,4]

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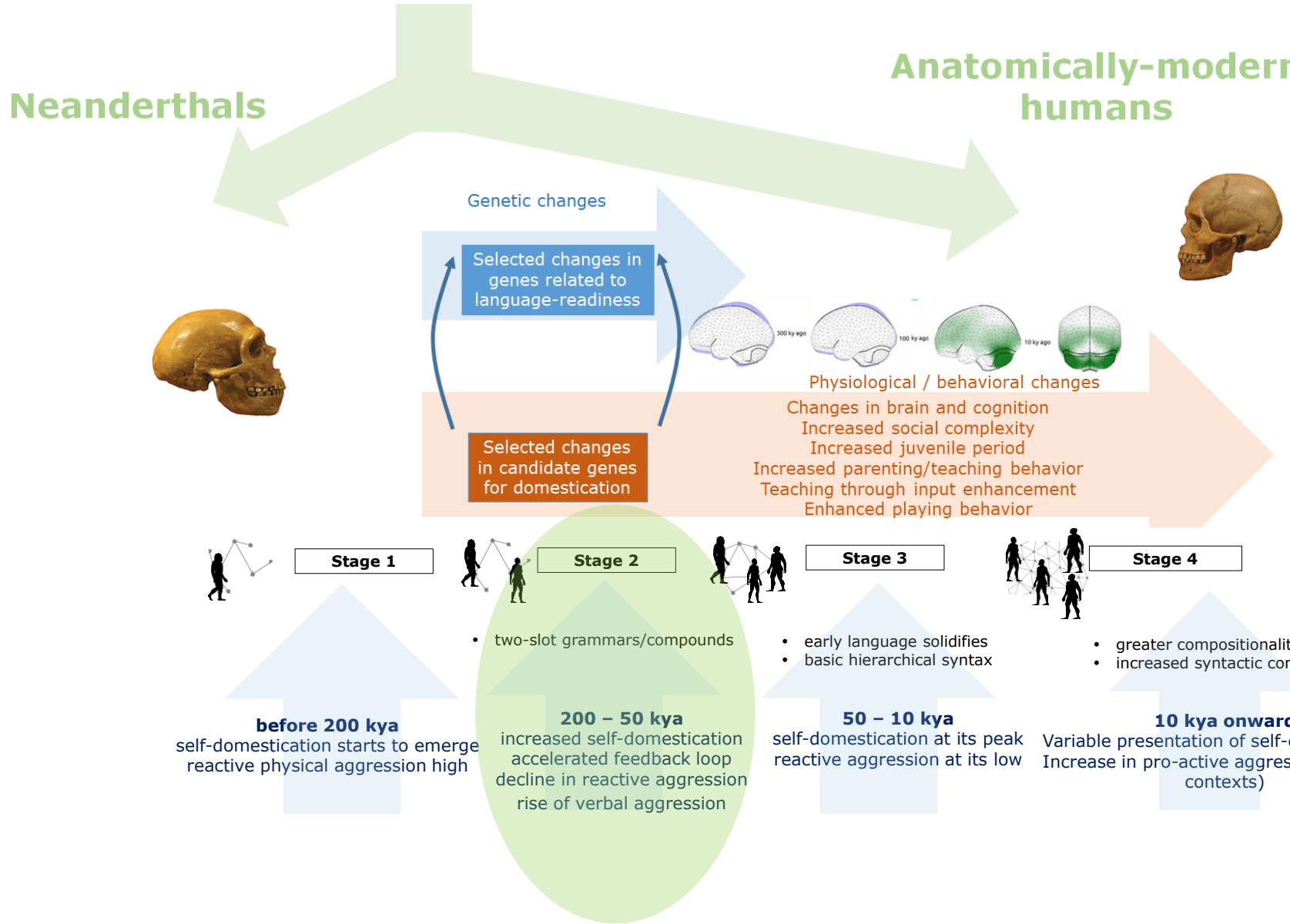
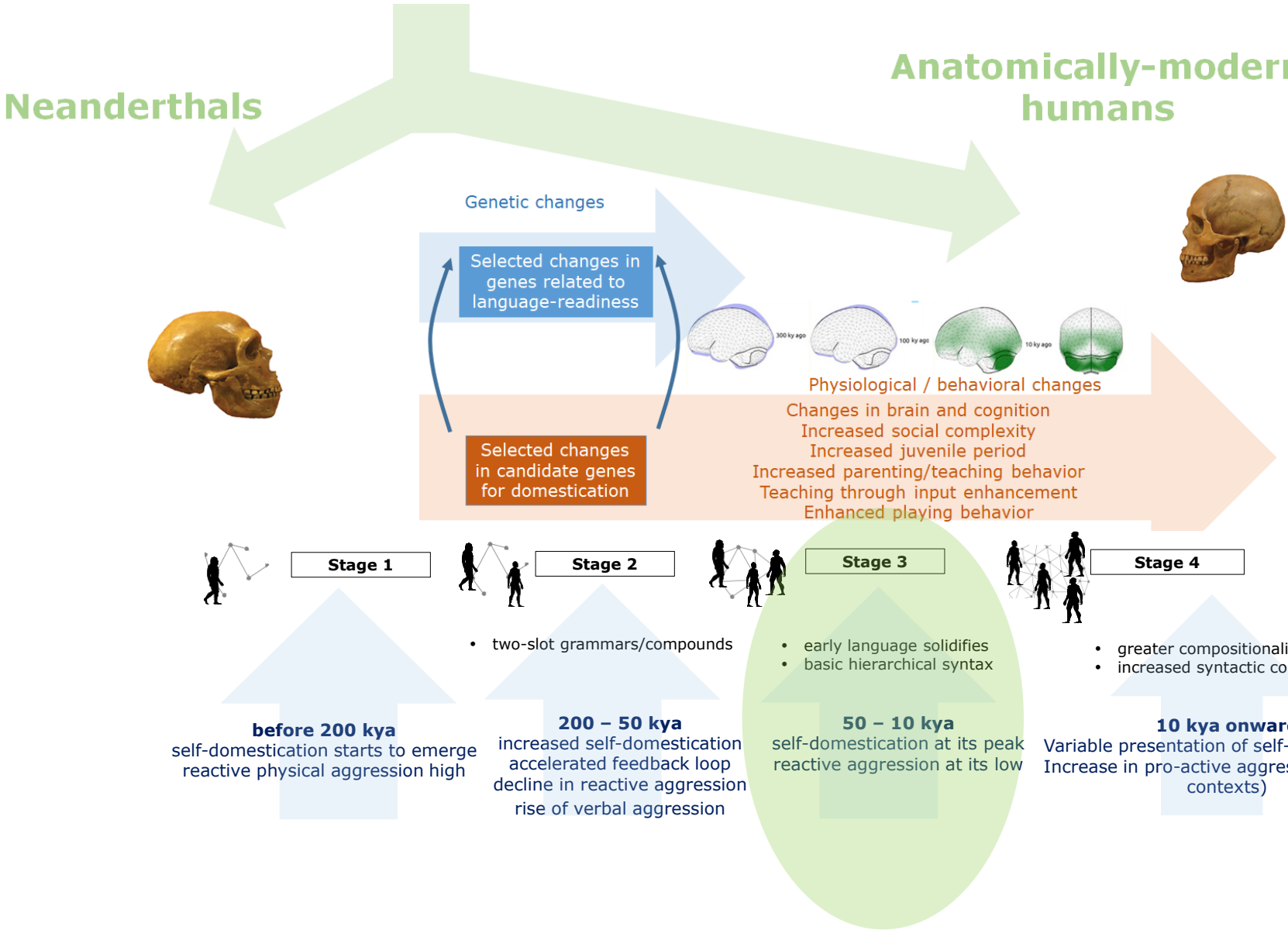

Neanderthals
Anatomically-modern humans
Genetic changes
Selected changes in genes related to language-readiness
Selected changes in candidate genes for domestication
300 ky ago
100 ky ago
10 ky ago
Physiological / behavioral changes
Changes in brain and cognition
Increased social complexity
Increased juvenile period
Increased parenting/teaching behavior
Teaching through input enhancement
Enhanced playing behavior
Stage 1
Stage 2
Stage 3
Stage 4
• two-slot grammars/compounds
• early language solidifies
• basic hierarchical syntax
• greater compositionality
• increased syntactic complexity
before 200 kya
self-domestication starts to emerge
reactive physical aggression high
200 – 50 kya
increased self-domestication
accelerated feedback loop
decline in reactive aggression
rise of verbal aggression
50 – 10 kya
self-domestication at its peak
reactive aggression at its low
10 kya onward
Variable presentation of self-domestication
Increase in pro-active aggression (in some contexts)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Increase in pro-active aggression (in some contexts)

	cross-modality: global	cross-modality: local
ASD	reduced	increased
SZ	increased	possibly reduced

	reactive aggression	proactive aggression
ASD	enhanced	reduced
SZ	slightly enhanced	enhanced

	literal language	metaphorical language
ASD	impaired	impaired
SZ	somewhat impaired	impaired

Language evolution: examining the link between cross-modality and aggression through the lens of disorders

Antonio Benítez-Burraco[1] and Ljiljana Progovac[2]

[1]Department of Spanish, Linguistics and Theory of Literature (Linguistics), Faculty of Philology, University of Seville, Seville, Spain
[2]Linguistics Program, Department of English, Wayne State University, Detroit, MI, USA

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❺

European sea bass
(*Dicentrarchus labrax*)
F. Moronidae

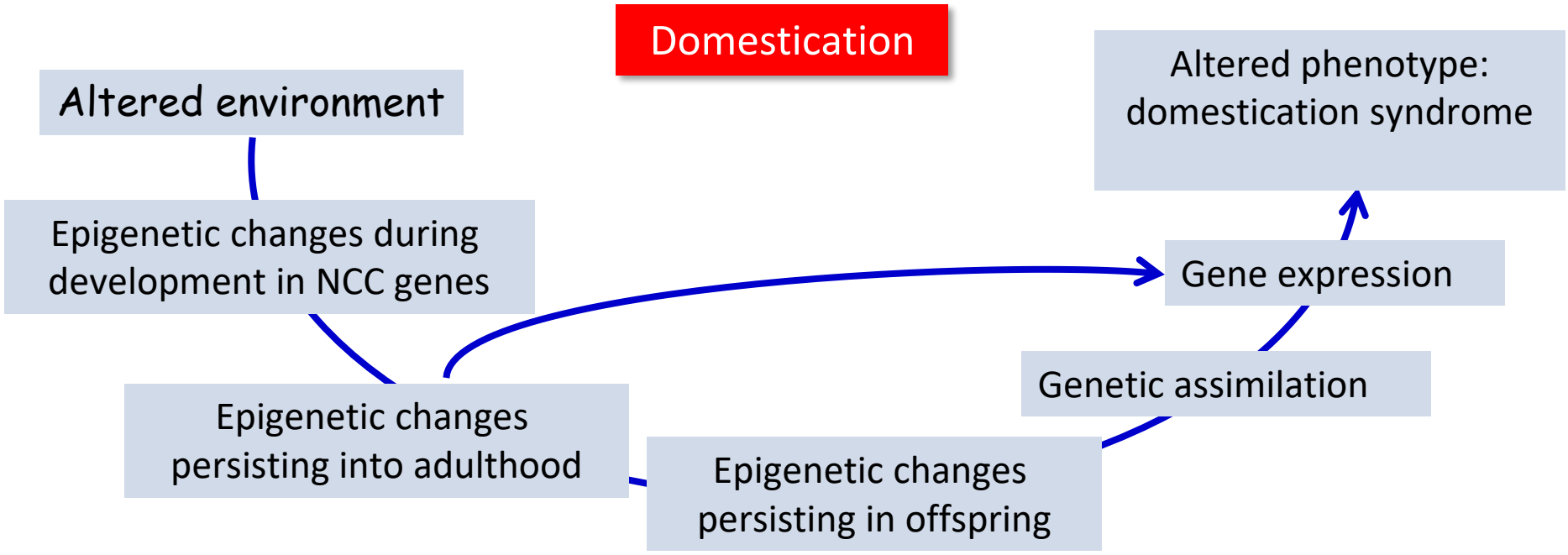
genes

MDPI

Article

Fish as Model Systems to Study Epigenetic Drivers in Human Self-Domestication and Neurodevelopmental Cognitive Disorders

Dafni Anastasiadi [1,*], Francesc Piferrer [2], Maren Wellenreuther [1,3] and Antonio Benítez Burraco [4]


Domestication
Altered environment
Altered phenotype: domestication syndrome
Epigenetic changes during development in NCC genes
Gene expression
Genetic assimilation
Epigenetic changes persisting into adulthood
Epigenetic changes persisting in offspring

Domestication

Altered environment

Epigenetic changes during development in NCC genes

Epigenetic changes persisting into adulthood

Epigenetic changes persisting in offspring

Genetic assimilation

Gene expression

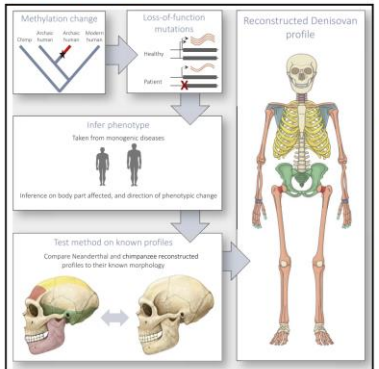
Altered phenotype: domestication syndrome

Article

Cell

Reconstructing Denisovan Anatomy Using DNA Methylation Maps

Graphical Abstract



Authors

David Gokhman, Nadav Mishol, Marc de Manuel, ..., Tomas Marques-Bonet, Yoel Rak, Liran Carmel

Correspondence

david.gokhman@mail.huji.ac.il (D.G.), liran.carmel@huji.ac.il (L.C.)

In Brief

DNA methylation maps can be used to predict anatomical features in hominins and chimpanzees, allowing for reconstruction of a putative anatomical profile of the Denisovan, currently absent from the fossil record.

john hawks weblog
Paleoanthropology, genetics, and evolution

Weblog Books and courses Events About John Hawk

Can methylation of DNA in ancient bones really predict the morphology of Denisovans?

3 minute read

John Hawks

I'm a paleoanthropologist, studying fossil hominins and genetics

Last week, *Cell* published a new paper by David Gokhman and coworkers that tries to infer the skeletal form of Denisovans from signatures of methylation in the Denisovan genome data. The paper is here: "Reconstructing Denisovan Anatomy Using DNA Methylation Maps".

European sea bass
(*Dicentrarchus labrax*)
F. Moronidae

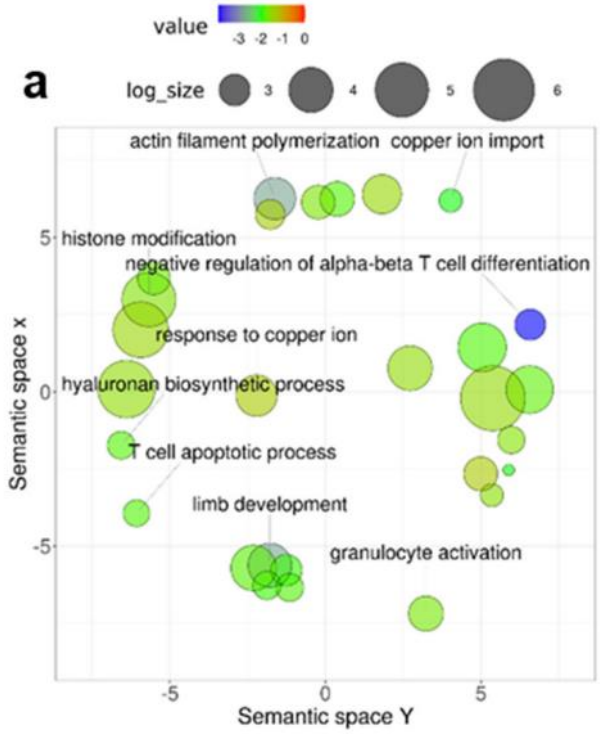
2114 candidates of mammalian domestication

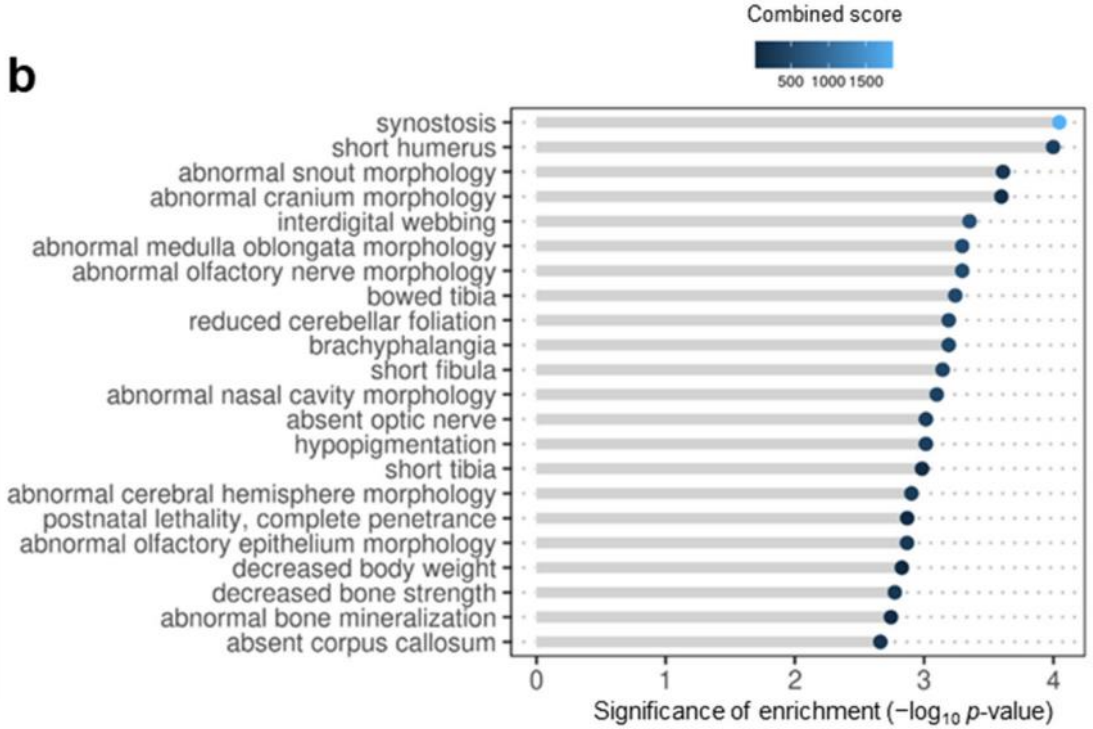
Identification of orthologues:
Protein to protein blast (diamond)

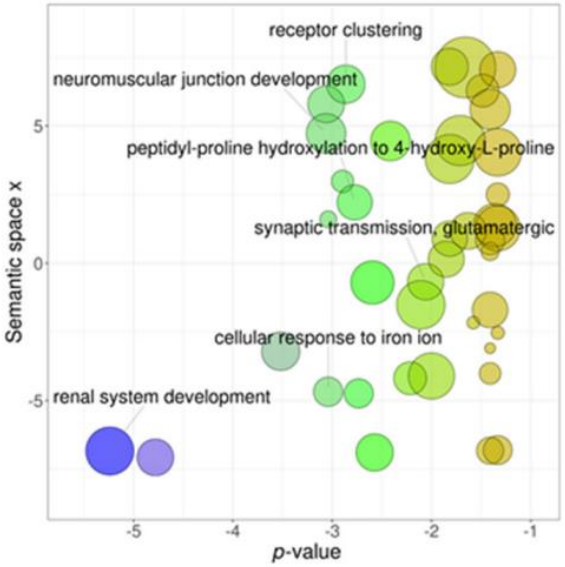
1141 genes with DMRs

Buchfink B et al 2015, Nat Methods

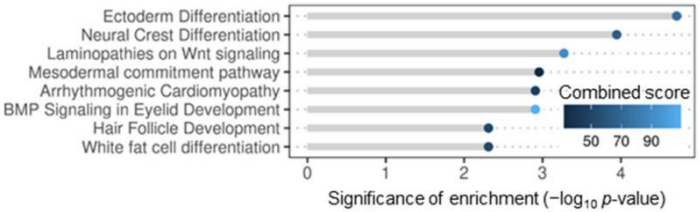
120 genes (128 in sea bass)

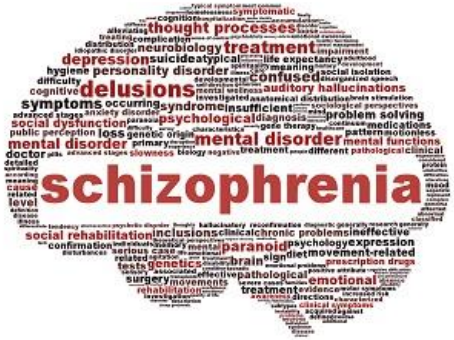

value
-3 -2 -1 0
a
log_size
3
4
5
6
actin filament polymerization
copper ion import
histone modification
negative regulation of alpha-beta T cell differentiation
response to copper ion
hyaluronan biosynthetic process
T cell apoptotic process
limb development
granulocyte activation
Semantic space x
Semantic space Y
5
0
-5
-5
0
5

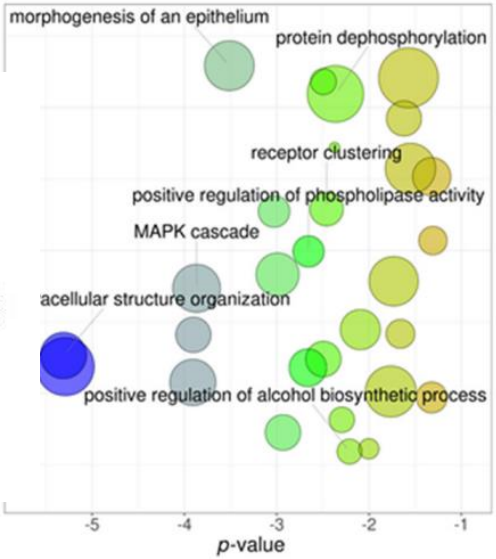

b
Combined score
500 1000 1500
synostosis
short humerus
abnormal snout morphology
abnormal cranium morphology
interdigital webbing
abnormal medulla oblongata morphology
abnormal olfactory nerve morphology
bowed tibia
reduced cerebellar foliation
brachyphalangia
short fibula
abnormal nasal cavity morphology
absent optic nerve
hypopigmentation
short tibia
abnormal cerebral hemisphere morphology
postnatal lethality, complete penetrance
abnormal olfactory epithelium morphology
decreased body weight
decreased bone strength
abnormal bone mineralization
absent corpus callosum
0
1
2
3
4
Significance of enrichment (−log10 p-value)

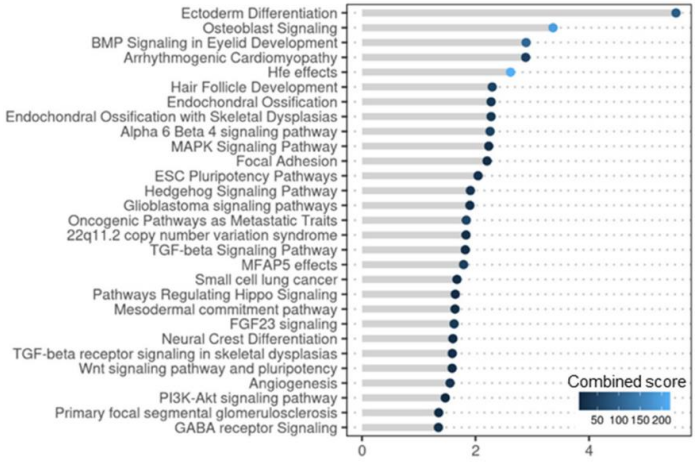

receptor clustering
neuromuscular junction development
peptidyl-proline hydroxylation to 4-hydroxy-L-proline
synaptic transmission, glutamatergic
cellular response to iron ion
renal system development
Semantic space x
p-value


autism
genetic
abnormalities
daily activities
restricted behavior
interest
disorder
affected
superior skills
factors
self-injury
perception
ritualistic behavior
dressing ritual
help
behavior
unchanging
menu
limited
health
evidence
attention
repetitive
communication
occurrence


Ectoderm Differentiation
Neural Crest Differentiation
Laminopathies on Wnt signaling
Mesodermal commitment pathway
Arrhythmogenic Cardiomyopathy
BMP Signaling in Eyelid Development
Hair Follicle Development
White fat cell differentiation
Combined score
50 70 90
Significance of enrichment (−log10 p-value)


schizophrenia
thought processes
treatment
depression
delusions
symptoms
social dysfunction
psychological
mental disorder
suicidal
personality disorder
Confused
problem solving
auditory hallucinations
social rehabilitation
paranoid
emotional
genetics
brain
movements

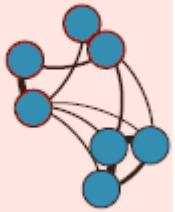

morphogenesis of an epithelium
protein dephosphorylation
receptor clustering
positive regulation of phospholipase activity
MAPK cascade
acellular structure organization
positive regulation of alcohol biosynthetic process
p-value


Ectoderm Differentiation
Osteoblast Signaling
BMP Signaling in Eyelid Development
Arrhythmogenic Cardiomyopathy
Hfe effects
Hair Follicle Development
Endochondral Ossification
Endochondral Ossification with Skeletal Dysplasias
Alpha 6 Beta 4 signaling pathway
MAPK Signaling Pathway
Focal Adhesion
ESC Pluripotency Pathways
Hedgehog Signaling Pathway
Glioblastoma signaling pathways
Oncogenic Pathways as Metastatic Traits
22q11.2 copy number variation syndrome
TGF-beta Signaling Pathway
MFAP5 effects
Small cell lung cancer
Pathways Regulating Hippo Signaling
Mesodermal commitment pathway
FGF23 signaling
Neural Crest Differentiation
TGF-beta receptor signaling in skeletal dysplasias
Wnt signaling pathway and pluripotency
Angiogenesis
PI3K-Akt signaling pathway
Primary focal segmental glomerulosclerosis
GABA receptor Signaling
Combined score
50 100 150 200

❻

Shared knowldege

S-languages



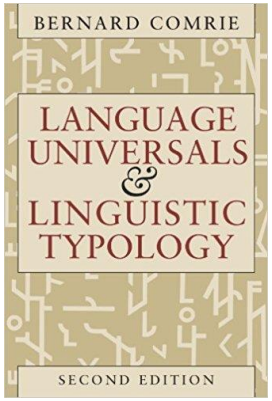
- complex phonologies
- opaque morphologies
- limited semantic transparency
- limited compositional structure
- less sophisticated syntax

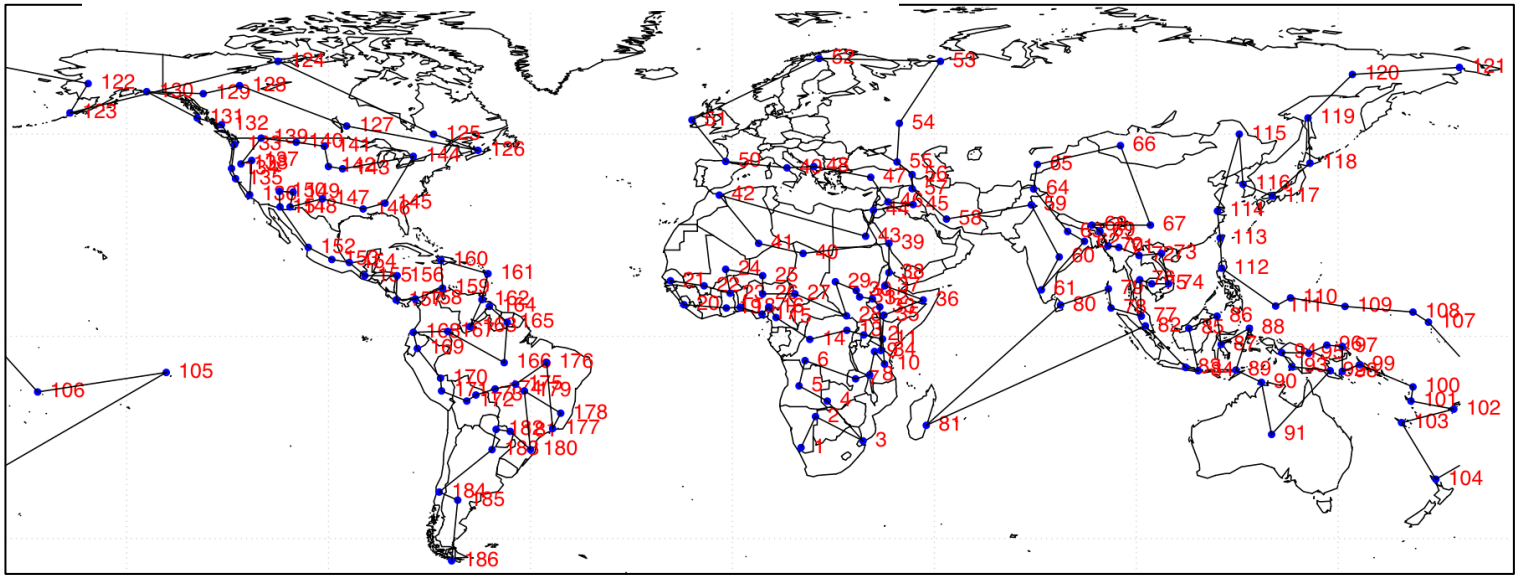
American Journal of PHYSICAL ANTHROPOLOGY
The Official Journal of the American Association of Physical Anthropologists

RESEARCH ARTICLE

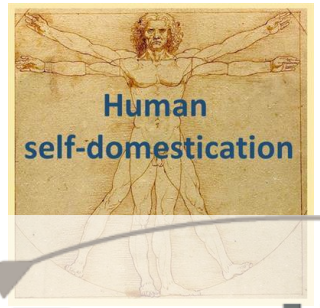
Female status, food security, and stature sexual dimorphism: Testing mate choice as a mechanism in human self-domestication

Ben Thomas Gleeson ✉, Geoff Kushnick





THE WORLD ATLAS
OF LANGUAGE STRUCTURES
ONLINE



Feedback Loop

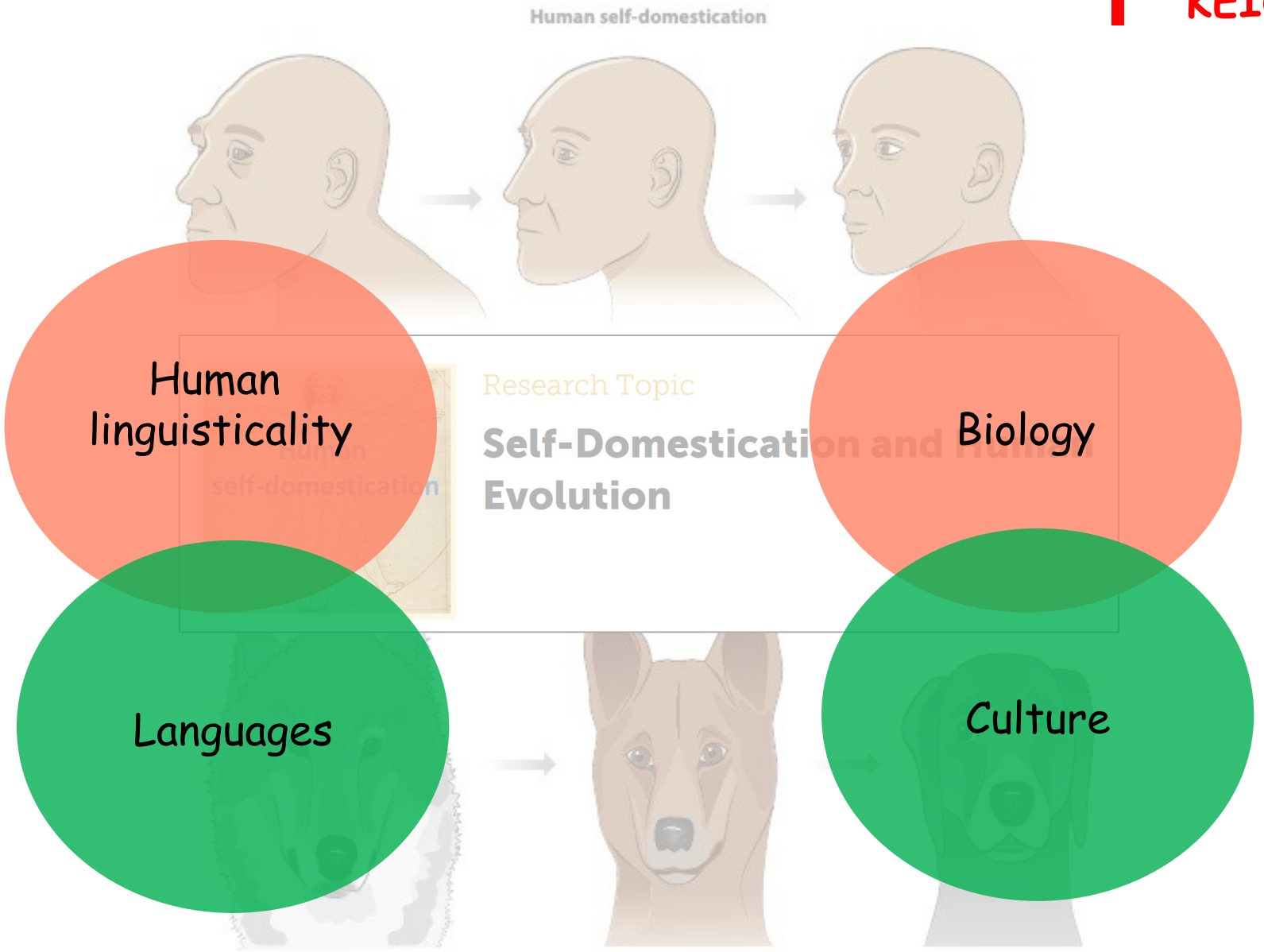
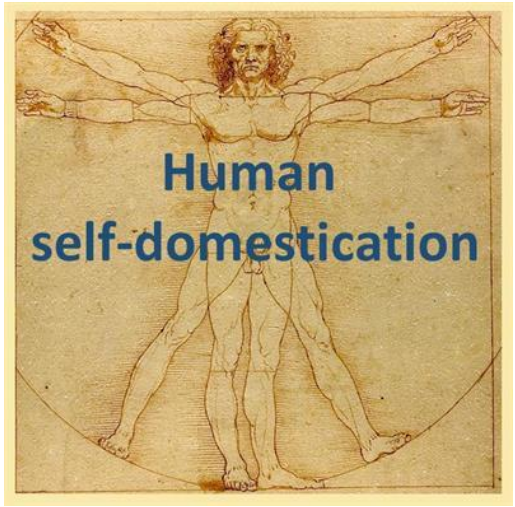
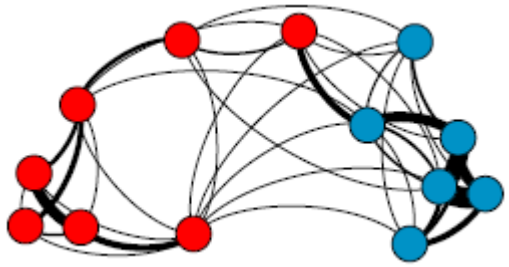


Figure 1

Homo sapiens evolved, in part, as a result of selection for increased in-group prosociality during the Paleolithic, leading to a variety of morphological, physiological, and cognitive changes also observed in domestic animals such as *Canis familiaris*.



Thanks a lot for your attention!



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Principal Investigator. Research Project: "La evolución de las lenguas modernas: fundamentos genéticos y sociológicos del continuo lingüístico esotérico-exotérico" (PID2020-114516GB-I00))

Principal Investigator. Research Group "Biolingüística" (HUM 972) (Junta de Andalucía, spain)