

CONTENTS

NOTICES	2
PUBLICATION ALERTS.....	2
ACADEMIA.EDU – The Upper Limb of Australopithecus sediba	2
STEVEN E. CHURCHILL et al with LEE R. BERGER – The Upper Limb of Australopithecus sediba	2
ACADEMIA.EDU – Femoral neck and shaft structure in Homo naledi.....	2
LUKAS FRIEDL et al with LEE R. BERGER – Femoral neck and shaft structure in Homo naledi from the Dinaledi Chamber (Rising Star System, South Africa)	2
SCIENCEDIRECT – The effect of trauma on Neanderthal culture: A mathematical analysis	3
W.NAKAHASHI – The effect of trauma on Neanderthal culture: A mathematical analysis	3
SCIENCEDIRECT – Call combinations, vocal exchanges and interparty movement in wild bonobos.....	3
ISAAC SCHAMBERG, DOROTHY L. CHENEY, ZANNA CLAY, GOTTFRIED HOHMANN & ROBERT M. SEYFARTH – Call combinations, vocal exchanges and interparty movement in wild bonobos	3
NEWS	3
BREAKING SCIENCE – 9,000-Year-Old Obsidian Tools Found at Bottom of Lake Huron	3
BREAKING SCIENCE – Researchers Test Ancient Lighting to See How Paleolithic Humans Lit Their Caves	4
NATURE BRIEFING – Why humans are so thirsty	4
SCIENCE DAILY – Climate conditions during the migration of Homo sapiens out of Africa reconstructed.....	4
SCIENCE DAILY – The evolution of good taste.....	4
SCIENCE DAILY – Early migrations of Siberians to America tracked using bacterial population structures.....	4
SCIENCE DAILY – Light in darkness: An experimental look at Paleolithic cave lighting.....	4
SCIENCE DAILY – Ten years of ancient genome analysis has taught scientists 'what it means to be human'	4
SCIENCE DAILY – At underwater site, research team finds 9,000-year-old stone artifacts.....	4
SCIENCE DAILY – Wild chimpanzee orphans recover from the stress of losing their mother	4
SCIENCE DAILY – Parrot talk	5
SCIENCE DAILY – New method could reveal what genes we might have inherited from Neanderthals	5
SCIENCE DAILY – Social secrets of killer whales discovered using drones.....	5
SCIENCE NEWS – Ancient genomes offer rare glimpse of Neanderthal family groups.....	5
SCIENCE NEWS – Killer whales form killer friendships, new drone footage suggests.....	5
SOCIETY FOR SCIENCE – New clues suggest people reached the Americas around 30,000 years ago	5
SOCIETY FOR SCIENCE – A deep look at a speck of human brain reveals never-before-seen quirks	5
THE CONVERSATION – Identity fusion: why some people will go to extremes for the beliefs of a group	5
THE CONVERSATION – Darwin got sexual selection backwards, research suggests.....	5
PUBLICATIONS	6
American Journal of Physical Anthropology	6
PAPERS	6
SHEELA ATHREYA & ALLISON HOPKINS – Conceptual issues in hominin taxonomy: Homo heidelbergensis and an ethnobiological reframing of species	6
Frontiers in Psychology	6
PAPERS	6
SABRINA PANESI & SERGIO MORRA – Executive Function, Language, and the Toddler’s Discovery of Representational Drawing.....	6
MARINA DAVILA-ROSS & GUILLAUME DEZECACHE – The Complexity and Phylogenetic Continuity of Laughter and Smiles in Hominids.....	6
SANNE J. M. KUIJPER, CATHARINA A. HARTMAN & PETRA HENDRIKS – Children’s Pronoun Interpretation Problems Are Related to Theory of Mind and Inhibition, But Not Working Memory	6
Nature	7
ARTICLES	7
ESKE WILLERSLEV & DAVID J. MELTZER – Peopling of the Americas as inferred from ancient genomics	7
COMMENTARIES	7
PHILIP HOPLEY et al – Clusters of flowstone ages are not supported by statistical evidence	7
ROBYN PICKERING et al – Reply to: Clusters of flowstone ages are not supported by statistical evidence.....	7
Nature Communications	7
PAPERS	7

MAX H. SIEGEL et al – Children’s exploratory play tracks the discriminability of hypotheses	7
FRANK SCHAEBITZ et al – Hydroclimate changes in eastern Africa over the past 200,000 years may have influenced early human dispersal	8
FERNANDO COLCHERO et al with RICHARD W. WRANGHAM & KLAUS ZUBERBÜHLER – The long lives of primates and the ‘invariant rate of ageing’ hypothesis.....	8
Nature Human Behaviour.....	8
PAPERS	8
REBECCA L. JACKSON, TIMOTHY T. ROGERS & MATTHEW A. LAMBON RALPH – Reverse-engineering the cortical architecture for controlled semantic cognition	8
Nature Reviews	8
PAPERS	8
BETH A. KOZEL et al – Williams syndrome	8
Nature Scientific Reports.....	9
PAPERS	9
FRANCESCA PANCOTTO & SIMONE RIGHI – Reflectivity relates differently to pro sociality in naive and strategic subjects	9
PLoS One.....	9
PAPERS	9
M ^a ÁNGELES MEDINA-ALCAIDE et al – The conquest of the dark spaces: An experimental approach to lighting systems in Paleolithic caves.....	9
Proceedings of the Prehistoric Society	9
PAPERS	9
LIONEL SIMS – Returning from the Underworld: The West Kennet Palisades in the Avebury Monument Complex.....	9
Science.....	9
ARTICLES	9
ANN GIBBONS – Genomes offer rare glimpse of Neanderthal family groups	9
CHRISTOPHER M. FILLEY – White matter and human behavior.....	9
PAPERS	10
BINGXIN ZHAO et al – Common genetic variation influencing human white matter microstructure	10
Scientific American.....	10
ARTICLES	10
ASHER Y. ROSINGER – Human Evolution Led to an Extreme Thirst for Water.....	10
SUBSCRIBE to the EAORC Bulletin	10
UNSUBSCRIBE from the EAORC Bulletin	10
PRODUCED BY AND FOR THE EAORC EMAIL GROUP.....	10

NOTICES

PUBLICATION ALERTS

If you have had a paper or book published, or you see something which would be of interest to the group, do please send me a publication alert so that I can include it in the newsletter. Many thanks to those who have already sent in alerts.

If there is a journal you feel I should be tracking on a regular basis, do let me know.

And if you have any other ideas for extending the “EAORC experience”, please contact me.

ACADEMIA.EDU – The Upper Limb of *Australopithecus sediba*

Science 340:1233477 (2013)

STEVEN E. CHURCHILL et al with LEE R. BERGER – The Upper Limb of *Australopithecus sediba*

The evolution of the human upper limb involved a change in function from its use for both locomotion and prehension (as in apes) to a predominantly prehensile and manipulative role. Well-preserved forelimb remains of 1.98-million-year-old *Australopithecus sediba* from Malapa, South Africa, contribute to our understanding of this evolutionary transition. Whereas other aspects of their postcranial anatomy evince mosaic combinations of primitive (australopith-like) and derived (Homo-like) features, the upper limbs (excluding the hand and wrist) of the Malapa hominins are predominantly primitive and suggest the retention of substantial climbing and suspensory ability. The use of the forelimb primarily for prehension and manipulation appears to arise later, likely with the emergence of *Homo erectus*.

https://www.academia.edu/15638314/The_Upper_Limb_of_Australopithecus_sediba

ACADEMIA.EDU – Femoral neck and shaft structure in *Homo naledi*

Journal of Human Evolution 133, 61-77 (2019)

LUKAS FRIEDL et al with LEE R. BERGER – Femoral neck and shaft structure in *Homo naledi* from the Dinaledi Chamber (Rising Star System, South Africa)

The abundant femoral assemblage of *Homo naledi* found in the Dinaledi Chamber provides a unique opportunity to test hypotheses regarding the taxonomy, locomotion, and loading patterns of this species. Here we describe neck and shaft cross-

sectional structure of all the femoral fossils recovered in the Dinaledi Chamber and compare them to a broad sample of fossil hominins, recent humans, and extant apes. Cross-sectional geometric (CSG) properties from the femoral neck (base of neck and midneck) and diaphysis (subtrochanteric region and midshaft) were obtained through CT scans for *H. naledi* and through CT scans or from the literature for the comparative sample. The comparison of CSG properties of *H. naledi* and the comparative samples shows that *H. naledi* femoral neck is quite derived with low superoinferior cortical thickness ratio and high relative cortical area. The neck appears superoinferiorly elongated because of two bony pilasters on its superior surface. *Homo naledi* femoral shaft shows a relatively thick cortex compared to the other hominins. The subtrochanteric region of the diaphysis is mediolaterally elongated resembling early hominins while the midshaft is anteroposteriorly elongated, indicating high mobility levels. In term of diaphyseal robusticity, the *H. naledi* femur is more gracile than other hominins and most apes. *Homo naledi* shows a unique combination of characteristics in its femur that undoubtedly indicate a species committed to terrestrial bipedalism but with a unique loading pattern of the femur possibly consequence of the unique postcranial anatomy of the species.

[https://www.academia.edu/39959251/Femoral neck and shaft structure in Homo naledi from the Dinaledi Chamber Rising Star System South Africa](https://www.academia.edu/39959251/Femoral_neck_and_shaft_structure_in_Homo_naledi_from_the_Dinaledi_Chamber_Rising_Star_System_South_Africa)

SCIEDIRECT – The effect of trauma on Neanderthal culture: A mathematical analysis

HOMO 68:2, 83-100 (2017)

W.NAKAHASHI – The effect of trauma on Neanderthal culture: A mathematical analysis

Traumatic lesions are often observed in ancient skeletal remains. Since ancient medical technology was immature, severely traumatized individuals may have frequently lost the physical ability for cultural skills that demand complex body movements. I develop a mathematical model to analyze the effect of trauma on cultural transmission and apply it to Neanderthal culture using Neanderthal fossil data. I estimate from the data that the proportion of adult individuals who suffered traumatic injuries before death was approximately 0.79–0.94, in which 0.37–0.52 were injured severely and 0.13–0.19 were injured before adulthood. Assuming that every severely traumatized individual and a quarter to a half of the other traumatized individuals lost the capacity for a cultural skill that demands complex control of the traumatized body part, I estimate that if an upper limb is associated with a cultural skill, each individual had to communicate closely with at least 1.5–2.6 individuals during adulthood to maintain the skill in Neanderthal society, and if a whole body is associated, at least 3.1–11.5 individuals were necessary. If cultural transmissions between experts and novices were inaccurate, or if low frequency skills easily disappeared from the population due to random drift, more communicable individuals were necessary. Since the community size of Neanderthals was very small, their high risk of injury may have inhibited the spread of technically difficult cultural skills in their society. It may be important to take this inhibition into consideration when we study Neanderthal culture and the replacement of Neanderthals by modern humans.

<https://www.sciencedirect.com/science/article/abs/pii/S0018442X17300094>

SCIEDIRECT – Call combinations, vocal exchanges and interparty movement in wild bonobos

*Animal Behaviour*122, 109-116 (2016)

ISAAC SCHAMBERG, DOROTHY L. CHENEY, ZANNA CLAY, GOTTFRIED HOHMANN & ROBERT M. SEYFARTH – Call combinations, vocal exchanges and interparty movement in wild bonobos

The vocal repertoire of nonhuman primates is largely fixed. Individuals produce their species-specific vocalizations from a young age, and do not acquire new call types over their lifetime. Despite these limitations, however, monkeys and apes are able to increase their vocal flexibility in several ways, including subtle acoustic modification, call combinations, turn-taking and call persistence. Although primates have been observed to utilize these communicative features, the extent to which they integrate these abilities is not known. Here we show that certain long-distance calls produced by wild bonobos, *Pan paniscus*, assimilate several aspects of vocal flexibility in ways not previously documented in nonhuman primates. Communication between foraging parties exhibits context-specific call combinations relating to the movement of caller, call modifications that potentially target particular individuals, call-and-answer exchanges in which the initial caller's behaviour depends on the listener's reply, and possible persistence in call production. The selective pressure exerted by bonobos' fission–fusion social structure has likely favoured the integration of these communicative capabilities.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347216302421>

NEWS

BREAKING SCIENCE – 9,000-Year-Old Obsidian Tools Found at Bottom of Lake Huron

The two ancient obsidian flakes recovered from a now submerged archaeological site beneath Lake Huron represent the oldest and farthest east confirmed occurrence of western obsidian in the continental United States.

http://feedproxy.google.com/~r/BreakingScienceNews/~3/na6JppwxPvc/lake-huron-obsidian-tools-09767.html?utm_source=feedburner&utm_medium=email

BREAKING SCIENCE – Researchers Test Ancient Lighting to See How Paleolithic Humans Lit Their Caves

Artificial lighting was a crucial physical resource for expanding complex social and economic behavior in groups of Paleolithic humans. Furthermore, the control of fire allowed the development of the first symbolic behavior in deep caves, around 176,000 years ago.

http://feedproxy.google.com/~r/BreakingScienceNews/~3/un0AtUS6YXY/paleolithic-lighting-systems-09771.html?utm_source=feedburner&utm_medium=email

NATURE BRIEFING – Why humans are so thirsty

Quirks of our evolution might explain why humans need to drink more water than most mammals. While our ancestors were evolving in Africa two to three million years ago, the climate became more arid. Their bodies became taller and slimmer, with a greater surface area. Combined with a reduction of body hair and increase in sweat glands, this made them better at dissipating heat. But it also increased the amount of water that our ancestors needed. “Throughout history people have drastically engineered their environments to ensure access to water” as a result, writes human biologist Asher Rosinger.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=ca597603ae&e=1db4b9a19b>

SCIENCE DAILY – Climate conditions during the migration of Homo sapiens out of Africa reconstructed

Climate reconstruction of the last 200,000 years from East Africa illustrates the living conditions of Homo sapiens when they migrated out of Africa / Homo sapiens was mobile across regions during wet phases and retreated to high altitudes during dry phases.

<https://www.sciencedaily.com/releases/2021/06/210614153909.htm>

SCIENCE DAILY – The evolution of good taste

Does evolution explain why we can't resist a salty chip? Researchers found that differences between the elemental composition of foods and the elemental needs of animals can explain the development of pleasing tastes like salty, umami and sweet.

<https://www.sciencedaily.com/releases/2021/06/210614153906.htm>

SCIENCE DAILY – Early migrations of Siberians to America tracked using bacterial population structures

Early migrations of humans to the Americas from Siberia around 12,000 years ago have been traced using the bacteria they carried by an international team.

<https://www.sciencedaily.com/releases/2021/06/210614153947.htm>

SCIENCE DAILY – Light in darkness: An experimental look at Paleolithic cave lighting

A recreation of three common types of Paleolithic lighting systems (torches, grease lamps, and fireplaces) illuminates how Paleolithic cave dwellers might have traveled, lived, and created in the depths of their caves, according to a new study.

<https://www.sciencedaily.com/releases/2021/06/210616143034.htm>

SCIENCE DAILY – Ten years of ancient genome analysis has taught scientists 'what it means to be human'

A ball of 4,000-year-old hair frozen in time tangled around a whalebone comb led to the first ever reconstruction of an ancient human genome a decade ago. The hair, which was preserved in arctic permafrost in Greenland, was collected in the 1980s. It wasn't until 2010 that evolutionary biologists were able to use pioneering shotgun DNA sequencing to reconstruct the genetic history of the hair. It sparked a 'decade of discovery.'

<https://www.sciencedaily.com/releases/2021/06/210616113824.htm>

SCIENCE DAILY – At underwater site, research team finds 9,000-year-old stone artifacts

Underwater archaeologists have been studying 9,000-year-old stone tool artifacts discovered in Lake Huron that originated from an obsidian quarry more than 2,000 miles away in central Oregon. The obsidian flakes from the underwater archaeological site represent the oldest and farthest east confirmed specimens of western obsidian ever found in the continental United States.

<https://www.sciencedaily.com/releases/2021/06/210616094106.htm>

SCIENCE DAILY – Wild chimpanzee orphans recover from the stress of losing their mother

Chronic stress could be one reason why some animal orphans have shorter lives and less offspring. Researchers assessed if, as orphan humans, orphan chimpanzees are exposed to chronic stress. They found that maternal loss is stressful but orphans experience little chronic stress since stress hormones return to normal after two years, possibly thanks to care provided by other chimpanzees.

<https://www.sciencedaily.com/releases/2021/06/210617133756.htm>

SCIENCE DAILY – Parrot talk

Outside the breeding season many parrots live in dynamic social systems in which individuals travel and forage. These flocks are characterized by frequent changes in composition and their dynamic nature entails a unique set of challenges, such as potential increased aggression and competition for resources. Therefore, the ability to selectively choose the right flock members may be essential to maximize individual fitness.

<https://www.sciencedaily.com/releases/2021/06/210617115545.htm>

SCIENCE DAILY – New method could reveal what genes we might have inherited from Neanderthals

Using neural networks, researchers have developed a new method to search the human genome for beneficial mutations from Neanderthals and other archaic humans. These humans are known to have interbred with modern humans, but the overall fate of the genetic material inherited from them is still largely unknown. Among others, the researchers found previously unreported mutations involved in core pathways in metabolism, blood-related diseases and immunity.

<https://www.sciencedaily.com/releases/2021/06/210617115536.htm>

SCIENCE DAILY – Social secrets of killer whales discovered using drones

Killer whales have complex social structures including close 'friendships', according to a new study that used drones to film the animals.

<https://www.sciencedaily.com/releases/2021/06/210616191525.htm>

SCIENCE NEWS – Ancient genomes offer rare glimpse of Neanderthal family groups

More than 49,000 years ago, a family of Neanderthals set up camp in a cave high in Siberia's Altai Mountains, overlooking a river valley where bison, red deer, and wild horses roamed. In the cave's main gallery, a teenage girl lost a tooth, perhaps while gnawing on bison that her father or his kin had hunted in the sweeping grasslands.

<https://www.sciencemag.org/news/2021/06/ancient-genomes-offer-rare-glimpse-neanderthal-family-groups>

SCIENCE NEWS – Killer whales form killer friendships, new drone footage suggests

In the animal kingdom, killer whales are social stars: They travel in extended, varied family groups, care for grandchildren after menopause, and even imitate human speech. Now, marine biologists are adding one more behavior to the list: forming fast friendships. A new study suggests the whales rival chimpanzees, macaques, and even humans when it comes to the kinds of "social touching" that indicates strong bonds.

<https://www.sciencemag.org/news/2021/06/killer-whales-form-killer-friendships-new-drone-footage-suggests>

SOCIETY FOR SCIENCE – New clues suggest people reached the Americas around 30,000 years ago

Ancient rabbit bones from a Mexican rock-shelter point to humans arriving on the continent as much as 10,000 years earlier than often assumed.

<http://click.societyforscience-email.com/?qs=17b1840889e97e10174197303ac1d289d2bea1eeb7ef277b9f56d7d8512ab19bd325d491bb11e5114a80069d3b0c1dbeacc7a71a610736e39>

SOCIETY FOR SCIENCE – A deep look at a speck of human brain reveals never-before-seen quirks

Three-dimensional views of 50,000 cells from a woman's brain yield one of the most detailed maps yet.

<http://click.societyforscience-email.com/?qs=17b1840889e97e101d4877a3980ceac62c96e5800ba6a7adbb910a1dee8f458b3db7aa96f2192bd8419e0303d9eb052e5aae59b6bf03fa>

THE CONVERSATION – Identity fusion: why some people will go to extremes for the beliefs of a group

We used computer models to study the evolutionary benefits of identity fusion.

<https://theconversationuk.cmail20.com/t/r-l-tldklyhl-khhilillah-a/>

THE CONVERSATION – Darwin got sexual selection backwards, research suggests

The sexual selection of larger males may be driven by an abundance – not a scarcity – of females.

<https://theconversationuk.cmail20.com/t/r-l-tlhlkjc-khhilillah-e/>

PUBLICATIONS

American Journal of Physical Anthropology

PAPERS

SHEELA ATHREYA & ALLISON HOPKINS – Conceptual issues in hominin taxonomy: *Homo heidelbergensis* and an ethnobiological reframing of species

Efforts to name and classify Middle Pleistocene *Homo*, often referred to as “*Homo heidelbergensis*” are hampered by confusing patterns of morphology but also by conflicting paleoanthropological ideologies that are embedded in approaches to hominin taxonomy, nomenclature, and the species concept. We deconstruct these issues to show how the field's search for a “real” species relies on strict adherence to pre-Darwinian essentialist naming rules in a post-typological world. We then examine Middle Pleistocene *Homo* through the framework of ethnobiology, which examines on how Indigenous societies perceive, classify, and name biological organisms. This research reminds us that across human societies, taxonomies function to (1) identify and classify organisms based on consensus pattern recognition and (2) construct a stable nomenclature for effective storage, retrieval and communication of information. Naming Middle Pleistocene *Homo* as a “real” species cannot be verified with the current data; and separating regional groups into distinct evolutionary lineages creates taxa that are not defined by readily perceptible or universally salient differences. Based on ethnobiological studies of this kind of patterning, referring to these hominins above the level of the species according to their generic category with modifiers (e.g., “European Middle Pleistocene *Homo*”) is consistent with observed human capabilities for cognitive differentiation, is both necessary and sufficient given the current data, and will allow for the most clear communication across ideologies going forward.

<https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.24330>

Frontiers in Psychology

PAPERS

SABRINA PANESI & SERGIO MORRA – Executive Function, Language, and the Toddler's Discovery of Representational Drawing

Working memory capacity and executive functions play important roles in the early development of drawing and language, but we lack models that specify the relationships among these representational systems and cognitive functions in toddlers. To respond to this need, the present study investigated the relations between drawing and language in very young children, and the role of working memory capacity, inhibition, and shifting in the association between these two representational systems. The participants were 80 children, 25–37 months old. The results revealed that in toddlers (a) all the measures of working memory, inhibition, and shifting loaded on a single factor of general executive functioning; (b) language and drawing are two distinct, but substantially correlated, representational systems; and (c) the development of executive function has a strong impact on language development, which in turn influences the development of drawing.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2021.659569/full>

MARINA DAVILA-ROSS & GUILLAUME DEZECACHE – The Complexity and Phylogenetic Continuity of Laughter and Smiles in Hominids

Laughter and smiles are often, but not always, associated with positive affect. These expressions of humans help to promote social relationships as well as the development of cognitive and socio-emotional skills and they may have a positive impact on health and well-being, hereby covering a selection of fitness-relevant benefits. Both laughter and smiles of positive affect also occur early in human development and across cultures, suggesting deep roots in human biology. The present work provides an evolutionary reconstruction of the evolution of human laughter and smiles of positive affect in form and function, based on the principle of maximum parsimony. According to the Complexity and Continuity Hypothesis, human laughter and smiles of positive affect must have evolved within the context of play from ancestral species. Furthermore, ancestral ape laughter and their open-mouth faces must already have been complex in form and function and changed over time via categorically different phylogenetic pathways to become characteristic, effective, and pervasive behaviors of everyday social interactions in humans.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2021.648497/full>

SANNE J. M. KUIJPER, CATHARINA A. HARTMAN & PETRA HENDRIKS – Children's Pronoun Interpretation Problems Are Related to Theory of Mind and Inhibition, But Not Working Memory

In several languages, including English and Dutch, children's acquisition of the interpretation of object pronouns (e.g., him) is delayed compared to that of reflexives (e.g., himself). Various syntactic and pragmatic explanations have been proposed to account for this delay in children's acquisition of pronoun interpretation. This study aims to provide more insight into this delay by investigating potential cognitive mechanisms underlying this delay. Dutch-speaking children between 6 and 12 years old with autism spectrum disorder (ASD; $n = 47$), attention-deficit/hyperactivity disorder (ADHD; $n = 36$) or typical development (TD; $n = 38$) were tested on their interpretation and production of object pronouns and reflexives and on theory of mind, working memory, and response inhibition. It was found that all three groups of children had difficulty with pronoun interpretation and that their performance on pronoun interpretation was associated with theory of mind and inhibition. These findings support an explanation of object pronoun interpretation in terms of perspective taking, according to which listeners need to consider the speaker's perspective in order to block coreference between the object pronoun and

the subject of the same sentence. Unlike what is predicted by alternative theoretical accounts, performance on pronoun interpretation was not associated with working memory, and the children made virtually no errors in their production of object pronouns. As the difficulties with pronoun interpretation were similar for children with ASD, children with ADHD and typically developing children, this suggests that certain types of perspective taking are unaffected in children with ASD and ADHD.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2021.610401/full>

Nature

ARTICLES

ESKE WILLERSLEV & DAVID J. MELTZER – Peopling of the Americas as inferred from ancient genomics

In less than a decade, analyses of ancient genomes have transformed our understanding of the Indigenous peopling and population history of the Americas. These studies have shown that this history, which began in the late Pleistocene epoch and continued episodically into the Holocene epoch, was far more complex than previously thought. It is now evident that the initial dispersal involved the movement from northeast Asia of distinct and previously unknown populations, including some for whom there are no currently known descendants. The first peoples, once south of the continental ice sheets, spread widely, expanded rapidly and branched into multiple populations. Their descendants—over the next fifteen millennia—experienced varying degrees of isolation, admixture, continuity and replacement, and their genomes help to illuminate the relationships among major subgroups of Native American populations. Notably, all ancient individuals in the Americas, save for later-arriving Arctic peoples, are more closely related to contemporary Indigenous American individuals than to any other population elsewhere, which challenges the claim—which is based on anatomical evidence—that there was an early, non-Native American population in the Americas. Here we review the patterns revealed by ancient genomics that help to shed light on the past peoples who created the archaeological landscape, and together lead to deeper insights into the population and cultural history of the Americas.

<https://www.nature.com/articles/s41586-021-03499-y>

COMMENTARIES

PHILIP HOPLEY et al – Clusters of flowstone ages are not supported by statistical evidence

ARISING FROM R. Pickering et al. Nature <https://doi.org/10.1038/s41586-018-0711-0> (2019)

Pickering et al. identify six clusters of U–Pb dates among 29 flowstone deposits in the Cradle of Humankind to argue that the hominin record of South Africa is restricted to dry climate phases. The six clusters were identified as peaks in a kernel density estimate, which was created using software developed by one of us²: unfortunately, this software has not been used appropriately. Kernel density estimation is a descriptor of data and not a statistical tool—it has no parametric or distributional element, and the data are not ‘fitted’ in a statistical sense. Therefore, a kernel density estimate cannot be used as justification to subdivide the small dataset of 29 dispersed values into 6 even-smaller clusters.

<https://www.nature.com/articles/s41586-021-03586-0>

ROBYN PICKERING et al – Reply to: Clusters of flowstone ages are not supported by statistical evidence

In the accompanying Comment¹, Hopley et al. focus on our use of a kernel density estimator (KDE) to illustrate the periodicity that is present within a speleothem age spectrum. We agree with the limitations of the KDE, and indeed use it simply as a more robust visualization tool than the commonly used probability density function. We stress that our interpretation and conclusions do not hinge on the use of the KDE: the very same conclusions can be drawn from a simple histogram that we present—together with the KDE—in figure 2 of our Article². This histogram conveys the same age distribution information as the KDE, and entirely vindicates our conclusions without any reference to the KDE.

<https://www.nature.com/articles/s41586-021-03587-z>

Nature Communications

PAPERS

MAX H. SIEGEL et al – Children’s exploratory play tracks the discriminability of hypotheses

Effective curiosity-driven learning requires recognizing that the value of evidence for testing hypotheses depends on what other hypotheses are under consideration. Do we intuitively represent the discriminability of hypotheses? Here we show children alternative hypotheses for the contents of a box and then shake the box (or allow children to shake it themselves) so they can hear the sound of the contents. We find that children are able to compare the evidence they hear with imagined evidence they do not hear but might have heard under alternative hypotheses. Children (N = 160; mean: 5 years and 4 months) prefer easier discriminations (Experiments 1-3) and explore longer given harder ones (Experiments 4-7). Across 16 contrasts, children’s exploration time quantitatively tracks the discriminability of heard evidence from an unheard alternative. The results are consistent with the idea that children have an “intuitive psychophysics”: children represent their own perceptual abilities and explore longer when hypotheses are harder to distinguish.

<https://www.nature.com/articles/s41467-021-23431-2>

FRANK SCHAEBITZ et al – Hydroclimate changes in eastern Africa over the past 200,000 years may have influenced early human dispersal

Reconstructions of climatic and environmental conditions can contribute to current debates about the factors that influenced early human dispersal within and beyond Africa. Here we analyse a 200,000-year multi-proxy paleoclimate record from Chew Bahir, a tectonic lake basin in the southern Ethiopian rift. Our record reveals two modes of climate change, both associated temporally and regionally with a specific type of human behavior. The first is a long-term trend towards greater aridity between 200,000 and 60,000 years ago, modulated by precession-driven wet-dry cycles. Here, more favorable wetter environmental conditions may have facilitated long-range human expansion into new territory, while less favorable dry periods may have led to spatial constriction and isolation of local human populations. The second mode of climate change observed since 60,000 years ago mimics millennial to centennial-scale Dansgaard-Oeschger cycles and Heinrich events. We hypothesize that human populations may have responded to these shorter climate fluctuations with local dispersal between montane and lowland habitats.

<https://www.nature.com/articles/s43247-021-00195-7>

FERNANDO COLCHERO et al with RICHARD W. WRANGHAM & KLAUS ZUBERBÜHLER – The long lives of primates and the ‘invariant rate of ageing’ hypothesis

Is it possible to slow the rate of ageing, or do biological constraints limit its plasticity? We test the ‘invariant rate of ageing’ hypothesis, which posits that the rate of ageing is relatively fixed within species, with a collection of 39 human and nonhuman primate datasets across seven genera. We first recapitulate, in nonhuman primates, the highly regular relationship between life expectancy and lifespan equality seen in humans. We next demonstrate that variation in the rate of ageing within genera is orders of magnitude smaller than variation in pre-adult and age-independent mortality. Finally, we demonstrate that changes in the rate of ageing, but not other mortality parameters, produce striking, species-atypical changes in mortality patterns. Our results support the invariant rate of ageing hypothesis, implying biological constraints on how much the human rate of ageing can be slowed.

<https://www.nature.com/articles/s41467-021-23894-3>

Nature Human Behaviour

PAPERS

REBECCA L. JACKSON, TIMOTHY T. ROGERS & MATTHEW A. LAMBON RALPH – Reverse-engineering the cortical architecture for controlled semantic cognition

We employ a reverse-engineering approach to illuminate the neurocomputational building blocks that combine to support controlled semantic cognition: the storage and context-appropriate use of conceptual knowledge. By systematically varying the structure of a computational model and assessing the functional consequences, we identified the architectural properties that best promote some core functions of the semantic system. Semantic cognition presents a challenging test case, as the brain must achieve two seemingly contradictory functions: abstracting context-invariant conceptual representations across time and modalities, while producing specific context-sensitive behaviours appropriate for the immediate task. These functions were best achieved in models possessing a single, deep multimodal hub with sparse connections from modality-specific regions, and control systems acting on peripheral rather than deep network layers. The reverse-engineered model provides a unifying account of core findings in the cognitive neuroscience of controlled semantic cognition, including evidence from anatomy, neuropsychology and functional brain imaging.

<https://www.nature.com/articles/s41562-020-01034-z>

Nature Reviews

PAPERS

BETH A. KOZEL et al – Williams syndrome

Williams syndrome (WS) is a relatively rare microdeletion disorder that occurs in as many as 1:7,500 individuals. WS arises due to the mispairing of low-copy DNA repetitive elements at meiosis. The deletion size is similar across most individuals with WS and leads to the loss of one copy of 25–27 genes on chromosome 7q11.23. The resulting unique disorder affects multiple systems, with cardinal features including but not limited to cardiovascular disease (characteristically stenosis of the great arteries and most notably supra-aortic stenosis), a distinctive craniofacial appearance, and a specific cognitive and behavioural profile that includes intellectual disability and hypersociability. Genotype–phenotype evidence is strongest for ELN, the gene encoding elastin, which is responsible for the vascular and connective tissue features of WS, and for the transcription factor genes GTF2I and GTF2IRD1, which are known to affect intellectual ability, social functioning and anxiety. Mounting evidence also ascribes phenotypic consequences to the deletion of BAZ1B, LIMK1, STX1A and MLXIPL, but more work is needed to understand the mechanism by which these deletions contribute to clinical outcomes. The age of diagnosis has fallen in regions of the world where technological advances, such as chromosomal microarray, enable clinicians to make the diagnosis of WS without formally suspecting it, allowing earlier intervention by medical and developmental specialists. Phenotypic variability is considerable for all cardinal features of WS but the specific sources of this variability remain unknown. Further investigation to identify the factors responsible for these differences may lead to mechanism-based rather than symptom-based therapies and should therefore be a high research priority.

<https://www.nature.com/articles/s41572-021-00276-z>

Nature Scientific Reports

PAPERS

FRANCESCA PANCOTTO & SIMONE RIGHI – Reflectivity relates differently to pro sociality in naïve and strategic subjects

Is pro sociality a natural impulse or the result of a self-controlled behavior? We investigate this issue in a lab in the field experiment with participants from the general adult population in Italy. We find two key results: first, that there is a positive relationship between pro sociality and strategic reasoning. Second, that reflectivity relates to lower pro sociality but only among strategic subjects, indicating that the intuitive view of pro sociality is valid only among strategic individuals. Non-strategic individuals are instead intuitively selfish. We surmise that these results emerge due to a common cognitive root between strategizing and pro sociality, namely empathy.

<https://www.nature.com/articles/s41598-021-91960-3>

PLoS One

PAPERS

M^a ÁNGELES MEDINA-ALCAIDE et al – The conquest of the dark spaces: An experimental approach to lighting systems in Paleolithic caves

Artificial lighting was a crucial physical resource for expanding complex social and economic behavior in Paleolithic groups. Furthermore, the control of fire allowed the development of the first symbolic behavior in deep caves, around 176 ky BP. These activities would increase during the Upper Paleolithic, when lighting residues proliferated at these sites. The physical peculiarities of Paleolithic lighting resources are very poorly understood, although this is a key aspect for the study of human activity within caves and other dark contexts. In this work, we characterize the main Paleolithic lighting systems (e.g., wooden torches, portable fat lamps, and fireplaces) through empirical observations and experimental archeology in an endokarstic context. Furthermore, each lighting system's characteristic combustion residues were identified to achieve a better identification for the archaeological record. The experiments are based on an exhaustive review of archaeological information about this topic. Besides, we apply the estimated luminous data of a Paleolithic cave with Paleolithic art (Atxurra in northern Spain) in 3D through GIS technology to delve into the archeologic implications of illumination in Paleolithic underground activities.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0250497>

Proceedings of the Prehistoric Society

PAPERS

LIONEL SIMS – Returning from the Underworld: The West Kennet Palisades in the Avebury Monument Complex

In recent decades some archaeologists have come to doubt key components and properties of the Late Neolithic/Early Bronze Age (EBA) Avebury monument complex. By site excavation of the Beckhampton Avenue, Silbury Hill, and the West Kennet Palisades the idea of an integrated group of contemporaneous monuments has been thrown into doubt. In this paper these critiques are themselves critiqued and further tested by an inter-disciplinary exercise integrating archaeology, landscape phenomenology, and archaeoastronomy. It is suggested that the emergent properties of this procedure reveal that these recent doubts are unfounded and that this monument complex was designed for rituals to initiate neophytes by simulating journeys through a virtual underworld.

<https://www.cambridge.org/core/journals/proceedings-of-the-prehistoric-society/article/returning-from-the-underworld-the-west-kennet-palisades-in-the-avebury-monument-complex/89278F9B9F2AD436F2314C73C0046213>

Science

ARTICLES

ANN GIBBONS – Genomes offer rare glimpse of Neanderthal family groups

More than 49,000 years ago, a family of Neanderthals set up camp in a cave in Siberia's Altai Mountains, overlooking a river valley where bison, red deer, and wild horses roamed. Now, researchers have analyzed the genomes of a father and daughter and 12 of their relatives, many of whom sheltered in the same cave over less than 100 years. The new genomes almost double the number of Neanderthal genomes known and offer the first real clues to the social structure of a group of Neanderthals. In addition to identifying the first father-daughter pair, the genetic evidence suggests these males stayed in their family groups as adults, like men in many modern human societies.

<https://science.sciencemag.org/content/372/6548/1251>

CHRISTOPHER M. FILLEY – White matter and human behavior

One of the most enduring themes in human neuroscience is the association of higher brain functions with gray matter. In particular, the cerebral cortex—the gray matter of the brain's surface—has been the primary focus of decades of work aiming to understand the neurobiological basis of cognition and emotion. Yet, the cerebral cortex is only a few millimeters thick, so the relative neglect of the rest of the brain below the cortex has prompted the term “cortico-centric myopia”. Other regions relevant to behavior include the deep gray matter of the basal ganglia and thalamus, the brainstem and cerebellum,

and the white matter that interconnects all of these structures. On page 1304 of this issue, Zhao et al. present compelling evidence for the importance of white matter by demonstrating genetic influences on structural connectivity that invoke a host of provocative clinical implications.

<https://science.sciencemag.org/content/372/6548/1265>

PAPERS

BINGXIN ZHAO et al – Common genetic variation influencing human white matter microstructure

The white matter of the brain, which is composed of axonal tracts connecting different brain regions, plays key roles in both normal brain function and a variety of neurological disorders. Zhao et al. combined detailed magnetic resonance imaging-based assessment of brain structures with genetic data on nearly 44,000 individuals (see the Perspective by Filley). On the basis of this comprehensive analysis, the authors identified structural and genetic abnormalities associated with neurological and psychiatric disorders, as well as some nondisease traits, thus creating a valuable resource and providing some insights into the underlying neurobiology.

<https://science.sciencemag.org/content/372/6548/eabf3736>

Scientific American

ARTICLES

ASHER Y. ROSINGER – Human Evolution Led to an Extreme Thirst for Water

We are more dependent on water than many other mammals and have developed a host of clever strategies for obtaining it.

<https://www.scientificamerican.com/article/human-evolution-led-to-an-extreme-thirst-for-water/>

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