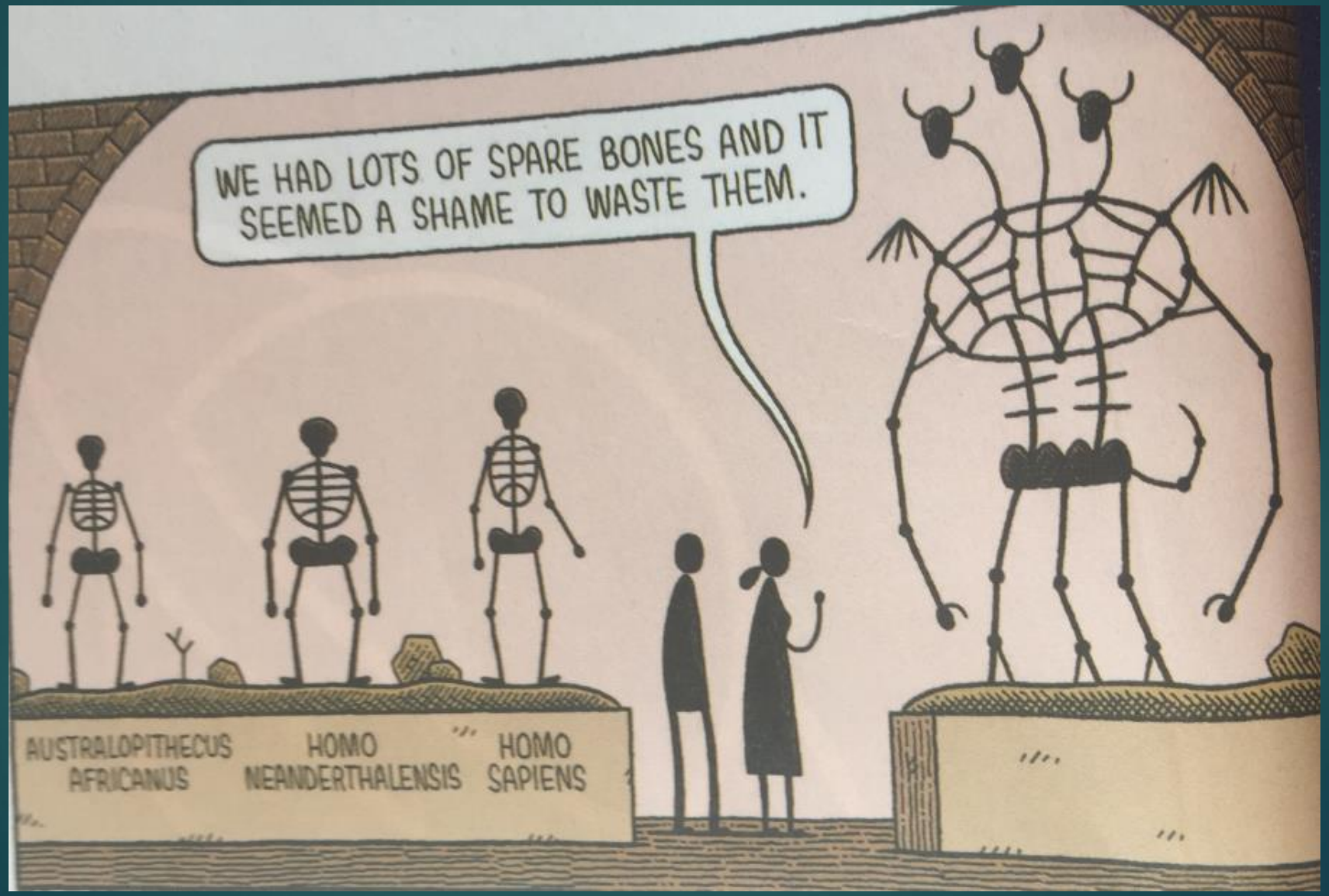
The Neandertals

Part III:
The Debate over Neandertal Abilities

by
Charles J Vella, PhD.
May 27, 2020

Today's Theme: How do you interpret what you find archeologically?



2020: Bacho Kiro Cave, Bulgaria: MHs at 47 Ka

- Bones of early *H. sapiens* in Europe are scarce: Discovery and direct dating of human remains found in association with Initial Upper Palaeolithic artefacts, from excavations at Bacho Kiro Cave (Bulgaria): as early as 47 Ka, which makes them the earliest known members of our species in Europe.
- Morphological analysis of a MH molar and mitochondrial DNA from several hominin bone fragments, identified through proteomic screening, assign these finds to *H. sapiens;* human bones and artifacts date from 43,650 to 45,820 years ago. The ages of animal bones modified by people suggest they were in the cave “probably beginning from 46,940” years ago,

Jean-Jacques Hublin, et al., 2020

Lithic artefacts from layer I of Bacho Kiro Cave. Pointed retouched blades and fragments (1–4, 6, 7) and piece with bifacial retouch (5). Photographs by V.S.-M. and T. Tsanova.

2020: Bacho Kiro Cave, Bulgaria: MHs at 47 Ka

- The excavations yielded a wealth of bone artefacts, including pendants manufactured from cave bear teeth that are reminiscent of those later produced by the last Neanderthals of western Europe.

- DNA of these early arrivals shows, however, that they left no descendants in Europe today.
- Hublin notes that pendants made from the teeth of cave bears at Bacho Kiro are similar to pendants thought to be the handiwork of later Neanderthals and crafted about 44 to 42 Ka—the so-called Châtelperronian industry, first found at the Grotte du Renne site in France. He argues that this supports his long-held contention that Neanderthals picked up this type of pendant from moderns.

Bone tools and personal ornaments from Bacho Kiro Cave layers I and J; a-j, Pendants made from perforated and grooved teeth **(a,** ungulate; **b-j,** cave bear), **k, 1, o,** Awls, **m,** Anthropogenically modified piece, **n, p,** *Lissoirs,* **q,** Ivory bead.. Scale bars, lcm **(a-o, q),3cm (p).**

MH vs N Bone tools/pendants:

Bacho Kiro (46 Ka) vs. Grotto du Renne (44-42 Ka)

Personal ornaments and bone tools from Bacho Kiro cave (Bulgaria) in Hublin et al., 2020.

Personal ornaments and bone tools from Grotte du Renne, Arcy-sur-Cure, France. Modified from Fig.1 Caron F, d'Errico F, Del Moral P, Santos F, Zilhão J (2011) The Reality of Neandertal Symbolic Behavior at the Grotte du Renne, Arcy-sur-Cure, France. PLOS ONE 6(6): e21545. https://doi.org/10.1371/journal.pone.0021545

Bacho Kiro: Bone tools and pendants

- 219 pieces of bone from 23 different animal species, the most frequent of bison, and also cervids, equines, caprids and carnivores such as the bear. Some have cut marks and served as food, but others were transformed for use as a tool. Ocher on some of these pieces.
- 1 ivory bead and 12 pierced pendants, 11 of them made with bear teeth and 1 with ungulate tooth.
- Stone tools, some with raw material obtained 180 km away from the site.
- Some of these ornamental and useful bone objects are similar to materials found at Grotte du Renne (southern France, 2000 km west of Bacho Kiro), which are assigned to Neanderthals.
- Hublin: proposes that perhaps these individuals inspired Neanderthals to make similar ornaments a few thousand years later.
- Stringer: Ns were using eagle talons as necklaces 80 Ka before this

Carbon 14 recalibration

- The basis of radiocarbon dating is simple: all living things absorb carbon from the atmosphere and food sources around them, including a certain amount of natural, radioactive carbon-14. When the plant or animal dies, they stop absorbing, but the radioactive carbon that they've accumulated continues to decay. Measuring the amount left over gives an estimate as to how long something has been dead.
- But this basic calculation assumes that the amount of carbon-14 in the environment has been constant in time and space — which it hasn't.
- Conversion tables are needed that match up calendar dates with radiocarbon dates in different regions

Carbon 14 recalibration: previous dates to 50 Ka, now 55 Ka

- Carbon dating, the archaeological workhorse, is getting a major reboot
- For the first time in seven years, the technique is due to be recalibrated using a slew of new data from around the world
- The work combines thousands of data points from tree rings, lake and ocean sediments, corals and stalagmites, among other features, and extends the time frame for radiocarbon dating back to 55,000 years ago — 5,000 years further than the last calibration update in 2013.
- A new calibration curve to consult; recalibration mostly results in subtle changes
- Oldest *H. sapiens* fossil found in Eurasia — Ust'-Ishim, unearthed in Siberia — is almost 1,000 years younger
- The oldest single tree, a bristlecone pine from California, was previously dated at 5,000 years old. Now pushed back to 13,910 years ago.

Oldest bristlecone pine: 13,910 years old, White Mts, Inyo Co. CA

Neandertal Brain:

Basis of Neandertal Abilities

Why do these 2 skulls have different shapes?

Neanderthal skulls (left) were on average slightly larger and differently shaped and than modern human skulls (right). (*Credit: Weaver, Roseman and Stringer; Journal of Human Evolution Volume 53, Issue 2, August 2007*)

N Skull: long and low

MH: globular

Skull shape molded by brain shape

Philipp Gunz, et al., 2018

Brain cases: N vs MH

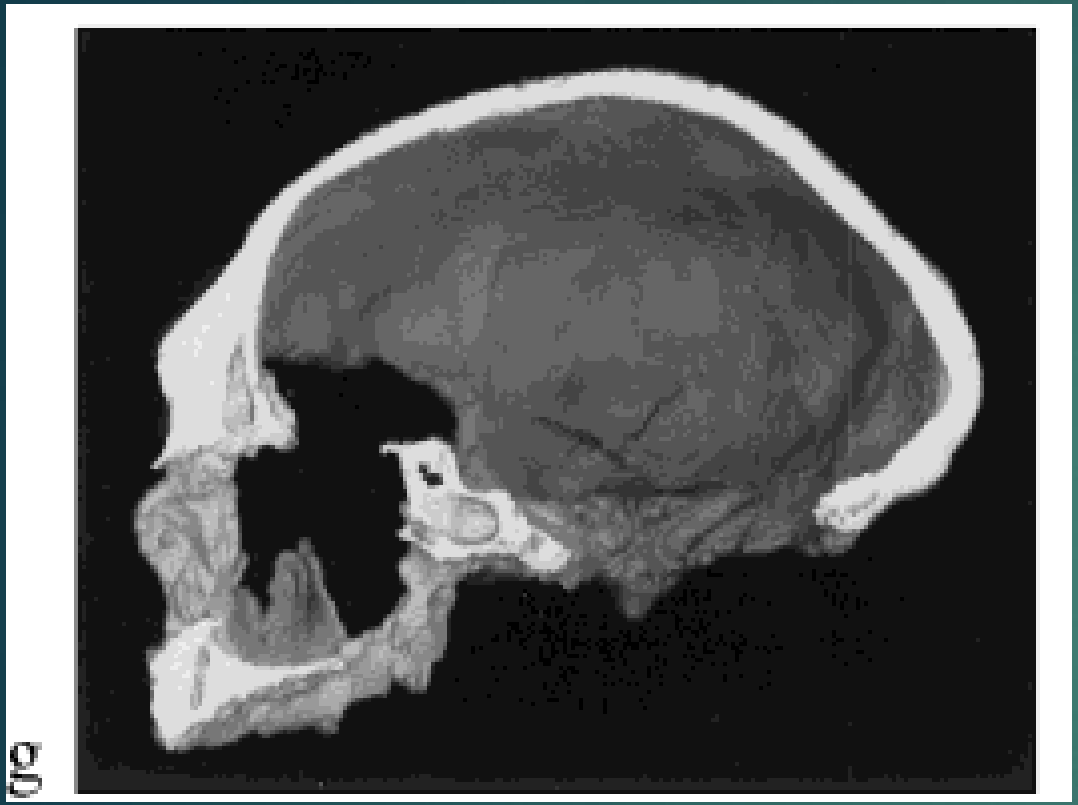
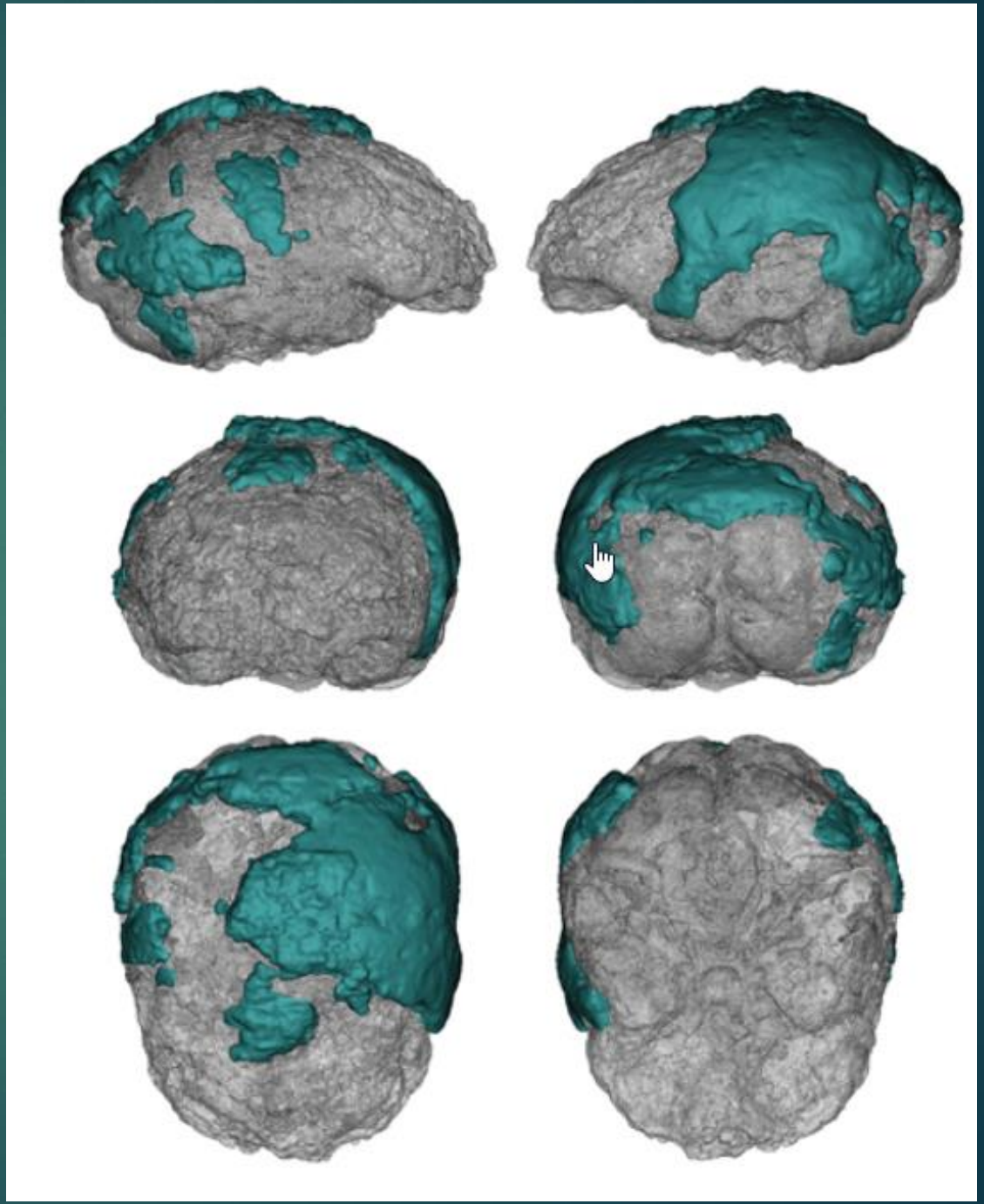


Image g shows Guattari, or a "classic" *Homo Neandertalensis* skull.

Image h shows *Homo sapiens*

N natural endocast, Gánovce, Slovakia

- The natural endocranial cast of Gánovce was found in 1926 in Slovakia, and dated to 105 Ka.
- Cranial capacity is approximately 1320 cc
- Clear Neandertal appearance,
  - with flat parietal lobes,
  - projecting occipital lobes,
  - wide frontal lobes



Neandertal Brain

- **Brain size**:
  - Average N brain size is about 1450 cc, (1245 to 1,750 cc; (Holloway 1985))
  - Compared to 1560 cc ave in AMH, and 1350 cc in current MHs
  - Relative N brain size may have been smaller than MH due to their greater body mass
  - Neandertals retained an archaic brain shape despite larger size,

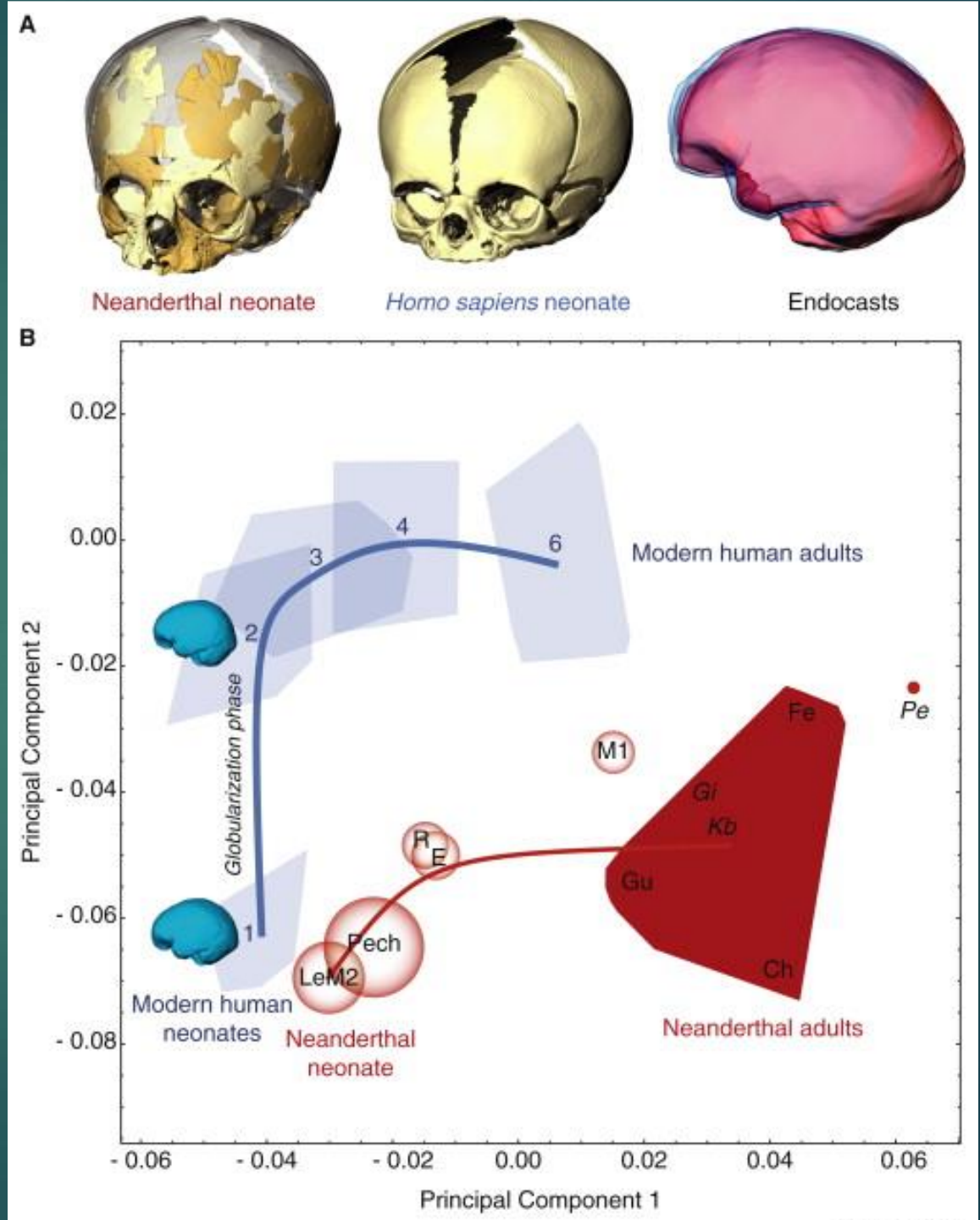
Neandertal Brain

- Recent MHs span from 900 to 2,100 cc
- All Ns brain volumes fall comfortably within the range of living people.
- Neandertals had larger occipital region
- Modern humans exhibiting larger parietal and cerebellar regions, as well as increasing size (Bruner et al. 2004)
- Recent Study: correlations between recent MH individual brain globularity and genes involved in neurogenesis and myelination, most of all in putamen and cerebellum

N & MHs brains grew differently from start.

MH globularization happens in 1st 2 years of development. (MHs develop globular brain after birth)

Ns start out with and maintained elongated brain after birth



2018: 3D Brain reconstruction of N brain

- Ns had:
  - smaller parietal region
  - relatively smaller cerebellum (esp. right side) and significantly larger occipital region
  - narrower orbitofrontal cortex,
  - smaller olfactory bulbs
  - and less increased and forward-projecting temporal lobe poles (relatively low temporal pole position in NT)

Takanori Kochiyama, et al., 2018

Neuroanatomic differences

The first important note about the H. sapiens' brain is how globularized it is!

Globularization produces closer neurons with faster, denser connections

The Parietal Lobe

The parietal lobe is essential for cognitive functioning:

- Visuospatial working memory

The ability to create internal stable representations of external environment and one's place in it.

Ability to grasp and manipulate objects like tools and understand cause and effect relations in tool use

Sense of self, self-representation, and self-consciousness.

emotional perspective taking.

Theory of Mind (can guess what others are thinking; eye-contact, gaze-following, and intentional attributions)

Complex Functions of Parietal lobe

- Virtual reality capacity: brain-generated simulation of a three-dimensional image of environment
- Spatial orientation
- Constructional activity
- Higher Order Cognition: central to IQ - *Parietal-frontal network* is implicated in:
  - abstract human intelligence,
  - fluid intelligence,
  - working memory, episodic memory; visuospatial working memory
  - attentional control

Parietal Functions

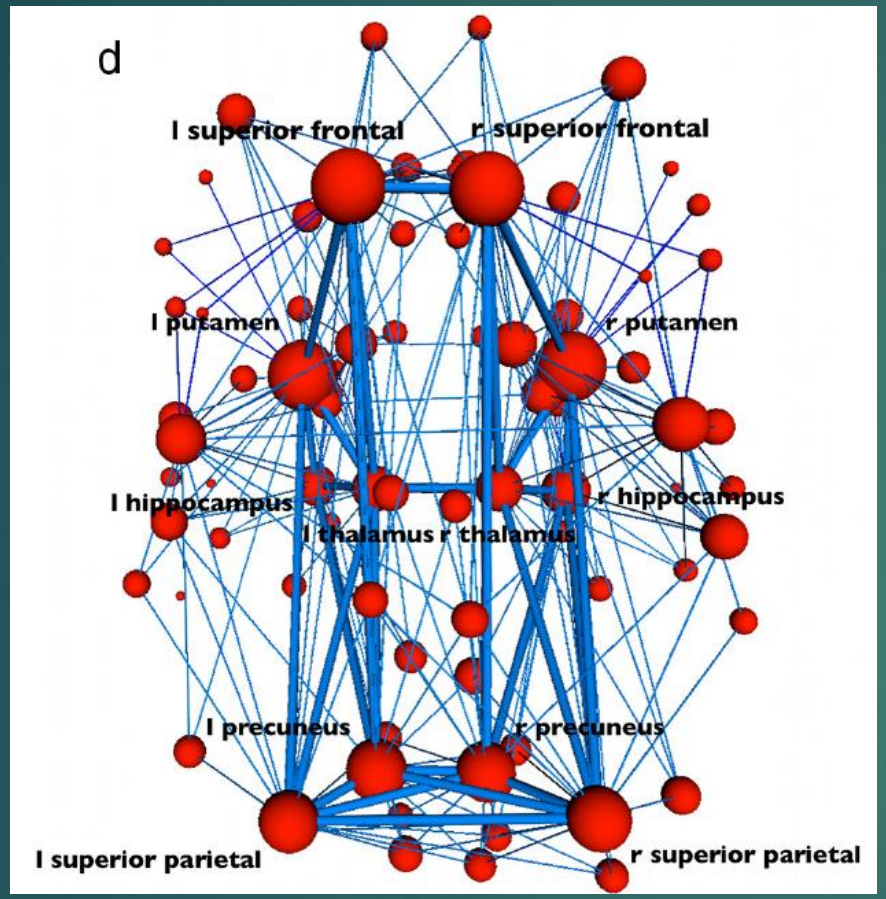
- Language comprehension - Understanding the grammatical & syntactical aspects of language
- Mind reading: taking a third-person versus first-person visual point of view.
- IrTMJ: make decision on basis of intention, not outcome:
  - Lower RTPJ activation: harsh, outcome-based judgments of accidents (e.g., she *poisoned* her friend; deliberate)
  - Higher RTPJ activation: more lenient belief-based judgments (e.g., she *thought* it was sugar; accident)
- Default Mode Network central (ventral Precuneus): highest resting metabolic rates; day dreaming, nonconscious cognitive processing

Parietals made us human

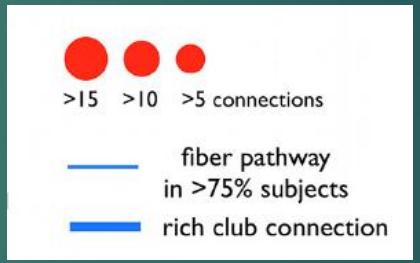
- Precuneus:
  - egocentric memory, the ability to create internal, stable representations of the external environment and one's place within it.
  - critical higher-order cognitive tasks, including the integration of visuospatial imagery, retrieval of episodic and autobiographical memories, and ability to take first-person perspectives in the experience of agency
  - ways of interfacing the environment with internal representations;
  - autonoetic thinking, the ability to recognize that the awareness of time is subjective, that one may travel backward and forward in it and, thus, that time may be perceived as relative (Tulving, 2002).

- The second critical function is prospective memory and future memory simulation

12 Rich World Hubs: central areas and freeways



Bilateral frontoparietal regions, including precuneus, superior frontal and parietal cortex, hippocampus, thalamus, and putamen are individually central & also densely interconnected, together forming a rich club.



Almost all regions of the brain have at least one link directly to the rich club. Brain lesions that damage one of the rich club hubs will have more serious behavioral effects (3x more) than damage to non-hub area.

N visual cortex and bigger eye sockets

- Cranial capacity and bigger eyeballs (20% larger) correlates with increasing latitude; a significant positive relationship between absolute latitude and human orbital volume, an index of eyeball size.
- Selection for larger visual systems has mitigated the effect of reduced ambient light levels

- Larger brains in coldest climates(16 cc): Inuits have largest cranial capacity
- Most likely increase in visual brain areas (for visual adaptation to low light levels) accounts for most of increased brain size in Ns

Beals, K.L., C.L. Smith, and S.M. Dodd (1984).
Eiluned Pearce & Robin Dunbar, 2011

Neandertals had Enhanced Visual system

- Neanderthals had significantly larger eye sockets (orbits) than AMHs.
- Neanderthal occipital lobes are relatively larger than those of AMHs.
- Due to larger bodies, Neanderthal also invested more neural tissue in somatic areas involved in body maintenance and control
- Using endocranial volumes, Neanderthals had significantly larger visual systems than contemporary AMHs (indexed by orbital volume) and that when this, along with their greater body mass, is taken into account, Neanderthals have smaller adjusted endocranial capacities than contemporary AMHs

Eiluned Pearce, Chris Stringer and R. I. M. Dunbar,, 2013

N visual system

- Neanderthals had enlarged visual and somatic regions, whereas AMHs achieved large brains by increasing parietal & cerebellar lobes
- In a 2013 study, researchers estimated N visual cortex volume based on the size of orbits (holes in skulls for eyes)
- Adaptation for higher latitudes, with less light
- Orbital size is a reliable indicator of visual cortex volume in humans
- Neanderthals between 75-30 Ka do not show significantly larger brains than contemporary AMHs

“Neanderthalize” a brain organoid; N genes in organoid to study brain development

An organoid that, instead of being smooth and spherical, is lumpy like popcorn — suggesting that the N gene mutations significantly influences early brain development.

Neandertal Life History Characteristics

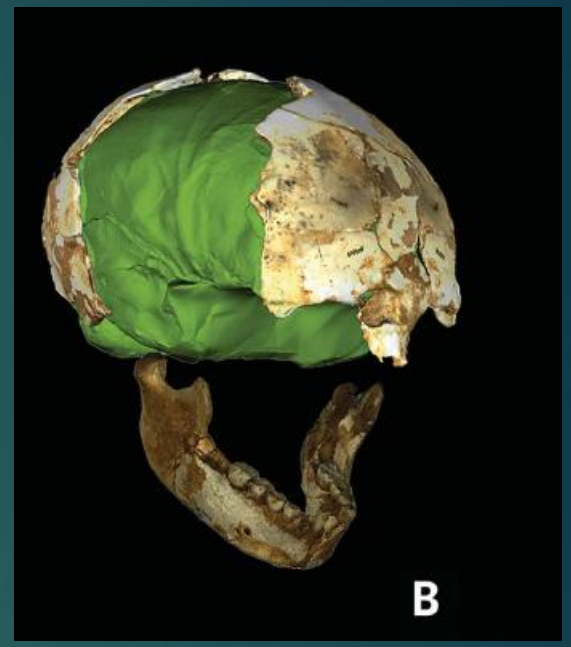
MH & N: Long Childhood

- Neandertals = the James Deans of human evolution—they grew up fast, died young, and became legends. (Ann Gibbons)
- MHs take almost twice as long as chimpanzees to reach adulthood and have prolonged childhood and delayed reproduction.
- Compared with living great apes, modern humans have short birth intervals, long maturation times, and long life spans.
- Long childhood: social and behavioral learning; period of synaptic pruning (we lose 50% of synaptic connections)

Antonio Rosas, et al., Science, 2018

El Sidròn N boy, 49 Ka: 7.7 years old

The skeleton of a Neanderthal boy recovered from the El Sidrón cave in Spain has revealed that Neanderthal brains spent a long time growing.



The *growth pattern of Neandertals*, reconstructed from a juvenile skeleton from El Sidrón (Spain).

- Juvenile partial skeleton (El Sidrón J1)
- Dental histology to estimate the age at death to be 7.7 years.
- Endocranial features suggest that brain growth was not yet completed.
  - Only around 87 percent of the full volume of the average adult male Neanderthal.
  - In contrast, a human child of the same age would have completed almost 95 percent of their total cranial growth.

Rosas A, et al., 2017

Life history: Development

- Some earlier studies, Neanderthal children grew faster than modern human children, based on dental growth.
- Ns had distinct demographics:
  - high mortality among young and prime age Neanderthals, with corresponding low adult life expectancy.
  - high mortality related to the high levels of stress and trauma also observed on Neanderthal skeletons.

Life History Traits

- Neanderthals and predispersal modern humans in the Levant both shared relatively high mortality among young adults,

- Later UP MHs had much lower young adult mortality, possibly contributing to their population growth.

- In contrast, Erik Trinkaus analyzed fossil records to gauge the adult life spans of Neanderthals and early modern humans. He found:
  - roughly the same number of 20- to 40-year-old adults and adults older than 40 in both Neanderthal and early modern human populations, suggesting life expectancy was probably the same for both circa 45 Ka

Changes in proportion of old to young ratio

- Age estimation in fossils:
  - Adult: if 3rd molar has erupted
  - Old adult: heavily worn teeth.

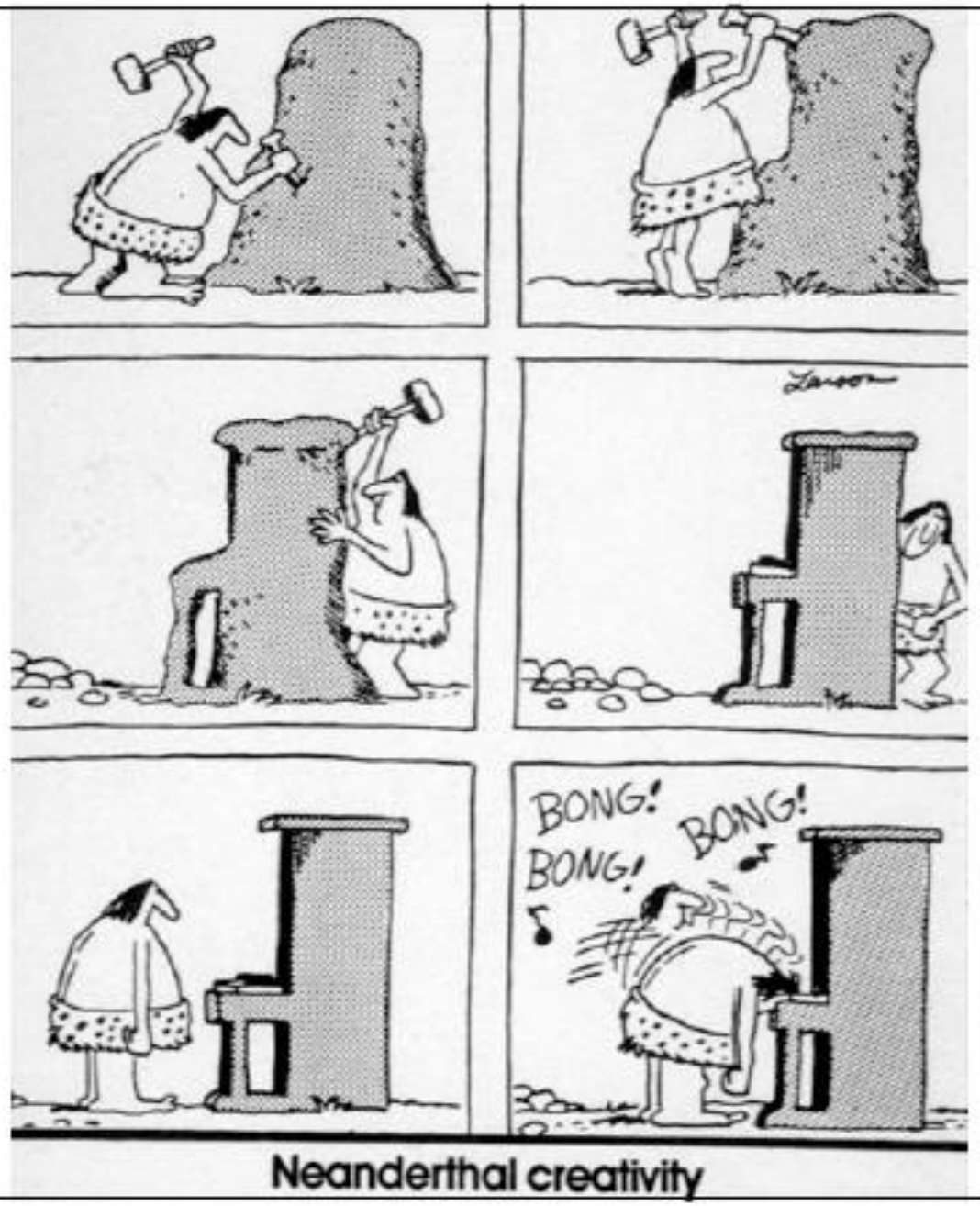
- In contrast to Trinkaus, newer study: dentition of 700 Ns: longer survival in MHs
  - Ns had 40% old to young: 4 older adults to every 10 younger
  - Upper Paleolithic MHs = 5x greater: 20 older adults to every 10 younger

Teeth: Stress in N children

- Study of the teeth of two Neanderthal kids (who lived until they were teens or young adults), at 250 Ka in Payre, France. Tooth enamel:
  - suffered from repeated lead exposure.
  - extreme wintertime stress in these children,
  - including probable weight loss
  - exposure to toxic lead at least twice
  - child was born in the spring
  - weaned before winter at 2.5 years of age.

Smith *et al*., 2019

Rethinking Neandertal Capabilities


BONG!
BONG!
BONG!
Neanderthal creativity

Evaluation of Behavioral Complexity: Recommended Reading

- *1 Archeology and the Evolution of Human Behavior*, R. Klein, 1999
- *2 The revolution that wasn't: a new interpretation of the origin of modern human behavior*, Sally McBrearty and Alison S. Brooks, 2000
- *3 Origin of Modern Human Behavior,* C. S. Henshilwood & C. W. Marean, 2003
- *4 Archaeological Evidence for the Emergence of Language, Symbolism, and Music—An Alternative Multidisciplinary Perspective*, Francesco d'Errico, Christopher Henshilwood, Graeme Lawson, Marian Vanhaeren, Anne-Marie Tillier, Marie Soressi, et al., 2003
- 5 *Behavioural Complexity in Eurasian Neanderthal Populations: a Chronological Examination of the Archaeological Evidence*, Michelle C. Langley, et al., 2008:
- *6 Neandertal Demise: An Archaeological Analysis of the Modern Human Superiority Complex*. Villa P, Roebroeks W, 2014
- *7 The false dichotomy: a refutation of the Neandertal indistinguishability claim,* Thomas Wynn, K. A. Overmann & Frederick L. Coolidge, 2016
- *8 Neandertals revised*, Wil Roebroeks and Marie Soressi, 2016

Our relationship to Ns: Not Us and Them

- S. Paabo: now recommends against imagining separate species of human evolution altogether: not an Us and a Them, but one enormous “metapopulation” composed of shifting clusters of humans that periodically coincided in time and space and, when they happened to bump into one another, occasionally had sex.

- Finlayson: “Each valley could have told a different story. In one, they may have hit each other over the head. In another, they may have made love. In another, they ignored each other.”

Not us and them

- Jon Mooallem: “a super long elevator ride with strangers.”
- Rebecca Wragg Sykes: There is no cognitive chasm between us, just as there was no reproductive barrier.
- Based on current archeological data, can we say that Ns were less than fully human?

Neandertal either became part of us or were already us

The Neanderthals

- *Homo neanderthalensis* or *Homo sapiens neanderthalensis*?
- *Homo neanderthalensis* has gotten a bad rap as lamebrained brutes who huddled in cold caves while gnawing at slabs of slain mammoth.
- Nature's down-and-outs were judged to be too dimwitted for moral conceptions, probably devoid of language and behaviorally inferior to their modern human contemporaries.

New Look at Ns

- Neanderthals have been subject to labelling and a whole host of false impressions simply for looking different (Devlin 2018).

- They are often ridiculed as stupid brutes because of their facial features and for not having survived the evolutionary process.

- The absurdity of the idea that Neanderthals died out as a result of limited intelligence becomes clear if one is able to envision a world where global warming has wiped out Homo sapiens but not the cockroach. Is asking who was more intelligent or symbolic the correct question to later ask?

The Neanderthals

- The squabbles over the intelligence and taxonomic status of these archaic humans have gotten so bitter and so intense that some researchers refer to them as the Neanderthal Wars.

- Over the years battle lines have been drawn over everything from the shape of Neanderthals' noses, the depth of their trachea, the extent to which they interbred with modern humans, and the authorship of certain cave art.

My premise: Ns were human too.

- Neanderthals weren't the slow-witted louts we've imagined them to be — not just a bunch of cavemen "Neanderthals".

- They were actually "very similar if not identical" to their contemporary *Homo sapiens* in Africa, in terms of standard markers of modern cognitive and behavioral capacities.

- We've always classified Neanderthals, technically, as human — part of the genus Homo. But it turns out they also did the cognitive stuff that makes us human.

Ns were human too

- Erik Trinkaus and Pat Shipman have described how Neanderthals became “mirrors that reflected, in all their awfulness and awesomeness, the nature and humanity of those who touched them.”

- The real surprise of this may not be the competence of Neanderthals but how obnoxiously low our expectations for them have been — we have been *H. sapiens* supremacists.

João Zilhão (Joel Zilhow?): N defender

- Portuguese archeologist João Zilhão has been the Neanderthals' loudest and most persistent advocate.
- At 62, he's more or less the de facto leader of the movement to rehabilitate the Ns. "The mainstream narrative of our origins has been fairly straightforward," he says. "The exodus of modern humans from Africa was depicted like it was a biblical event: Chosen Ones replacing debased Europeans, the Neanderthals." "Nonsense, all of it."
- Adaptation is key to Zilhão's take on Neanderthals. He has long maintained that they were the mental equals of *sapiens* and sophisticated enough to imagine, innovate, absorb influences, reinvent them and incorporate that knowledge into their own culture.
- "Sure, there were physical differences between Neanderthals and modern humans "But Neanderthals were humans, and in terms of basic things that make us different, there was no difference."

Neandertal Wars: Zilhão vs Hublin

- Zilhão vs J. Hublin: In1996, Zilhão read a paper Jean Hublin in *Nature* about human remains uncovered years before in the La Grotte des Fees cave near Châtelperron in central France.
- Strewn among skeletal fragments in the same layer of dirt were delicately carved bones, ivory rings, and pierced teeth. Hublin, proposed that the remains were of Neanderthals and that these objects used for personal ornamentation were copied by Neanderthals from MHs.
- Elsewhere in France, the same types of tools and ornaments were likewise found to predate the earliest evidence for *sapiens*.
- Hublin's team argued that the bling was created by Neanderthals who must have come into contact with sapiens and were influenced by or traded with them.
- Next 7 pages of the hx of this debate will be in the lesson pdf.

Châtelperronian debates: Hublin vs Zilhao

- Hublin's analysis identified the bone as belonging to a Neanderthal. But rather than reascribe the Châtelperronian industry to Neanderthals, Hublin chalked up his findings to "acculturation": Surely the Neanderthals must have learned how to make this stuff by watching us.
- "To me," says Zilhão, the University of Barcelona archaeologist, "there was a logical shock: If the paradigm forces you to say something like this, there must be something wrong with the paradigm."
- Hublin's conclusions infuriated Zilhão. "Views of the Neanderthals as somehow cognitively handicapped were inconsistent with the empirical evidence," he says.

Zilhão

- Zilhão published a stinging critique challenging the field to shake off its "anti-Neanderthal prejudice." Papers were fired back and forth, igniting what Zilhão calls "a 20-year war" and counting.
- Zilhão conferred with Francesco d'Errico, a prehistory researcher at the University of Bordeaux. D'Errico agreed that Ns had created these ornaments.
- Paul Mellars, convinced of sapiens' ascendancy, declared that Neanderthals were either incapable of art or uninterested in aesthetics. In a confutation oozing with Victorian condescension, he likened the Neanderthals' cognitive talents to those of colonial-era New Guineans: "No one has ever suggested that the copying of airplane forms in New Guinea cargo cults implied a knowledge of aeronautics or international travel."

Zilhão and Trinkaus: Lagar Velho

- Zilhão then met Erik Trinkaus, a fierce advocate of the Assimilation Model, a human origin hypothesis first expressed in the 1980s. The model proposed that Neanderthals and archaic people like them were absorbed through extensive interbreeding.

- In 1998, Zilhão's team made the discovery of the 30 Ka Lagar Velho child in central Portugal. To Zilhão's infinite amazement, the child had a sapiens' prominent chin, tooth size and spinal curvature as well as the stout frame, thick bones and short legs of a Neanderthal.

- Trinkaus concluded that the child was a hybrid. A paper was published in 1999 and a furor followed

- Meanwhile, the oldest *H. sapiens* fossil found in Eurasia — Ust'-Ishim, unearthed in Siberia — is almost 1,000 years younger according to the new conversion curves. "It changes the earliest date we can place on modern humans in central Siberia,"

Peştera cu Oase, Romania, 2003; 37.8 Ka

- Peştera cu Oase = “The Cave with Bones”
- Oase 1 mandible had a recent Neanderthal ancestor, with an estimated 5-11% Neanderthal autosomal DNA. The specimen's 12th chromosome was also 50% Neanderthal
- Oase 1: About 6-9% of the genome is Neanderthal in origin. This is the highest percentage of archaic introgression found in an anatomically modern human; Oase 1 had a relatively-recent Neanderthal ancestor – about four to six generations earlier.
- Oase 2: a MH-N mosaic of derived "modern human" features like projecting chin, no brow ridge, a high and rounded brain case; but also N a large face, a large crest of bone behind the ear and big teeth that get even larger toward the back

Pestera cu Oase: oldest MH in Europe

- Zilhão and Trinkaus labored on. In 2002, cavers found a human mandible in Pestera cu Oase, a bear cave in the Carpathian Mountains of Romania,
- Carbon-dating determined the mandible was 37.8 Ka years old, making it the oldest, directly dated modern human fossil. New Carbon 14 recalibration makes it 100s of years older, so the older the Oase 1 date, the further back Neanderthals were living in Europe
- Like the Lagar Velho child, the find presented a mosaic of early modern human and possible Neanderthal ancestry. Again, a paper was published. Others rejected conclusions. In 2015, DNA analysis showed that the owner of the jawbone had a Neanderthal in his lineage as recently as four generations back.
- J. Hublin: He's especially hard on Zilhão, who he thinks is on a "mission from God" to prove that Neanderthals were the equals of modern humans in every respect. "In other words," says Hublin, "that Neanderthals did not use iPhones, but only because they lived 60,000 years before Apple was created. If not, they would probably run the company today."

Zilhão vs Hublin

- In 2010, Zilhão reported that he had found solid signs that Neanderthals were using mollusk shells in a decorative and symbolic way. Some of the shells found in a Spanish cave were stained with pigment; some were perforated, as if to accommodate a string. Subsequent dating showed them to be 115 Ka, ruling out modern humans.

- Hublin was not swayed. “João thinks he has shells that have been used by Neanderthals in one site in Spain. So where are the other sites where we can find this behavior in Neanderthals? In Africa, there are many sites where we found shells used by sapiens. With Neanderthals there has been just one. To me, that kind of speculation is not science.”

Zilhão vs Hublin

- This complaint elicits a brief response from Zilhão. “Not one site, *two*,” he says.
- Hublin wants representational art as proof of Ns’ artistic ability.
- But must all cave art necessarily be representational? Even 64,800-year-old cave art painted 45,000 years before the UP bison and aurochs of Lascaux?
- Jerry Saltz, the Pulitzer Prize-winning art critic, doesn’t think so. “Neanderthals made art, they had a material culture where they traded stones,”. “They made tools and made them symmetrical—they made them beautiful.”

Game of Thrones: Winter was always coming

- Concerning N history:
- Juan Luiz Arsuaga: “What I have been telling people is that it was like Game of Thrones,", referring to the popular fantasy book and cable television series.
- "There were a few spread-out populations, some related, some not, emigrating or going extinct over time.
- And winter was always coming."

Richard G. Klein, 2003: Whither The Neandertals?

- Historical view of Ns:
- The Neanderthals are the longest known and best understood of all fossil humans.

- Today, 70 sites have several thousand Neanderthal bones

- Most Neanderthal specimens are isolated skeletal elements, especially teeth and jaws, but nearly every part of the skeleton is represented in multiple copies.

- There are also more than 20 partial skeletons from individuals of both sexes and different ages.

R. Klein, Whiter the Neanderthals?, Science, 2003

Klein

- More than 300 N sites have archaeological findings.
- Through a process of natural selection and random genetic drift, they emerged in full-blown form by 130 Ka; (but note that Sima de los Huesos has oldest Ns at 430 Ka via DNA)
-
- From then on, distributed from Spain to southern Russia; by 80,000 years ago, they had extended their range to western Asia.
- They persisted in Europe and western Asia until 50 to 30 Ka.
- The Neanderthals = fascinating but extinct side branch of humanity.

Klein: MH and N shared humanity

- Middle (N) and Upper Paleolithic (MH) people shared many advanced behaviors,
  - refined ability to flake stone,
  - burial of the dead (at least on occasion),
  - Use of naturally occurring mineral pigments,
  - full control over fire,
  - heavy dependence on meat (probably obtained mainly through hunting).

- Both Neanderthal and Cro-Magnon skeletal remains sometimes reveal debilitating disabilities, indicating that both kinds of peoples cared for the old and the sick. There could be no more compelling indication of shared humanity.

Klein: N limits

- MP Ns left little compelling evidence for art or jewelry. (as of 2003)
- Their graves contain nothing to suggest burial ritual or ceremony.
- They produced a much smaller range of readily distinguishable stone tool types; much more rarely crafted artifacts from plastic substances like bone, ivory, shell, or antler; and left no evidence for projectile (as opposed to thrusting) weapons.
- Their cave sites are generally poorer in cultural debris and richer in bones of bears and other cave dwellers (suggesting less dense human populations).

Klein

- Failed to build structures durable enough to leave an archaeological trace, and were confined to relatively mild, temperate latitudes.
- N tools varied little through time and space (Finlayson: why change if it worked perfectly well in your ecological context)
- MHs displaced the Neanderthals about 45,000 years ago in western Asia and only 5000 to 15,000 years later in Europe.
- Neanderthals disappeared much earlier in the far east (Russia) than the far west (Iberia). In most places the Neanderthals disappeared abruptly.

Klein

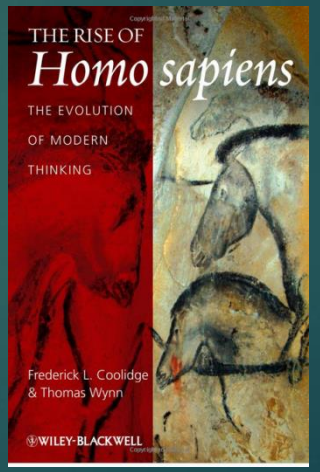
- Fossils show that between 130 to 50 Ka,
  - the African AMH were more modern in anatomy,
  - but archaeology suggests that they closely resembled the Neanderthals in behavior.

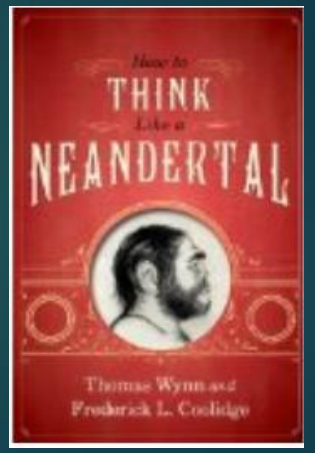
- Klein's classic hypothesis: AMH had a genetic mutational change in brain function about 50,000 years ago which could explain why modern Africans subsequently expanded to Eurasia.

- The longest continuous debate in paleoanthropology is nearing resolution (as of 2003)

Thomas Wynn & F. Coolidge

- Univ. of Colorado; archeologist & neuropsychologist
- T. Wynn helped to found the field of cognitive archeology
- Wynn & Coolidge argue:
  - advanced working memory was core cognitive feature that *distinguished H. sapiens* from *H. neanderthalensis*





N cognition: Importance of Working Memory

- Wynn & Coolidge, 2004: a picture of Neandertal cognition in which expert performance via long-term working memory is the centerpiece of problem solving.

- However, Neandertals' working memory capacity, which is the ability to hold a variety of information in active attention, may not have been as large as that of modern humans.
- This is their theory of why there was a rarity of N innovation
- Hypothesis that Neandertals relied on a form of expert cognition
- *H. neanderthalensis* 's cognition centered primarily on expertise/behavioral memory

Wynn & Coolidge: N cognition: expert cognition, not large working memory

- N mind = less advanced working memory, less theory of mind

- Ns organized their technical activities much like artisans, such as blacksmiths; they relied on “expert” cognition, a form of observational learning and practice acquired through apprenticeship that relies heavily on long-term procedural memory.

- Ns relied more heavily than we do on well-learned procedures of expert cognition.

Thomas Wynn and Frederick L. Coolidge

Wynn & Coolidge: N

- Wynn & Coolidge model of Ns =
  - pragmatic,
  - capable of leaving group members behind if necessary, and
  - stoical, to deal with frequent injuries and lengthy convalescence.
  - He or she had to be risk tolerant for hunting large beasts close up;
  - they needed sympathy and empathy in their care of the injured and dead;
  - and yet were neophobic, dogmatic and xenophobic.

  - CJV: The last point is what drives me crazy about conclusions made in journal articles: explanations with no possible evidence!

2016: The false dichotomy: a refutation of the Neandertal indistinguishability claim

- N Indistinguishability claim: Villa & Roebroeks (2014) and Zilhão (2014): Ns were indistinguishable archaeologically, and thus behaviorally and cognitively, from contemporaneous Homo sapiens.

- These authors state that to hold otherwise is to characterize Neandertals as inferior to H. sapiens, a false dichotomy that excludes the possibility that the two human types simply differed in ways visible to natural selection, including their cognition.

- The cranial differences between these two human types hold implications for cognition and behavior.

Thomas Wynn, K. A. Overmann & Frederick L. Coolidge, 2016

Neandertal indistinguishability claim

- Villa and Zilhão claim that those who believe Neandertals were inferior & *H. sapiens* superior, do so because they are afflicted by "a persistent influence … of Victorian-age ideas of evolution-as-progress and ancient-as-primitive"

- Further, support of the claim requires minimizing asymmetries in the quantity and degree of behavioral differences as attested by the archaeological record.

- They support evidence for cognitive and archaeological differences between the two human types in support of the excluded middle position (Ns were just different cognitively, not inferior).

- A more appropriate solution is to posit a small cognitive difference that had profound long-term consequences" (Wynn & Coolidge, 2004, p. 468), i.e. like working-memory capacity or executive functions

Per Wynn, MHs had Enhanced Working Memory

- Executive functions of working memory are implicated in: analogical reasoning, thought experimentation, contingency planning, levels of intentionality, and Theory of Mind.
- Working-memory capacity varies in extant human populations.

  7+/-2 capacity
- WM and executive functions are both highly correlated and heritable, 75-99 %; and both are both under additive (polygenic) genetic control.

- Enhanced capacity could have been achieved via comparatively simple mutation, epigenetic change, or embodied resources of material culture

Archeological evidence for EWM

- Alloying metals: 5 Ka
- Traps and weirs: hard evidence: 9-12 Ka; implications 20-25 Ka.
- Harpoons: 17 Ka
- Managed foraging: burning, Niah Cave, Borneo 30 Ka
- Abstract artifacts: Hohlen-Stadel Lion-Man; Lartet Plaque (ochre on bone); 30 Ka

Use of Traps as evidence of behavioral modernity

- Methodological challenge for Coolidge and Wynn was to identify archaeological patterns that might reflect an increase in working-memory capacity (enhanced working memory (EWM)).

- One example of the kind of reasoning invoked in the working-memory hypothesis is the use of traps (cognitively requires WM, EF, response inhibition, temporal planning)

- Unfortunately, evidence for use of traps is elusive; direct evidence of traps dates to no earlier than 14 Ka.

- As a consequence, arguments for earlier trap use necessarily rely on the indirect evidence of faunal remains – the presence of large numbers of a species that can only be effectively captured using traps.

Use of Traps as evidence of behavioral modernity

- Wynn & Coolidge's initial review of the archaeological evidence yielded only a single example, one from Niah Cave in Borneo (Barker *et al*., 2007) that dated to between 42 to 28 Ka.

- More recently, Wadley (2010) has made a similar argument for use of traps to capture blue duiker at Sibudu, with a much earlier date of perhaps 65 Ka ago. Also use of fire to alter landscapes, which appeared about the same time at both Niah and in South Africa

Neandertal indistinguishability claim: Conclusion

- Wynn and Coolidge: AMH and Neandertal brains differed, their genes differed, their physiologies and behaviors differed, and their archaeological signatures differed.
- This evidence supports two conclusions: First, Neandertals and AMH differed cognitively; second, these cognitive differences may have played a role in the Neandertal disappearance from the archaeological record and the ultimate success of AMH.
- It is time, as Zilhão (2014) himself noted, to stop labeling differences as implying inferiority and superiority: claiming that it is being argued when it is not serves only to perpetuate the false dichotomy.

MH Superiority Complex
in relation to N abilities

Absence of Evidence does not mean
Evidence of Absence

N characteristics

- Hunter-gatherer societies
- Survived in recurrent colder environments for 400 K years
- Climatic cycles resulted in:
  - population crashes with genetic drift,
  - lower genetic diversity,
  - founder effects
  - All playing a significant role in their smaller populations

Modern Human competitive advantages

- Classic proposed modern human competitive advantages include demographic and subsistence factors, such as:
  - larger group sizes,
  - slightly higher birth rates,
  - lower mortality rates,
  - shorter interbirth spacing,
  - greater dietary diversity,
  - more complex social networks,
  - better clothing and shelter

Zubrow 1989; Skinner 1997; Flores 1998; Gat 1999; Richards et al. 2001; Stringer et al. 2003; Hockett and Haws 2005

Supposed MH superior qualities

- Theories about MH superiority in a wide range of domains, either in Africa and/or upon arrival of *Homo sapiens* in the Neandertal geographical ranges. These include:
  - inventiveness and capacity for innovation,
  - complex symbolic and linguistic abilities,
  - more efficient hunting strategies,
  - exploitation of a broader range of resources including plants and aquatic ones,
  - projectile technology, heat treatment of lithic raw materials, hafting technology,

Supposed MH superior qualities

- Superior planning capacities
- larger scale social networks as shown by large transport distances of raw materials,
- environmental flexibility,
- Better memory capacity,
- larger population sizes.

- Inferiority in one or more of these domains has been at the core of many explanations for the demise of the Neandertals.

- Note that these capacities were exclusive manifestations of the later western Eurasian Upper Paleolithic

Procedural/Behavioral Memory

- Remember Wynn & Coolidge: N cognition = procedural memory

- Procedural skill: skills, by definition, refer to something one can acquire, learn, practice, and improve, and as such they come on line in routine way;
- EF (panning, problem solving) does not come on line in situations in which behavior can rely on learned, routine, or automatic responses; only in novel situations.
- The better practiced a skill is, the less reflective of EF it actually is.
- You can only test EF with an unknown proverb, otherwise you are testing memory ability, not EF
- (Golden hammer breaks iron door)

Coming Up Next:
Example of Behavioral Memory

- Typewriting skills are behavioral memory

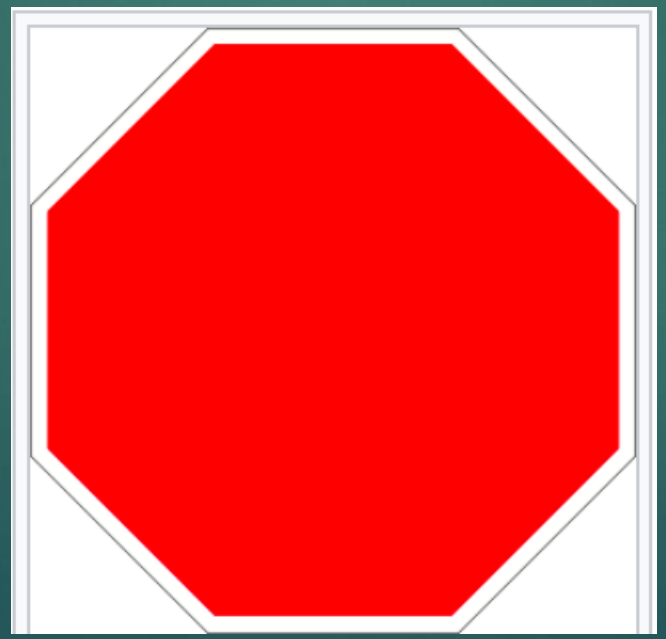
- CJV:

Typewriter that
I learned to type
on in first year of
high school in 1958

Behavioral Memory

Symbol

- A **symbol** is a mark, sign, or word that indicates, signifies, or is understood as representing an idea, object, or relationship
- Greek: “outward sign”, “to throw together”;
- Definition in 1590 AD: “something which stands for something else”



Definition of Symbolism

- Great review article: Archaeological Evidence for the Emergence of Language, Symbolism, and Music—An Alternative Multidisciplinary Perspective, F. d'Errico, C. Henshilwood, et al., 2003:
- They never define what "symbolic" means!!
- Symbolic thinking—the capacity to attribute specific meaning to conventional signs

1. a mark or character used as a conventional representation of an object, function, or process, e.g. the letter or letters standing for a chemical element or a character in musical notation.

2. a thing that represents or stands for something else, especially a material object representing something abstract.

Behavioral modernity

- **Behavioral modernity** is a suite of behavioral and cognitive traits that is claimed to distinguish current *Homo sapiens* from other anatomically modern humans, hominins, and primates.
- Most scholars agree that modern human behavior indicate presence of:
  - abstract thinking
  - planning ability
  - symbolic behavior (e.g., art, ornamentation),

Archeological evidence of modern behavior

- Paul Mellars, 1991: features of transition from MP Ns to UP MHs in Europe:
  - Stone tools: flakes to blades, more standardization
  - Increase in the variety and complexity of tools
  - Tools made of bone, antler and ivory
  - Increase in regional variety of tools
  - Appearance of beads, pendants, & other ornaments
  - Naturalistic art
  - Changes in economic and social organization
  - Hunting of particular animals
  - Increase in population size
  - Structured settlements with huts, tents

Traits of Modern Human Behavior

- Archaeologists have been nearly universally agreed that the Upper Palaeolithic of southwestern France was the archaeological yardstick for "behavioral modernity"
- Neanderthals made the Middle Palaeolithic Mousterian artifacts and *H. sapiens* made the Upper Palaeolithic "symbolic" artifacts.
- "Modern behavior" trait list was not really suitable for tropical Africa; unclear which African species to attribute the MSA toolkits
- 'Modern' behavior has always been a very particular version of how we like to think of ourselves. But we judge Ns by it.

2003: Traits Used to Identify Modern Human Behavior

- Applied to Africa:
- Burial of the dead as an indicator of ritual; grave goods
- Art, ornamentation, and decoration; representational art; figurative art (cave paintings, petroglyphs, dendroglyphs, figurines); jewelry; shells routinely drilled and strung as necklaces; utilitarian objects that are incised and decorated
- Symbolic use of pigment (such as ochre) and jewelry for decoration or self-ornamentation
- Worked bone and antler
- Blade technology
- Standardization of artifact types
- Artifact diversity
- Musical instruments

C. S. Henshilwood & C. W. Marean, 2003

Traits Used to Identify Modern Human Behavior

- Complex hearth construction
- Sites made or modified for ritual activities
- Composite tools
- Organized use of domestic space
- Expanded exchange networks
- Transport of resources over long distances
- Effective large-mammal exploitation
- Seasonally focused mobility strategies; Klg of seasonal food resources
- Use of harsh environments (deserts, high altitudes)
- Fishing and fowling

Claim that there was little or no evidence in European Mousterian for:

Procurement of raw materials over long distances (except in places with no stone at all) or mining
Projectile technology
Bladelets
Beads, clear geomatic designs
Burials with grave goods (implying rituals. beliefs)

- MHs in UP had social networks; procured material form 100s of kms away

- MHs: Projectile technology based on bladelets (less than 2.5 cm long, produced on a core intended to make a bladelet = a destination not an accident) in MHs; Ns just had accidents and occasionally produced bladelets

Critiques of trait lists for modernity

- Christopher S. Henshilwood (2003): Trait lists:
  - (1) Many are empirically derived from and context-specific to the richer European record, rendering them problematic for use in the primarily tropical and subtropical African continent.
  - (2) They are ambiguous because other processes can be invoked, often with greater parsimony, to explain their character.
  - (3) Many lack theoretical justification.

  - In addition, there are severe taphonomic problems in the application of these test implications across differing spans of time

- "Sapient Paradox": If so smart, why the gap of 30 K between MH arrival in Europe and first agriculture?

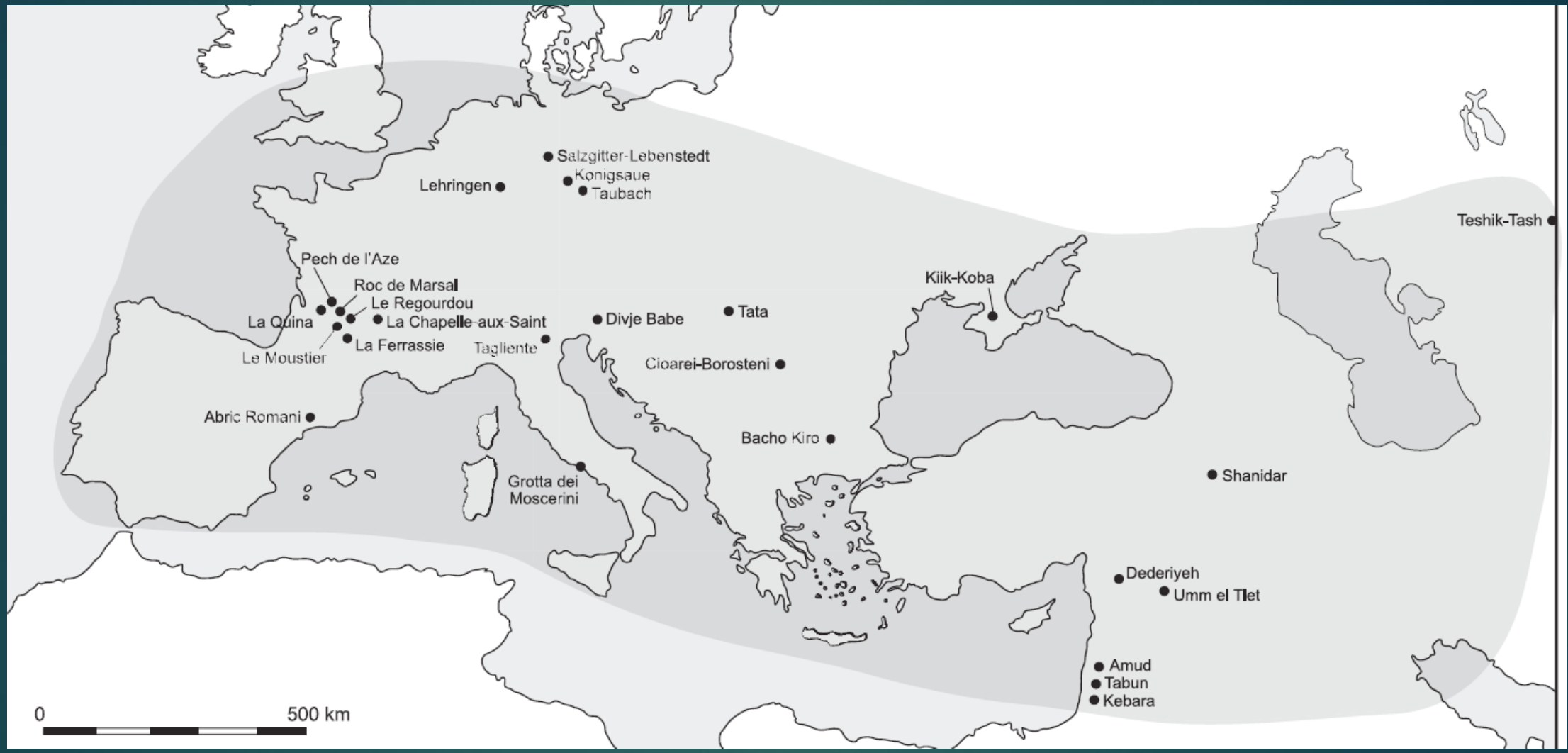
- Neandertal Paradox: If Ns were cognitively inferior, how did they survive in harsh climates of Eurasia for 300 K and why did it take MHs so long to colonize Eurasia, when they had colonized the East by 80 to 65 K?. Finlayson believes in Fortress Europe: Ns kept them out

Behavioral complexity

- Definition of complex behavior as that which requires successive cognitive components that demand the actor to plan several consecutive steps before the execution of the first step, or which require deep understanding of the operation of variables and their complex interplay as well as their reactions to deliberate manipulations by the actor.
- Symbolism is more difficult to define archaeologically. There is general consensus on what manifestations should represent symbolism in the archaeological record. These objects include figurative art, notational pieces, use of pigments, ornamentation, burials, body modification, multi-component tools, multi-step processing (d'Errico *et al*. 2003; McBrearty & Brooks 2000; Mellars 2005).

M. Langley, et al., 2008

Locations of archeological evidence of N behavioral complexity



Symbolic or complex behavior associated with Neanderthals between 160 and 40 Ka

Behavioural Complexity in Eurasian Neanderthal Populations, Langley, et al., 2008

- Study: 49 examples of symbolic and complex behavior were recognized, consisting of over 30 archaeological features and more than 300 individual artefacts from 30 sites from western and central Europe and western Asia

- Conclusions: a single, directional increase in the archaeological record of behavioral complexity among Neanderthals through time that cannot easily be dismissed as the result of differential preservation or changing population size.

- There was a significant increase in the archaeological signal of behavioral complexity and symbolic expression in the lead up to the Châtelperronian

60-40 Ka

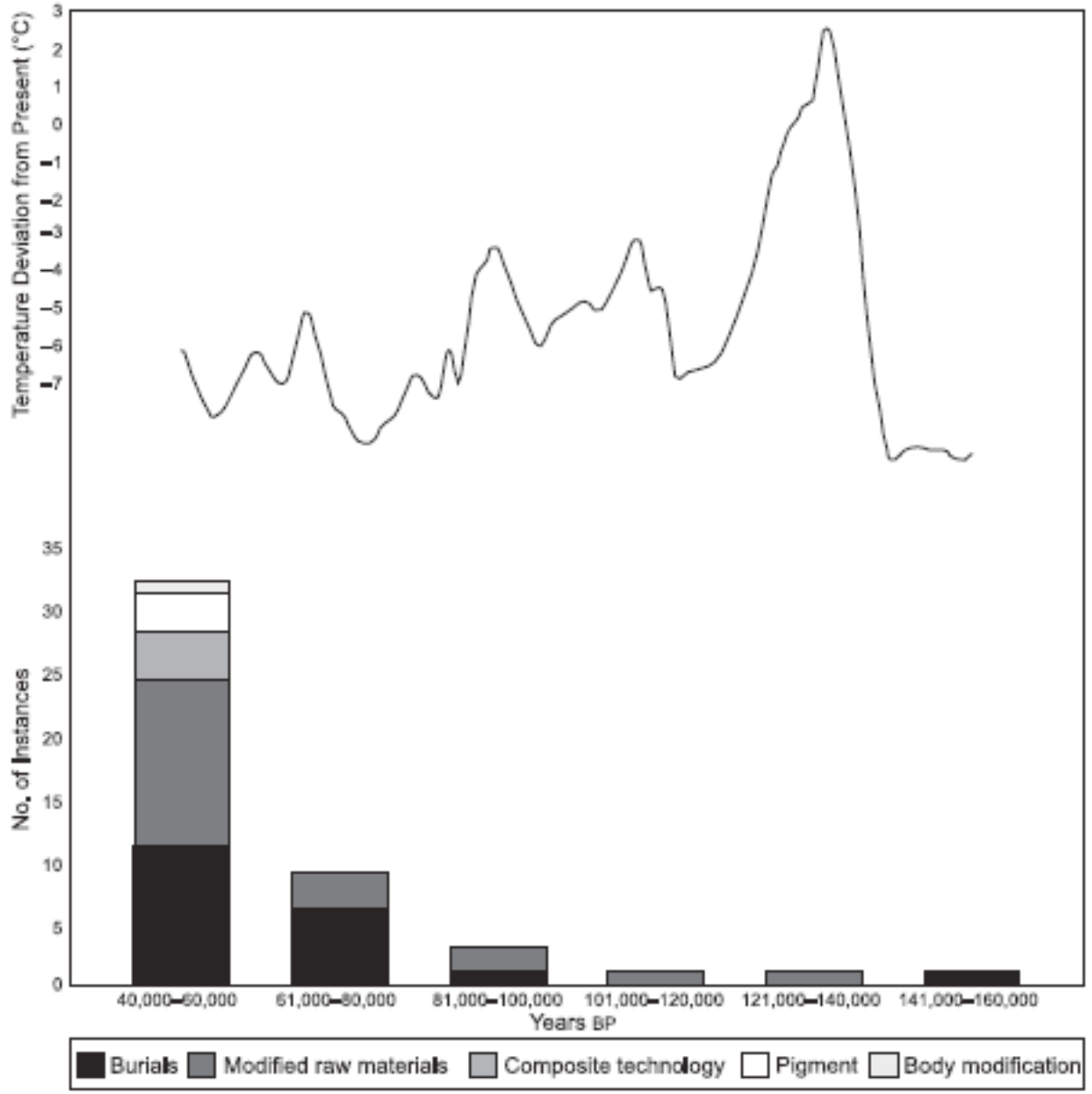


Figure 2. *Occurrence of symbolic and complex behavioural instances in the Neanderthal archaeological record between 160,000 and 40,000 years ago as against OIS curve (Mellars 1996).*

160-140 Ka

Earliest N complex behavior

- 150 Ka, Tabun, burials, first example in the archaeological record
- 120-125 Ka, modified raw materials such as a wooden spear point from Lehringen & incised bone artefact from Taubach
- 100 Ka, The modified fossil nummulite from Tata and residue and use-wear evidence for bone and wood working from La Quina
- 100 Ka, bone and wooden artefacts exhibiting intentional modification from Budzujeni, Salzgitter-Lebenstedt, Pech de l'Aze I and Abric Romani.
- 60-55 Ka, Pigment and composite technology first appear in the Neanderthal archaeological record in the form of both pigment crayons and artefacts exhibiting pigment stains from Pech de l'Aze I and Cioarei-Borosteni, along with the Levallois point found embedded in the vertebrae of a wild ass at Umm el Tlet.
- 46 Ka, The single instance of body modification, represented by Shanidar 1 and 5 (cranial deformation)

Jump in N encephalization after 100 Ka

- If we compare mean cranial capacity through time for Eurasian and African lineages, there are no real differences in expansion rates of brain size
- There is one exception: in the period from c. 200–100 ka, Neanderthal mean cranial capacity (1,306 cc) fell below the African mean (1,445 cc).
- Otherwise, Neanderthal cranial capacities maintain parity with those of African lineage. This implies Neanderthals had a late burst of encephalization after c. 100 ka, taking them to a mean over 1,500 cc between 70 and 40 ka.

Many of Ns greatest advances occurred after 60K

- Burials increased (have more N bones from this period)
- Increased distance that they transported stone to make tools
- Use of feathers for ornamentation
- Experimentation with more colors & started perforating shells

Africa: Human Revolution? Was it sudden at 50 Ka?

MH behavioral modernity: R. Klein

- "The Leap", 1995, R. Klein:
- The Later Upper Paleolithic Model theory that modern human behavior arose through cognitive, genetic changes abruptly around ~50,000 years ago:
- stressed a punctuated emergence of "modern human behavior" via a neural mutation thought to have promoted the final development of the modern human brain.
- Not by an increase in brain size but by a sudden increase in brain quality that created ability to innovate and language ability; expansion out of Africa
- Counter: No evidence for genetic change; humans left Africa many times before 50 Ka; untestable hypothesis

MH behavioral modernity: McBrearty & Brooks

- 2000, Sally McBrearty and Alison S. Brooks:
- proponents of gradualism, forcefully arguing that the components of this “Upper Paleolithic revolution” were already visible in the African MSA, beginning at 100 Ka.
- They suggested a gradual assembling of a package of modern human behavior in Africa, which was later exported to other regions of the Old World.
- According to McBrearty and Brooks, there are four features that are characteristic of modern human behavior: abstract thinking, the ability to plan and strategize, "behavioral, economic and technological innovativeness," and symbolic behavior

Evidence of “Modern Behavior” Before the leap

- Hypothesis of an origin of symbolism earlier than that of the Middle–Upper Paleolithic transition in Europe (d’Errico *et al*., 2001; d’Errico and Nowell, 2000; Henshilwood *et al*., 2001a,b, 2002; McBrearty and Brooks, 2000).

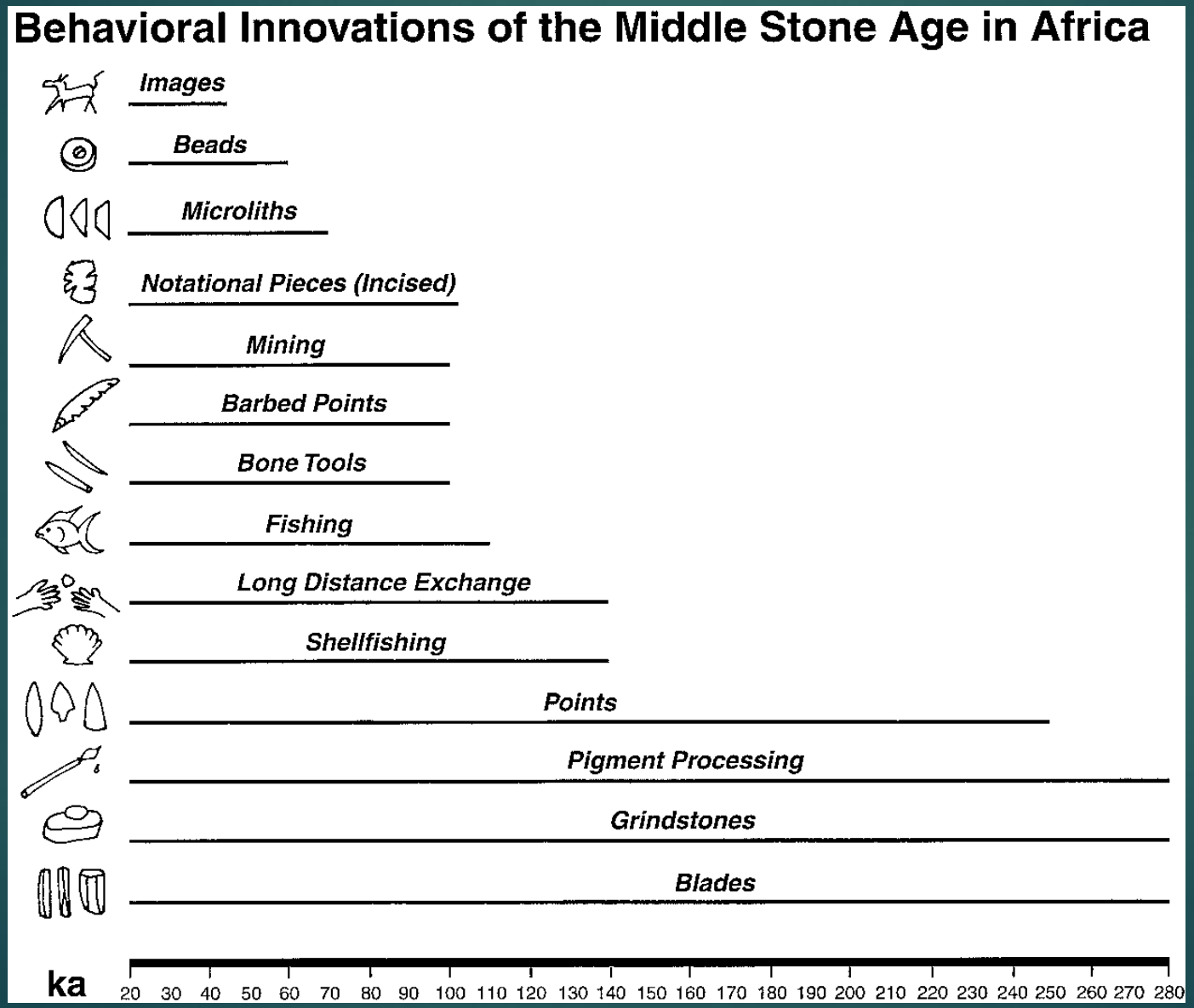
- Near East archaeological record reveals striking behavioral similarities between Neandertals and AMHs (Bar-Yosef, 1992; Shea, 2001), making it presumptuous to assume dramatic differences in their cognitive abilities.

- Sites of in Zambia and Kenya (McBrearty, 2001) have yielded convincing proof of the symbolic use of pigments during the Acheulean–Middle Stone Age transition (ca. 200,000 years ago).

McBrearty & Brooks (2000) The revolution that wasn't *JHE,* 39, 453–563

280-20 Ka
In Africa

Images not until 40 ka, same as in Europe



- Increasing innovation rates, no abrupt change:
- Bladelets old;
- balls of ochre, under a tuff dated to 340 K in Kenya;
- hafted points, 235-260 K, long before found in Mousterian;
- long distance exchange has old antiquity in Africa;
- exotic stone all over place after 500-400 K, not there in Acheulean;
- No moment of sudden revolution

CJV: The evidence for Neanderthal equivalency

- The following is CJV's compilation of known N discoveries that point to a stronger equivalency between MHs and Ns behavioral and cognitive capabilities.

- Both Homo sapiens and Homo neanderthalensis existed for more than 500 thousand years, post their divergence from their LCA.

- Many of the MH capacities that look superior to N's came late in their career, after 75 Ka; similar to the timing of more complex behaviors in Ns. They were on similar cognitive trajectories.

CJV: The evidence for Neanderthal equivalency

- My suspicion is that, if Ns had existed for another 30 K, their behavioral and cognitive complexity would have perfectly equaled those of MH's.

- This growing body of evidence creates a more dynamic image of Neandertal cultures and challenges the idea that they were essentially static, closed to innovation and without symbolic imaging.

CJV: The evidence for Neanderthal equivalency

- Neandertals began to produce a richer archaeological record, including bone tools, personal ornaments and use of manganese and ochre, at the time when AMH started colonizing Europe.

- Some interpreted this change in the record as the result of Neandertal absorption of ideas and techniques from the incoming AMH.

- However, as will be reviewed here, use of ochre, of personal ornaments, production of specialized bone tools and complex hafting techniques were part of the Neandertal repertoire before the arrival of AMH in western Eurasia.

Modern behavior disappeared and reappeared

- During the period between 160 ka and 20 Ka complex technologies, adaptation to hostile environments, engravings, pigments, personal ornaments, formal bone tools and burial practices apparently appear, disappear and reappear in different forms, suggesting major discontinuities in cultural transmission.
- The discontinuous nature in time and space of this process indicate that local conditions must have played a role in the emergence, diffusion and the eventual disappearance or continuity of crucial innovations in different regions.
- These local conditions must have been closely linked to the size and organization of cultural systems and ecological settings in which these populations evolved, and sometimes probably disappeared.
- Type of cognition does not explain these changes.

Role of demography in innovation

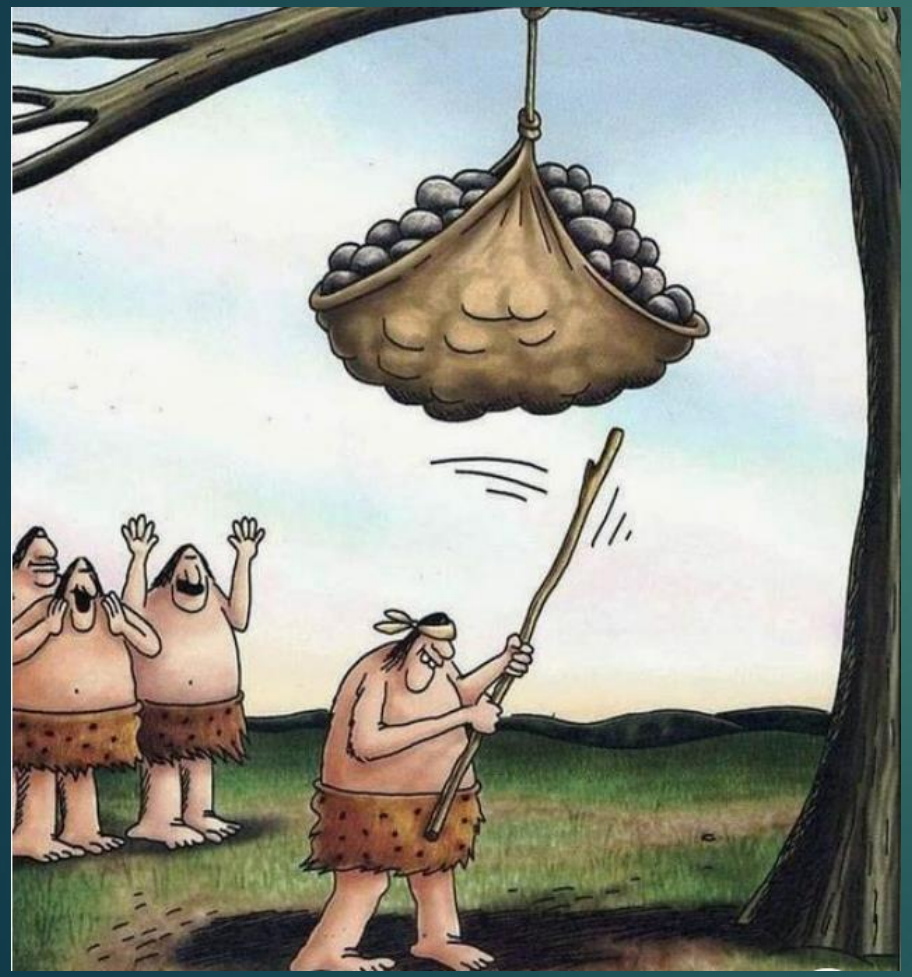
- There is Important role of demography in the emergence and loss of cultural innovations through modelling.
- You need a large enough population size for social learning of technological and cultural innovation to spread.
- Powell et al. reach the conclusion that the number and size of subpopulations and the degree of interaction between them are key factors in the emergence, maintenance, spread and loss of innovations.
- They speculate that population size in Africa could have reached a critical threshold about 100 Ka, when population density and enhanced contact between groups could have allowed the rate of accumulation of innovations to significantly overtake their loss.

Equivalency of N capabilities

A growing body of evidence creates a more dynamic image of Neandertal cultures and challenges the idea that they were essentially static, closed to innovation and without symbolic ability.

Could Ns chew gum and talk at same time? – John Smith

Early pinatas



- Ns have historically been disparaged based on very little evidence
- What does current archeological evidence indicate?
- Were Ns cognitively challenged or cognitively similar to us?

N Record: View the whole picture, the accumulation of evidence

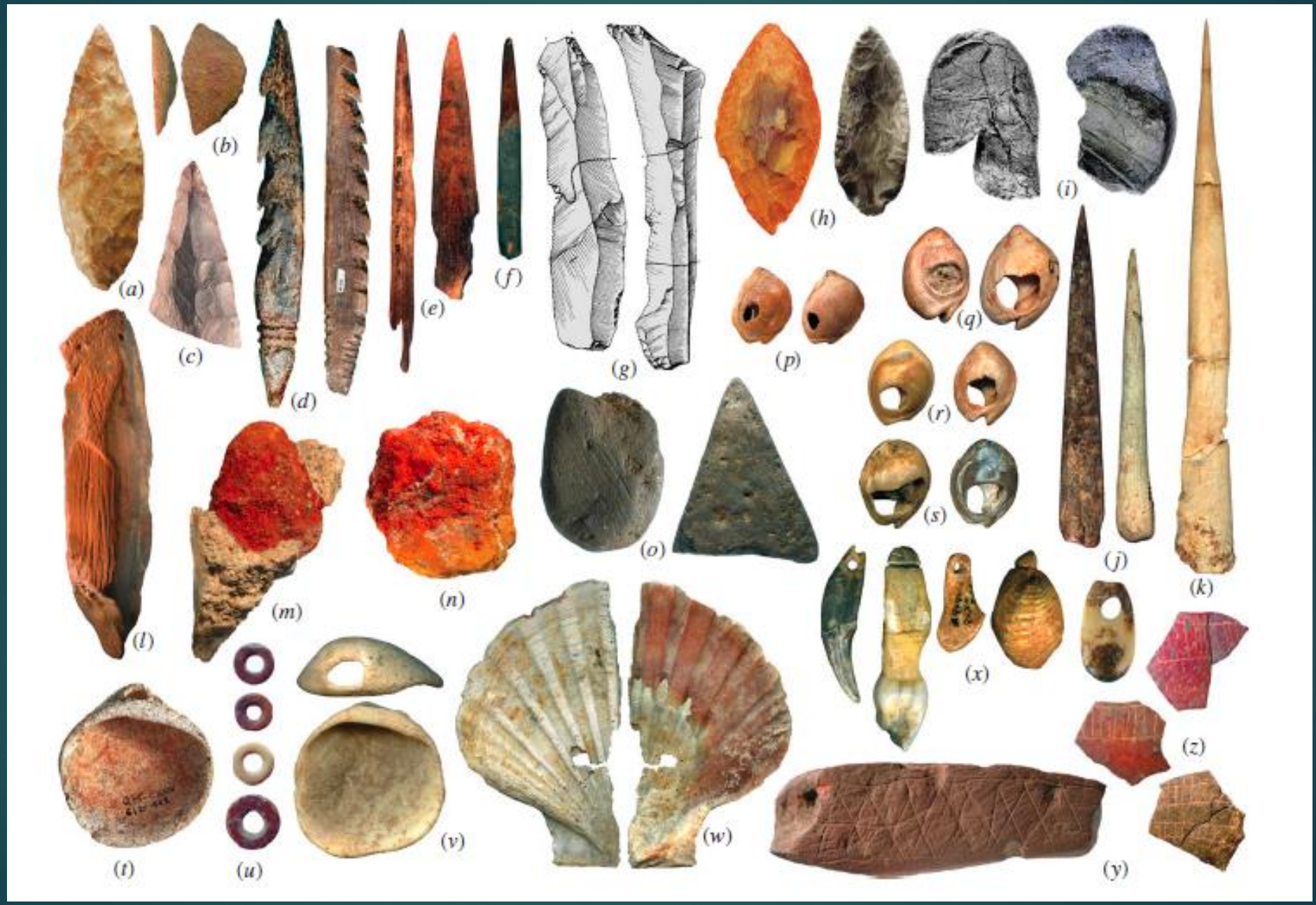
- Behavioural Complexity in Eurasian Neanderthal Populations: a Chronological Examination of the Archaeological Evidence, Michelle C. Langley, et al., 2008:

- "The number and diversity of complex Neanderthal behaviors increases between 160 to 40 Ka.
- Whether this pattern derives from preservation factors, the evolution of cognitive and behavioral complexity, cumulative learning, or population size is unclear.
- We take the view that it is not the apparent sophistication of a single specific item, nor the presence or absence of particular types in the archaeological record that is important.
- Instead, we believe that it is the overall abundance of artefacts and features indicative of complex behaviors within the Neanderthal archaeological record as a whole that should provide the mark of Neanderthal capabilities and cultural evolutionary potential."

Which items are MH and which are N?

MH:
a-f

MH:
l-u



N:
g-k

N:
v-x

MH:
y-z

MH modernity

- In 2003 D'Errico reviewed the cultural attributes which McBrearty and Brooks saw as defining modernity.
- He argued that comparable traits also occur in the Neandertal record and rejected the theory that behavioral "modernity" indicators are uniquely associated with *Homo sapiens*.
- Many historically known modern human societies either lacked a consistent number of these modern features or, while displaying them, would have left little archeological evidence of them behind for recognition by future archaeologists.
- Example of Ns lacking evidence of representational art: many current human societies of the historical and ethnographic present lack it

Difficulty in interpreting differences in archeological evidence

- Recent differences in MH archeological record:
- Consider Native Americans (spears) vs Europeans (guns) circa 1492
- Consider current Amazonian aboriginals (spears) vs urban Brazil (cars)
- Consider Hadza hunter gathers (arrows) vs urban South Africans (TVs)
- Consider rural Pakistan (clay stove) vs modern New York City (iPhones)

- Would archeological findings in 1000 years produce conclusion that second groups above were cognitively and behaviorally superior compared to first groups (despite both being MHs)?

Native Americans as a parallel

- We have only to look to the widespread destruction of indigenous cultures by Europeans in recent times to find parallels for technologically and organizationally — but not cognitively — more complex societies rapidly overwhelming indigenous peoples with usually disastrous effects.

A comparison: Aboriginal AMH & Neandertals

- Tasmanian Aboriginal stone technology is similar to the European Middle Paleolithic, but lacks its stone points and Levallois technology, and is mainly composed of multi- and single platform cores, primary flakes, retouched flakes and various sized scrapers. In contrast to the Neandertal Middle Paleolithic record, there is also no direct archeological evidence of hafting or the use of resins or mastics for gluing.
- The Tasmanian Pleistocene record does not have blades, microliths, hafted bone tools, and carved bone ornaments, no stone lined-hearths and strict spatial organization of activities, and there is little if any technological change occurring for at least 25,000 years.
- Nonetheless, the first Tasmanians were AMH, as were all occupants of Sahul. What these records clearly show is that the models used to describe human groups as either ‘archaic’ or ‘modern’ are flawed.

“extinct” like *T. rex* or “extinct” like Tasmanians?

At the time of British settlement in 1803 there were an estimated 4000 to 7000 Indigenous **Tasmanians**, by 1847 there were just 147. While some mixed-race communities endured, the last full-blooded Tasmanian, Truganini, died in Hobart in 1876.

In anatomy, language, and culture Neandertals are gone, Tasmanians are gone, but they were both human populations with descendants in human populations today, meaning they were among our ancestors.

Review of N and MH similarities and differences

- In my following review of N capabilities , I highlight the hypotheses outlined by P. Villa and W. Roebroeks 2014 article: Neandertal Demise: An Archaeological Analysis of the Modern Human Superiority Complex

- They focus on the premise that prior researchers have used, in their analysis of MH and N archeological evidence, the hypothesis of a "Modern Human Superiority Complex" leading to demise of Ns

Review of N and MH similarities and differences

- I will focus on their conclusions related, not to N demise, but on N cognitive and behavioral equivalency; that, in fact, MHs were not cognitively superior

- But recall that Wynn and Coolidge appeal for an alternative from their perspective: that MH and Ns were in fact cognitively different, but not inferior

Neandertal demise: MH Superiority Complex

- Villa P, Roebroeks W (2014) *Neandertal Demise: An Archaeological Analysis of the Modern Human Superiority Complex*. PLoS ONE 9(4)

- Modern humans in the MP and early UP are usually hypothesized as being superior to Ns in a wide range of domains,

- Their systematic review of the archaeological records of Ns and MH contemporaries finds no support for such an interpretation.

Paola Villa, Wil Roebroeks, 2014 See also **Neandertals revised -** Wil Roebroeks& Marie Soressi, 2016

N Demise: Superiority of MHS caused N demise

- Virtually all explanations for the disappearance of the Neandertals from the Eurasian record point in one way or another to the arrival of *Homo sapiens*, anatomically modern humans (AMH), in Europe and western Asia

- The disappearance of the Neandertals is routinely explained
  - in terms of the "superiority" of modern humans,
  - who had developed in Africa complex cultural traditions
  - Due to superior cognitive capacities which allowed them to expand globally and replace all other hominins

Nine MH Superiority Complex hypotheses

- 1. Ns did not have “complex symbolic communication systems” and “fully syntactic language”, while AMH did.
- 2 Neandertals had limited capacity for innovations.
- 3. Neandertals were less efficient hunters.
- 4. Neandertal weaponry was inferior to AMH projectile technology.
- 5. Neandertals had a narrow diet, unsuccessful in competition with AMH with their more diverse diets.

MH Superiority Complex hypotheses

- 6. Ns did not use of traps and snares to capture animals
- 7. Ns had smaller social networks.
- 8. Ns had smaller regional populations when AMH entered Neandertal territory
- 9. Hafting by AMH required complex procedures indicative of modern cognition, while Neandertals hafting was a simple procedure using naturally available glues.

Modern Human Superiority?: ** N had no symbolic ability

- P. Villa and W. Roebroeks believe that none of their 9 hypothesis regarding MH superiority are supported by adequate archaeological data.

- There was no significant differences between the African MSA data used to support MH superior cognition and the later Middle Paleolithic record of N behavior.

J. Hawks: N vs MH modern behavior activity comparison

- ~100 Ka and after: N sites and activities are similar to MSA MH in Africa
- Similar spatial organization in home sites
- Similar transport of material (but African MHs longer distances, i.e. obsidian in Ethiopia)
- Use of grains: In Africa, 80 Ka, storage of grains; Ns were using grains 100 Ka
- Use of shells: MHs = Blombos, S Africa, 75 Ka & Qafzeh Cave in Israel, circa 92 Ka; and Skhul Cave; and Ns circa 100 Ka
- Pigments: In Europe, Ns at 200 K and esp. at 50 Ka; in Africa, 80 Ka

- Some of these cultural developments persisted and some did not

** Hypothesis 1: A. Language

- Hypothesis 1 - AMH had “complex symbolic communication systems” and “fully syntactic language”, while Neandertals did not.

- Any successful evolutionary primate species has a successful system for communication
- While recent MHs have syntactic language, it is a hypothesis that ancient MHs had same type of language.
- This hypothesis has no archeological evidence
- No archeological evidence of “syntactic language” (except 1?)
- No current scientific method to prove this hypothesis

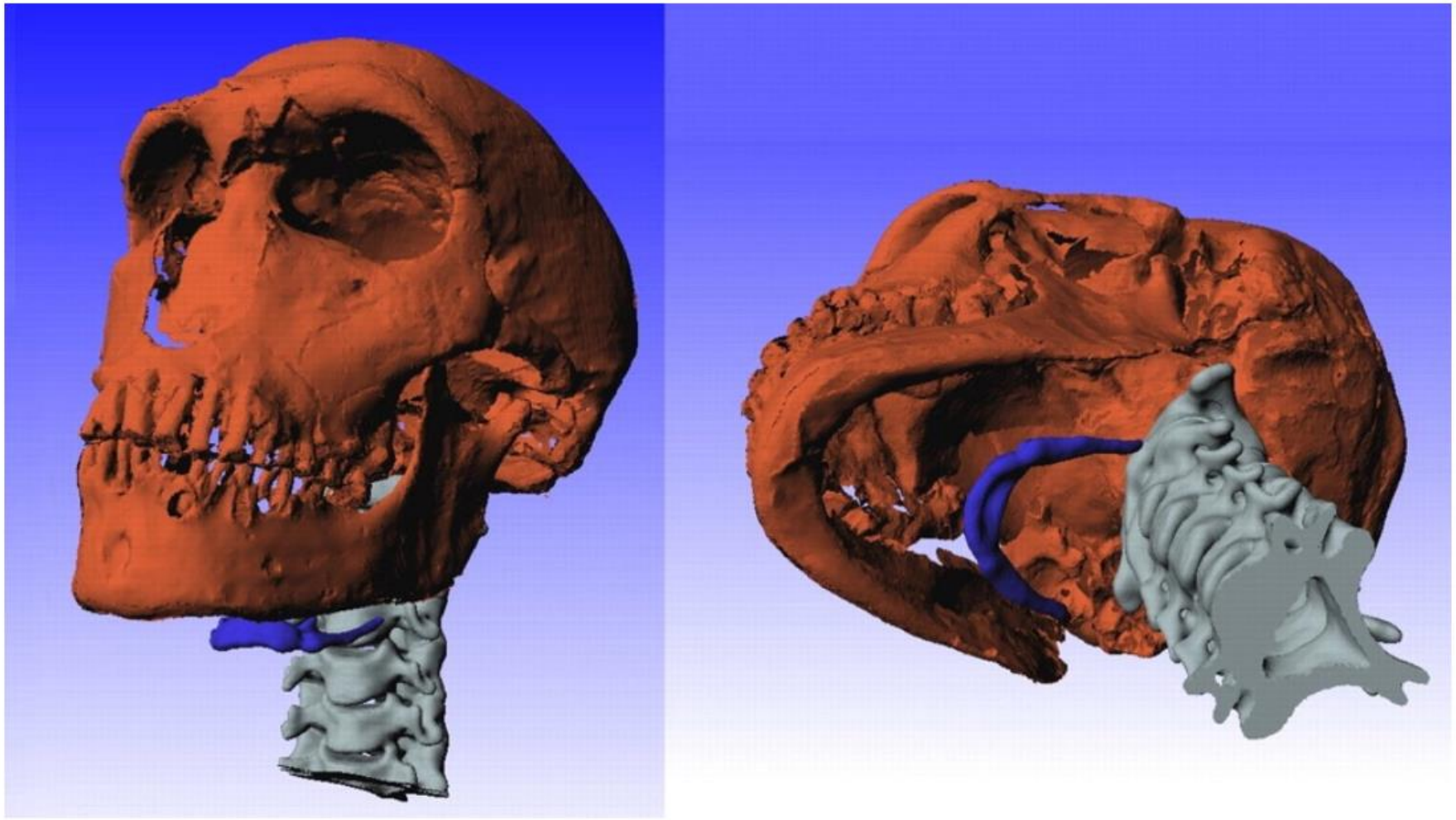
Ns had language

- Ns almost certainly used some form of spoken language.
- A hyoid bone found at the Kebara site in Israel appears fully modern. Shape and position of hyoid bone was adequate for speech
- N vocal tract was like ours, capable of making the same sounds we make.
- Location of their tracheal anatomy suggests that they were capable of language and probably had high-pitched, raspy voices, like Julia Child.
- Ns had FOXP2 language gene (required for MH speech capacity): it increases the expression of 61 genes and decreases the expression of 51 genes compared with the chimp version. Significant in brain development; severe articulation and language disorder if missing

Kebara hyoid bone: Neandertal speech/language?

- Whether or not Neandertals possessed the ability to speak is a question that incites more furious debates than those on Neandertal burials.
- This hyoid bone is identical to ours, thus suggesting that the Neandertals shared our capacity for language.

N hyoid bone: holds up the tongue, which sits above **it**, and **it** holds up the larynx,



Models based on CT scans show where the Neanderthal hyoid (blue) likely sat.

Language and tool making

- Neanderthal brains had a well-developed Broca's area (as did prior Homo);
- FMRI studies: This area is involved in both tool making ability and expressive language ability

- Study: Language seems to be a precondition for the transmission of elaborate lithic technologies:
  - Study: novices were systematically taught the simple Oldowan technology under five different conditions (reverse engineering, emulation, basic teaching, gestural teaching and spoken teaching)
  - Conclusion: Full linguistic teaching led to the most efficient technique and good tools, followed by gestural teaching.
  - Their technology and hunting tactics would have been difficult to learn and execute without language.

N language and toolmaking

- R. Dunbar: Sociality & language increased brain size in *Homo*; suspects complex speech at 500 Ka (starting with *H. heidelbergensis*)

- If one considers all of the cultural skills needed to survive in ecologies from the Arctic to game-poor Mediterranean shore regions, it is difficult to argue that Neanderthals lacked complex linguistic codes, capable of communicating about spatial locations, hunting and gathering, fauna and flora, social relations, technologies, and so on.

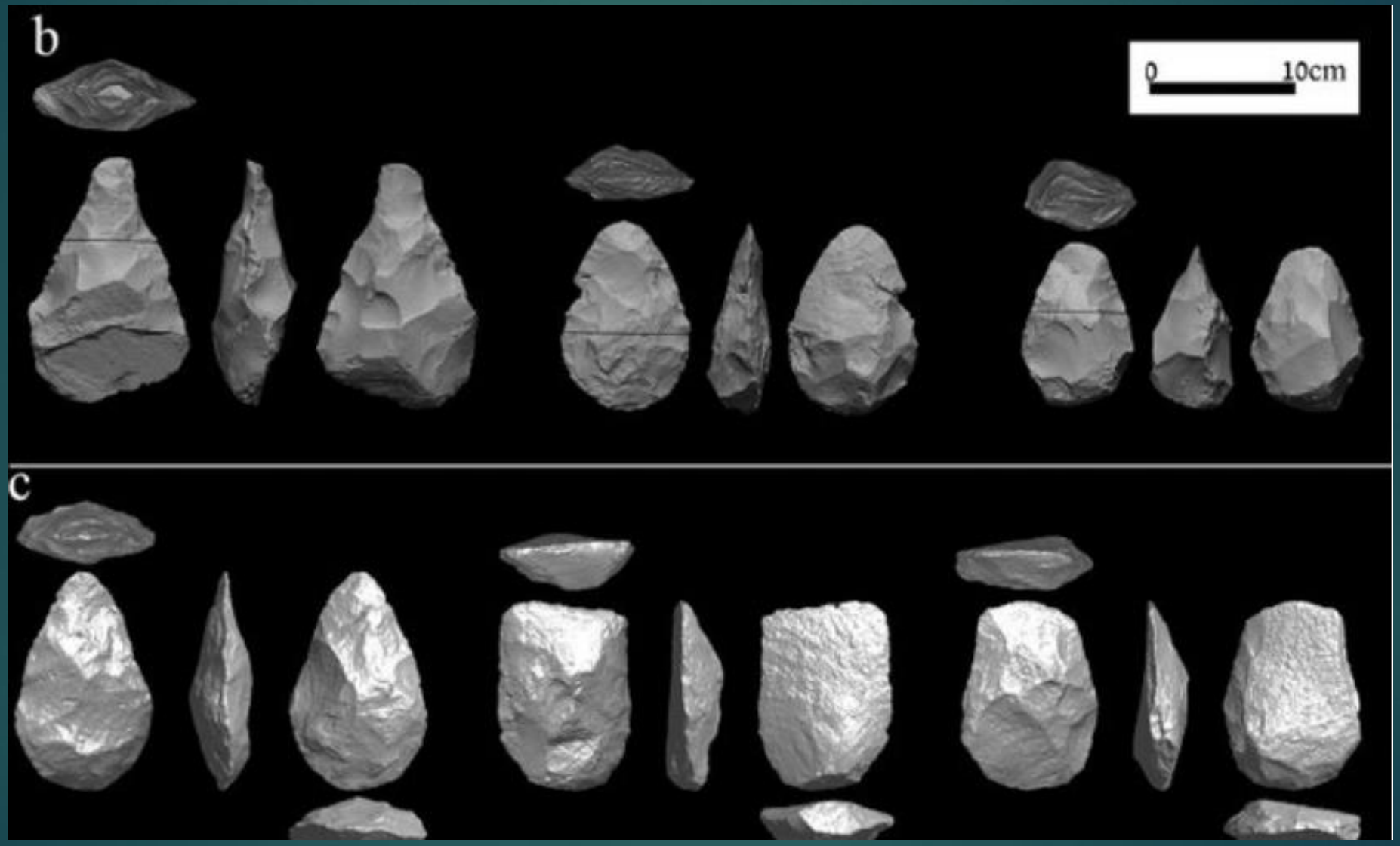
- Granting Neanderthals advanced language capacities seems eventually to be inevitable

- The fact that we have assumed they did not have complex language seems presumptuous.

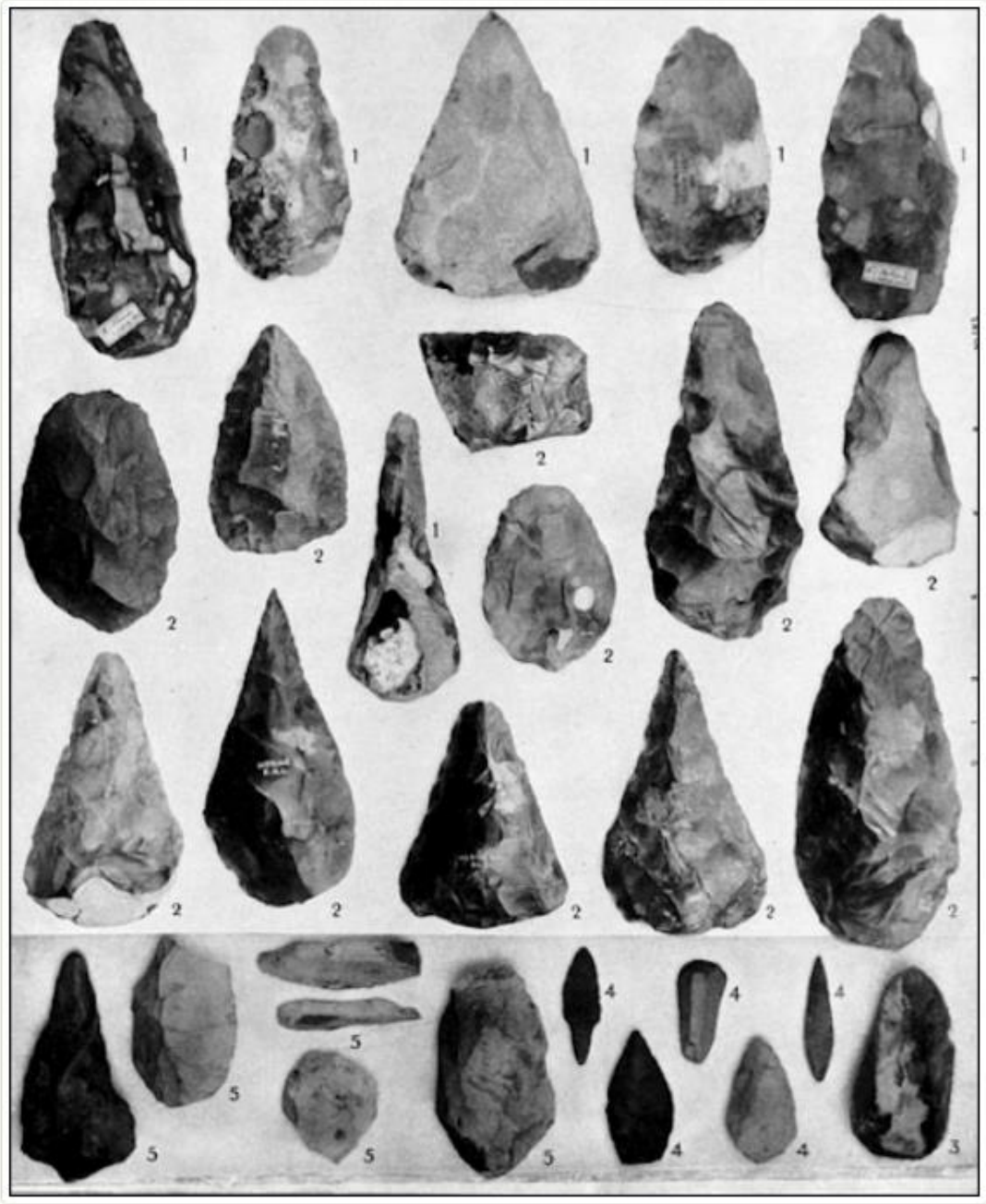
** B. Nature of N innovation

- Neandertals had limited capacity for innovations. AMH had faster innovation in time and space
- Lack of change in Mousterian tools for 250 K cited vs Ns
- Usually noted “proof” for MH innovation:
  - South African lithic toolkit: MH Still Bay (SB) at 71 Ka and the Howiesons Poort (HP) technologies; 66 to 60 Ka
  - engraved pieces of ochre from Blombos Cave,
  - Perforated Nassarius shells from the same location,
  - heated silcrete artefacts from the site of Pinnacle Point

Acheulean lithics: *Homo erectus*, lasted for 1.5 M years

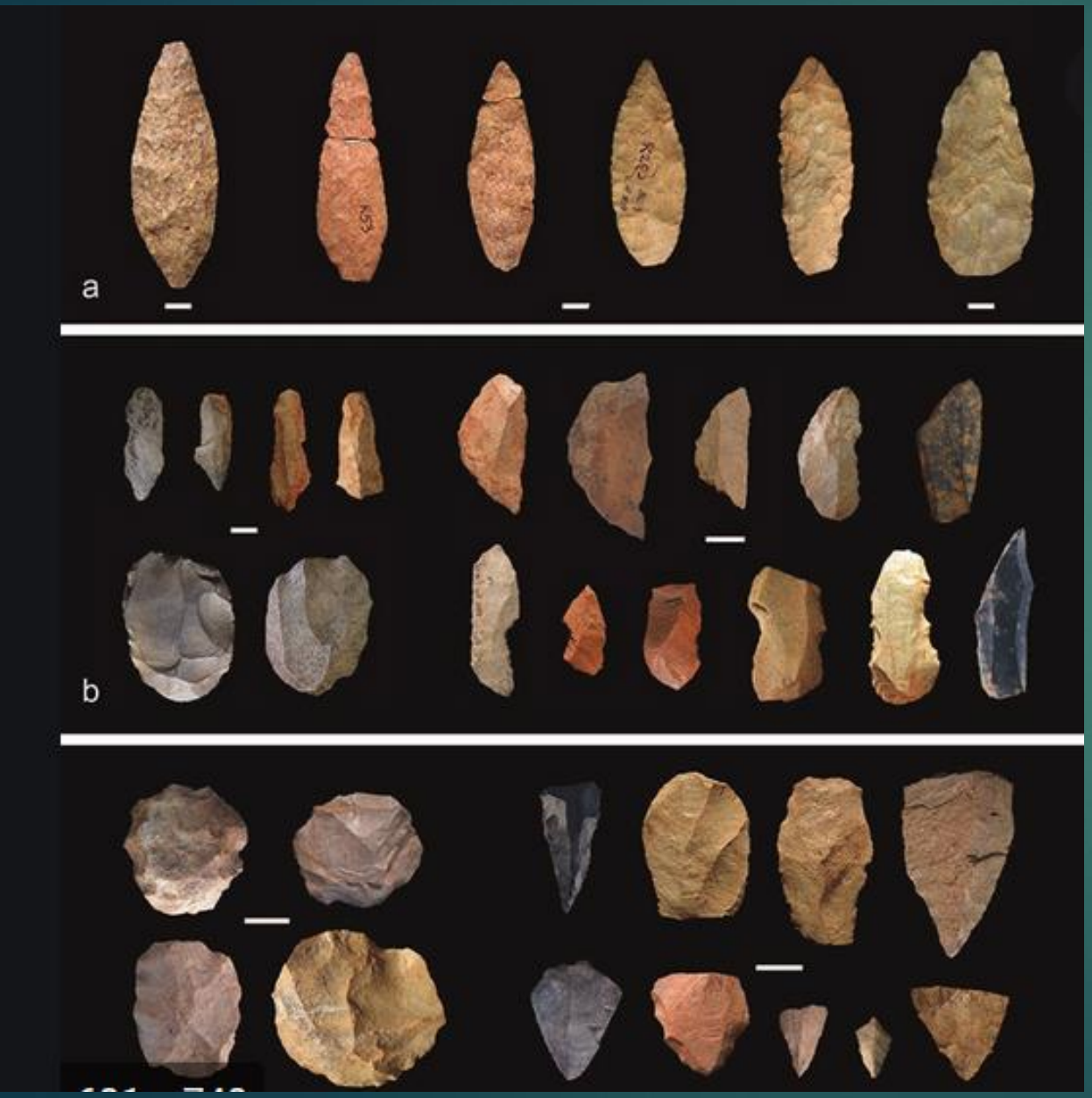


Mousterian lithics: for 250 K



1911 image of tools from Le Moustier cave

Still Bay & Howiesons Poort, South Africa lithics, lasted 1-5 K



N Tool Technologies

- Most Neandertals are found with Middle Paleolithic Mousterian tool industries.

- Later Neandertals are associated with an upper Paleolithic industry, known as the Châttelperronian

Stone technologies

- The Neanderthals are associated with the archaeological period known as the **Middle Paleolithic** (MP), ~300–35 Ka
- Two main defining characteristics of MP stone tools:
  - decrease in the frequency of large bifacial cutting tools (handaxes and cleavers)
  - appearance of prepared-core technology, such as Levallois.
- Microwear and residue studies: MP tools were used for a wide variety of tasks, including butchery, plant processing, and woodworking
- Besides Levallois, they made blade, discoidal, Quina, and bifacial technologies
- They made and used compound tools made from more than one material, including the first hafted spears, some 127,000 years ago

Middle Paleolithic (Middle Stone Age) Industries

- Characterized by prepared core technologies in which multiple steps are required to create a tool of specific characteristics (e.g. Levailois technique, disk cores etc.).
- Included both soft and hard hammer techniques and bone tools.
- Include more tool types than Early Stone Age industries in Africa
- Smaller N groups meant less technology klg exchanged

Mousterian toolkit

A Mousterian point is typologically defined by a triangular flake with the presence of a retouch on one or two sides to form a point.

Levallois technology

The stages of manufacture of a Levallois core:

- 1, selection of an unretouched cobble;
- 2, removal of flakes around the periphery of the core;
- 3, removal of flakes from the main surface of the core, using the previous removals as platforms;
- 4, continuation of flaking in order to create a convex surface;
- 5, removal of the central flake;
- 6, the Levallois core and flake.

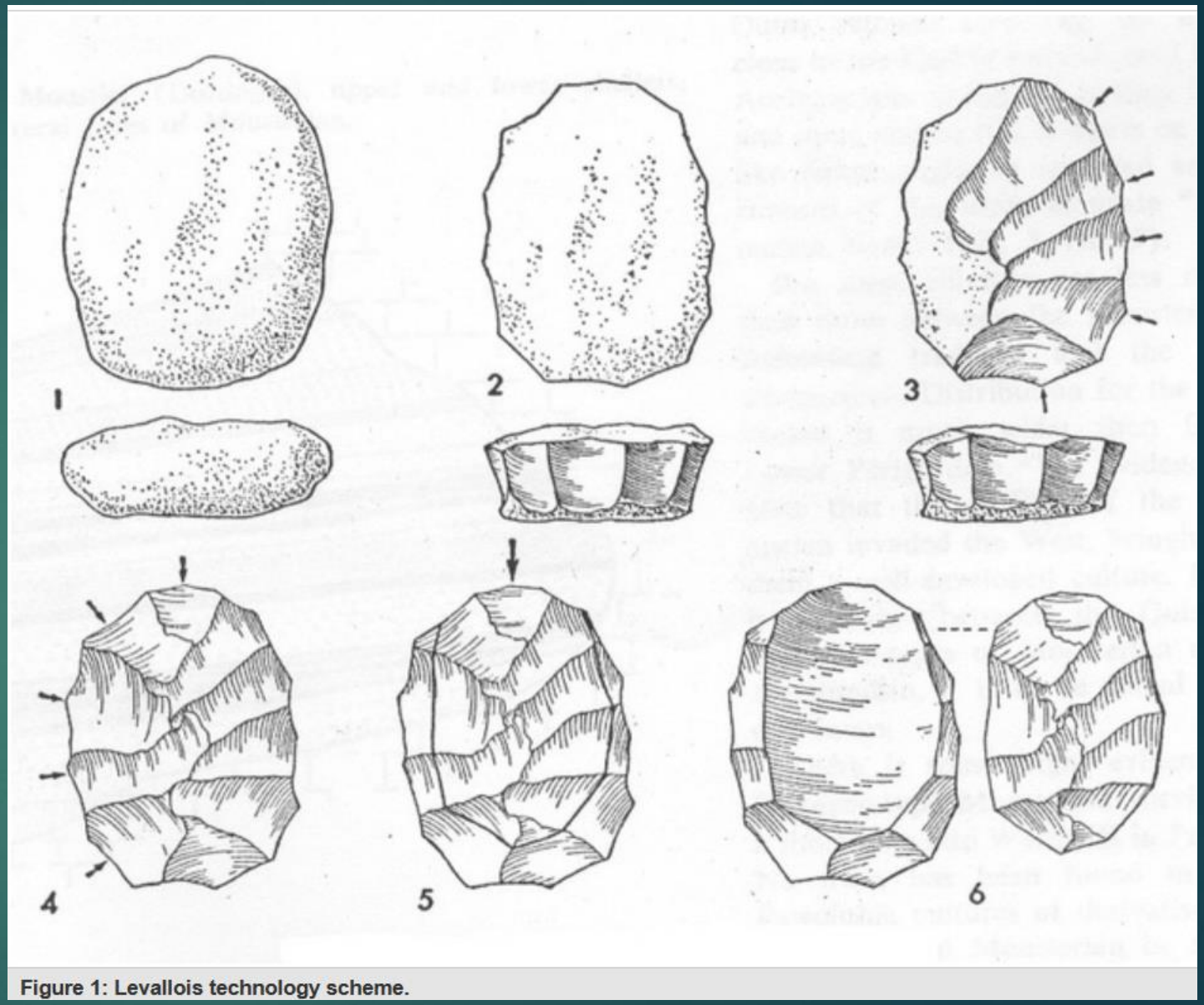
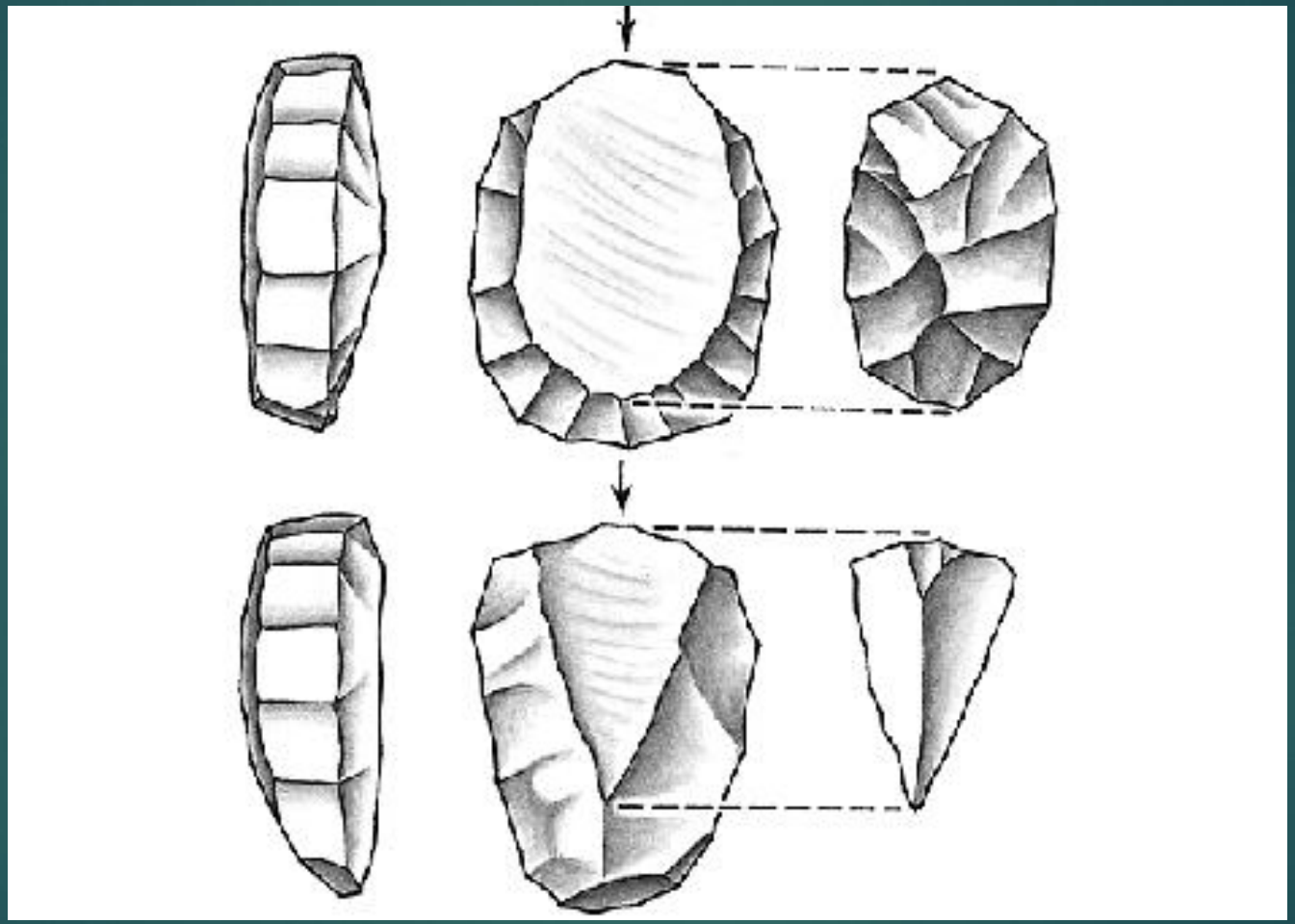


Figure 1: Levallois technology scheme.

Expert knappers who had the cognitive abilities necessary to design and execute complex knapping sequences.

Levallois technology



Flake

Tool

The Great Mousterian Debate

- F. Bordes produced descriptions of classic types of Mousterian lithics, but not all agreed with his interpretation of their purpose:
  - Different cultural groups (Bordes)
  - the facies represented **diachronic** (change over time) patterning (Mellars 1965, 1969),
  - different activities (Binford & Binford 1966),
  - scraper reduction (Dibble 1984, 1995), or
  - intensity of raw material use and climate (Rolland & Dibble 1990).
- This controversy has been called "The Great Mousterian Debate."

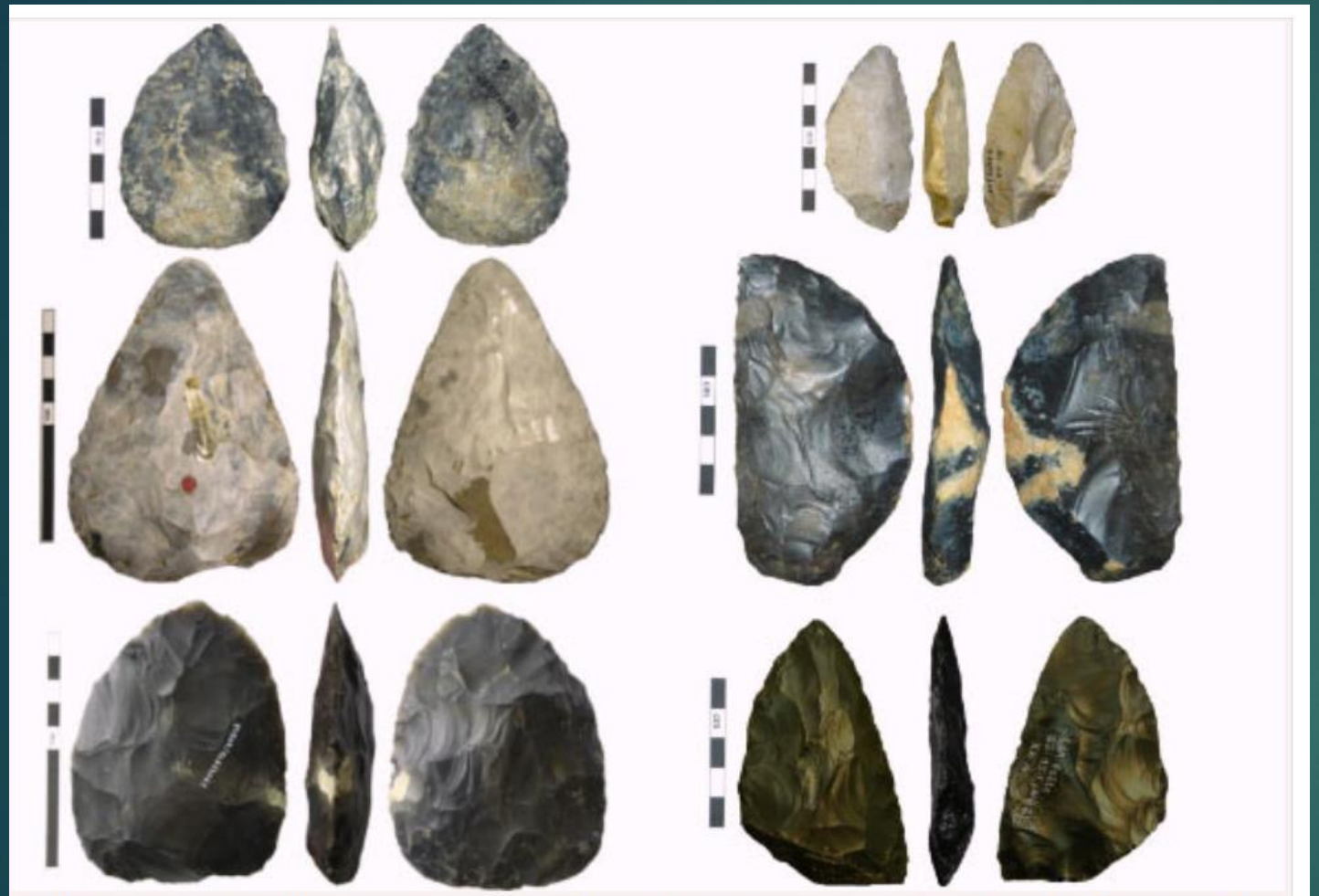
Regional variation in tool culture

West of Rhine

East of Rhine

- Karen Ruebens, analyzed 1,300 stone tools from European Neanderthal sites dated to between 115,000 and 35,000 years ago.
- She found that they belong to at least two distinct tool-making traditions.
  - MTA: West of the Rhine River, Neanderthal hand axes are oval or roughly triangular,
  - KMG: In east, they are rounded on one edge and flat on the other.
  - MBT: Near the Rhine, the traditions seem to overlap, as if two cultures were sharing their techniques.

Two Mousterian Traditions



Left: Mousterian of Acheulean Tradition hand axes, from top to bottom – cordiform hand axe from Le Moustier, France; triangular hand axe from St. Just en Chaussée, France; hand axe from Lynford, UK (Karen Ruebens). Right: Keilmessergruppen Tradition hand axes, from top to bottom – keilmesser from Sesselfesgrotte, Germany; keilmesser from Abri du Musée, France; faustkeilblatt from Königsaue, Germany (Karen Ruebens).

- Neanderthals in the western region made symmetrical, triangular and heart-shaped hand axes,
- During the same time period, in the eastern region, they produced asymmetrically shaped bifacial knives.

2 N tool traditions + overlap

A map of the two Neanderthal hand axe traditions. The MTA is the western tradition, KMG is the eastern, and MBT is a mixture of the two

Neandertal long range transport

- Neandertal lithic assemblages show a strong focus on the exploitation of local (<5 km from the site) raw materials, with transport of stone artifacts over larger distances (>50 km) occurring in small, variable proportions.

N Tool innovation

- New analyses suggesting that there were
  - no differences in raw material efficiency,
  - bone was used for tools
  - hafting might go back to 240–270 Ka
  - manganese dioxide was used to produce fire on demand by 50 Ka,
  - only after c. 40 Ka (as the Neanderthals were disappearing) did AMH technology become clearly superior
- Des-Cubierta Cave in Spain has Mousterian layers containing numerous small hearths with over 30 antlers and horn-cores associated with an infant burial.

N innovation

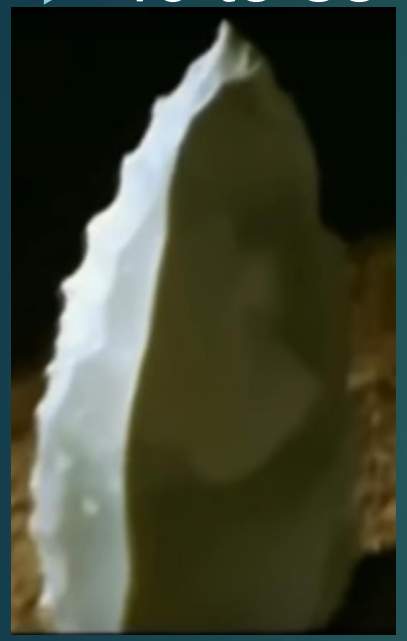
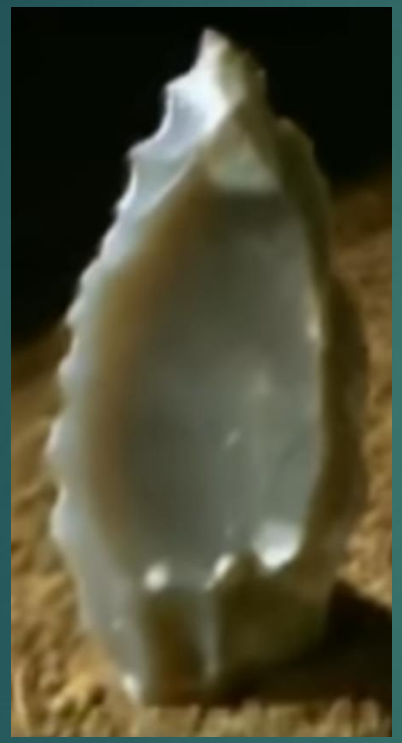
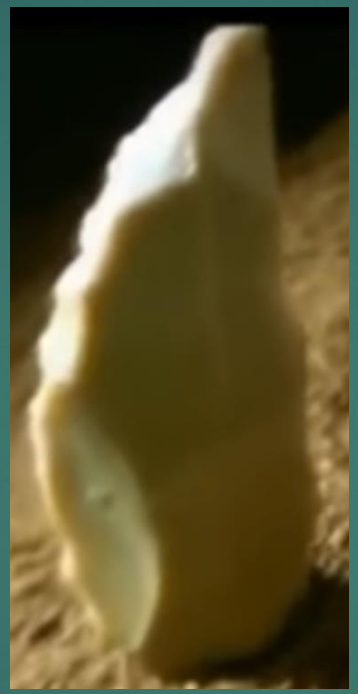
- Some Evidence of N innovation:
  - use of ochre and manganese
  - Neandertal production of glue made from pitch,
  - presence of transported and ochre-smeared shells,
  - ornaments such as eagle talons and bird feathers
  - production of specialized bone tools (lissoirs)

- The pace of change in the last phases of the Middle Paleolithic, prior to the arrival of modern humans, is comparable to that of the late MSA in South Africa.

- There is no significant differences between the MSA data commonly used to create these more abstract explanations of MH superiority and the later Middle Paleolithic record.

Late stage N tools changed

- 40 to 35 K

Early Blades in Middle Paleolithic & MSA

- Blades have been a MH criteria for long time. But why not N triangles
- MP – Amud (Israel) > 270 Ka
- MSA – Kapthurin FM (Kenya > 285 Ka
- MSA – Howiesons Poort (S. Africa) 55-70 Ka
- Now Blades are being found earlier and more commonly in many European MP assemblages, long before MHs in Europe

Bladelets: Ns knew how, but did it less

- Bladelets have been considered a discriminant factor between the MP and the UP and therefore between AMH and Neandertals.
- Production of bladelets has been securely identified in French Mousterian assemblages, e.g. at Combe Grenal, Champ Grand and Grotte Mandrin, and in Spain at sites such as El Castillo and Cueva Morin. All these assemblages belong to the final Mousterian.
- This shows that Neandertals, like late MSA humans and early UP makers, mastered the technology of bladelet production.
- It is their frequency, not cognition or technical competence, that distinguishes AMH bladelet production from that of Neandertals

Châtelperronian lithic industry

- Châtelperronian lithic industry has the richest complex/symbolic content of all Neanderthal assemblages (see Coolidge & Wynn 2004; d'Errico *et al*. 1998; Hublin *et al*. 1996; White & Taborin 2000).

- Bone tools, such as the Châtelperronian in France & the Uluzzian in Italy, culturally distinct tool traditions

- While there is almost no figurative art associated with Neanderthals, personal ornaments such as pierced or grooved animal teeth and ivory rings have been found at the Châtelperronian sites of Saint-Césaire and Arcy-sur-Cure, France (Lévêque *et al.* 1993, Hublin *et al.* 1996).

Châtelperronian at the Grotte du Renne

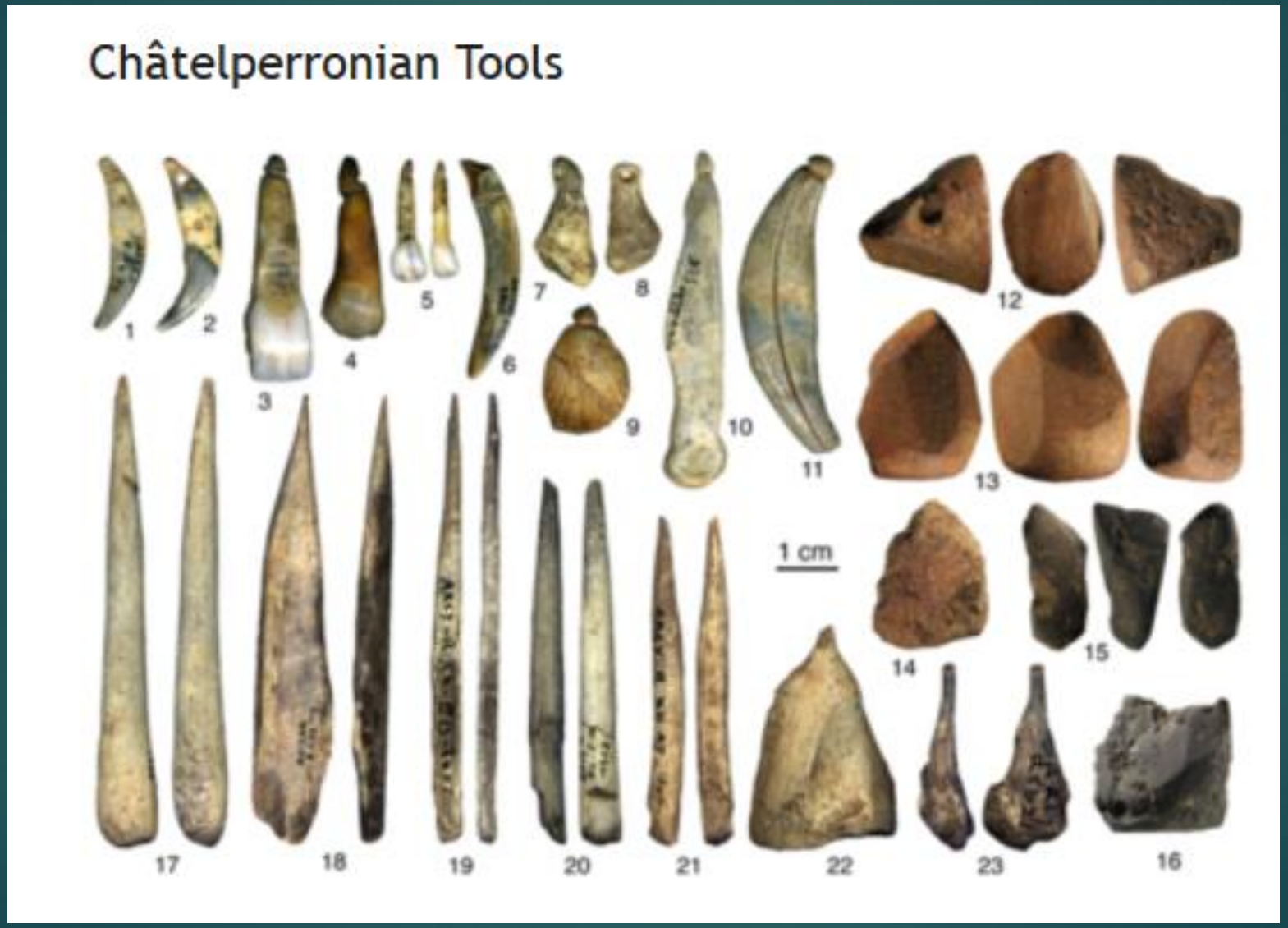
- History of contradictory study findings of authors of Châtelperronian at the Grotte du Renne. Hublin = AMH, Zilhão = N

- The purported differences in technology between AMH and Neanderthals now appear much smaller following the clear association of the Châtelperronian at the Grotte du Renne with the Neanderthals;

- The unequivocal recovery of Neanderthal proteins at Grotte du Renne seems to connect them, the advanced Châtelperronian technology, and the elaborate necklaces of animal teeth and shells found there.

Frido Welker …J. Hublin, et al. 2016

Châtelperronian Tools made by Neandertals, 45 to 40 Ka

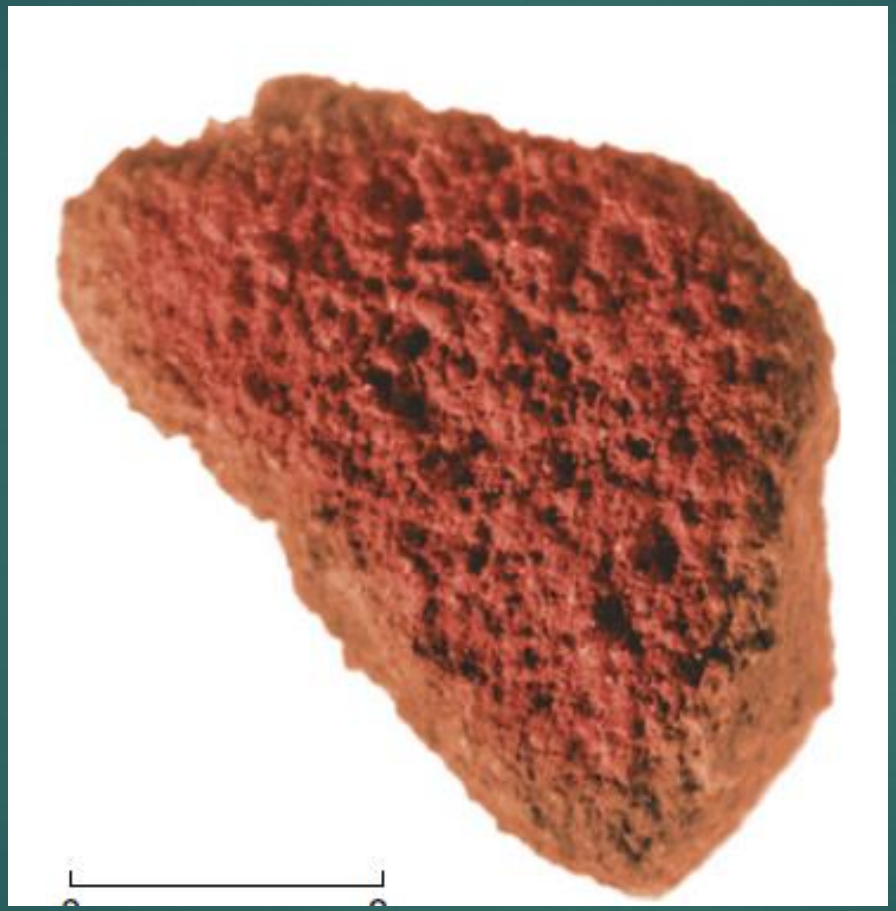


Ochre: oldest pigment used by humans

Blombos Cave, S. Africa, circa 73 Ka

Ochre cliffs of Rousillon, France

Maastricht-Belvédère, Netherlands: non-local hematite, 200–250 Ka



Wil Roebroeks, et al., 2012

C. Pigment use by Ns

- Soressi M, & D'Errico F. 2007: three different kinds of evidence for Neandertal “symbolic behavior”:
  - engravings (mainly on bone, but also stone),
  - ornaments,
  - pigments.
- Pigment use by Ns: In Europe, 70 sites, 60 to 40 Ka, have yielded blocks of pigments or objects that served to grind pigments; mostly black pigment, manganese dioxide, and more rarely ochre, attributed to the Mousterian.
- Pech de l’Azé I: 500 blocs, most often blocks of manganese dioxide, suitable as black pigment; 250 pieces have been ground, having visible striations; some are crayons

Soressi et al. 2007

Pigments

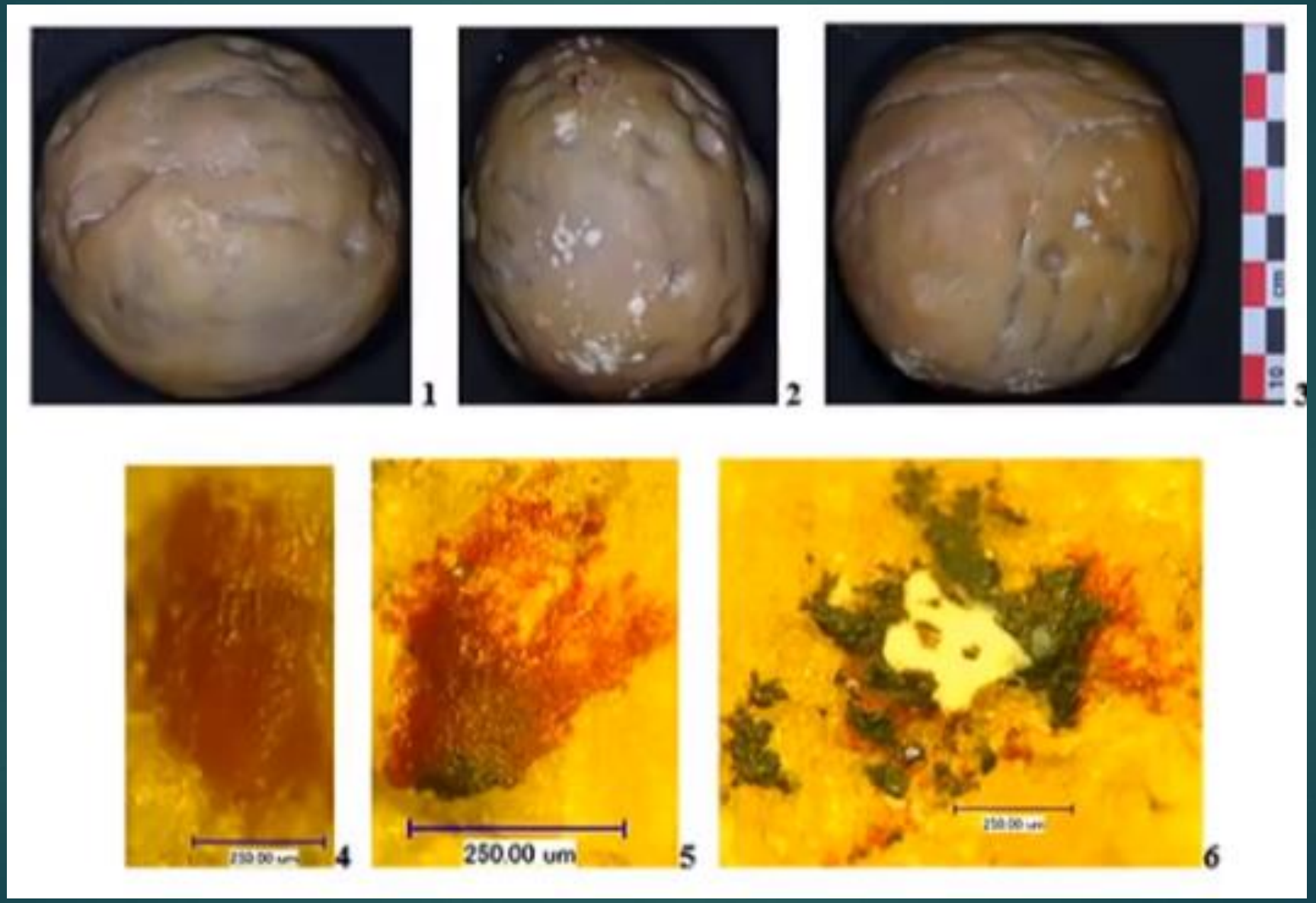
- Use of pigment, as old as 200-250 Ka, widespread after 60 Ka and is associated with pigment processing tools and pigment containers.

- There is evidence that Neanderthals used mineral pigments such as red ochre (hematite) and manganese dioxide at several sites in Europe, including Pech de l'Azé I, France (d'Errico 2003), and Cueva de los Aviones and Cueva Antón, Spain (Zilhão *et al.* 2009).

Pigment containers

- In Cioarei-Borosteni Cave, Romania, eight pigment containers have been found in a Middle Paleolithic context.
- These are small fragments of stalagmites, basically cup-shaped, with pigment (yellow and red ochre) and scratches on the inside.
- Similar stalagmite containers have been found in the Upper Paleolithic of France
- 18 kg (40 lbs) of red and black pigments, often bearing traces of use, found in the Châtelperronian layers of the Grotte du Renne, Arcy-sur-Cure, the largest quantity of pigmental material found so far at a Palaeolithic site.

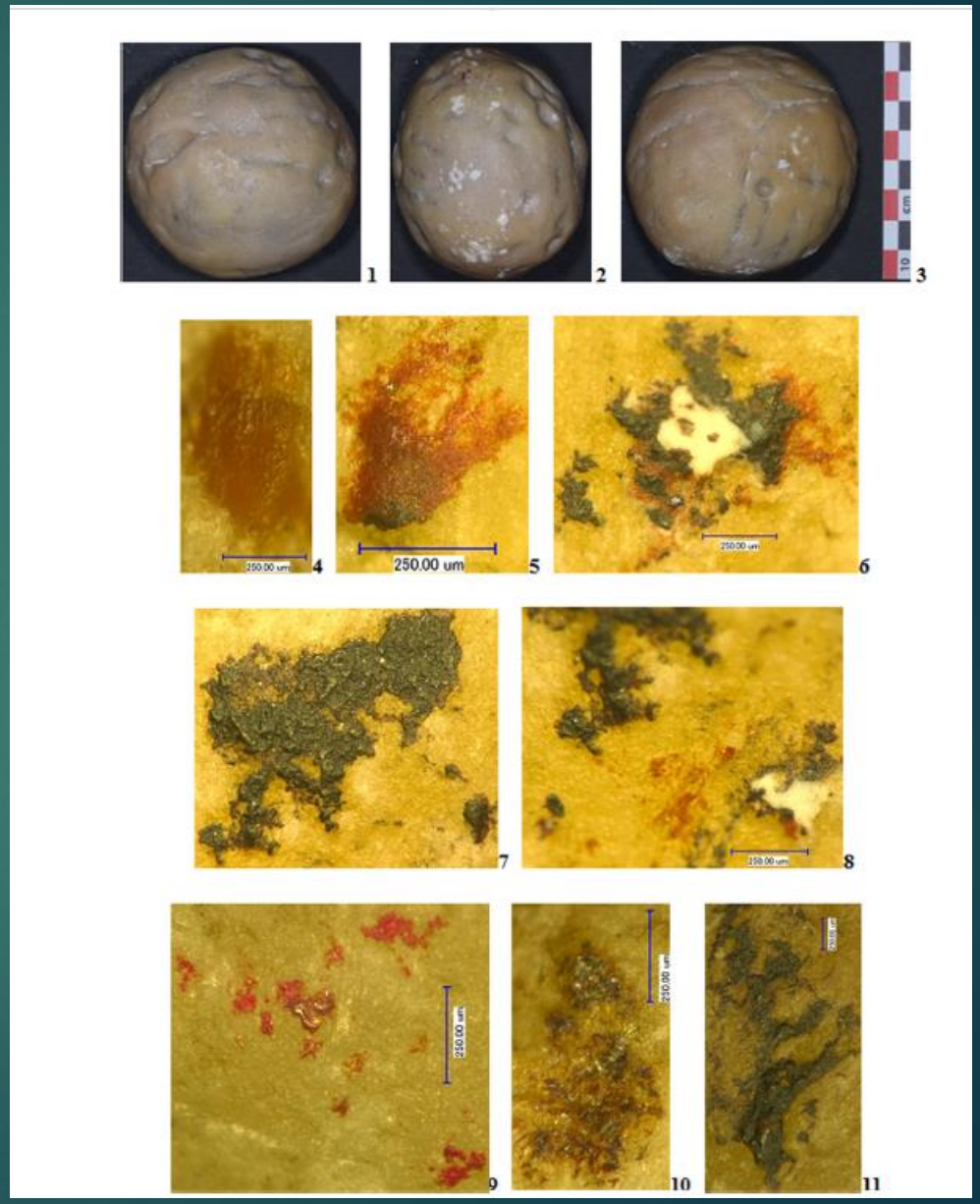
Geodes – Cioari-Borosteni, 48 Ka



Carciumaru, Niju & Cirstina

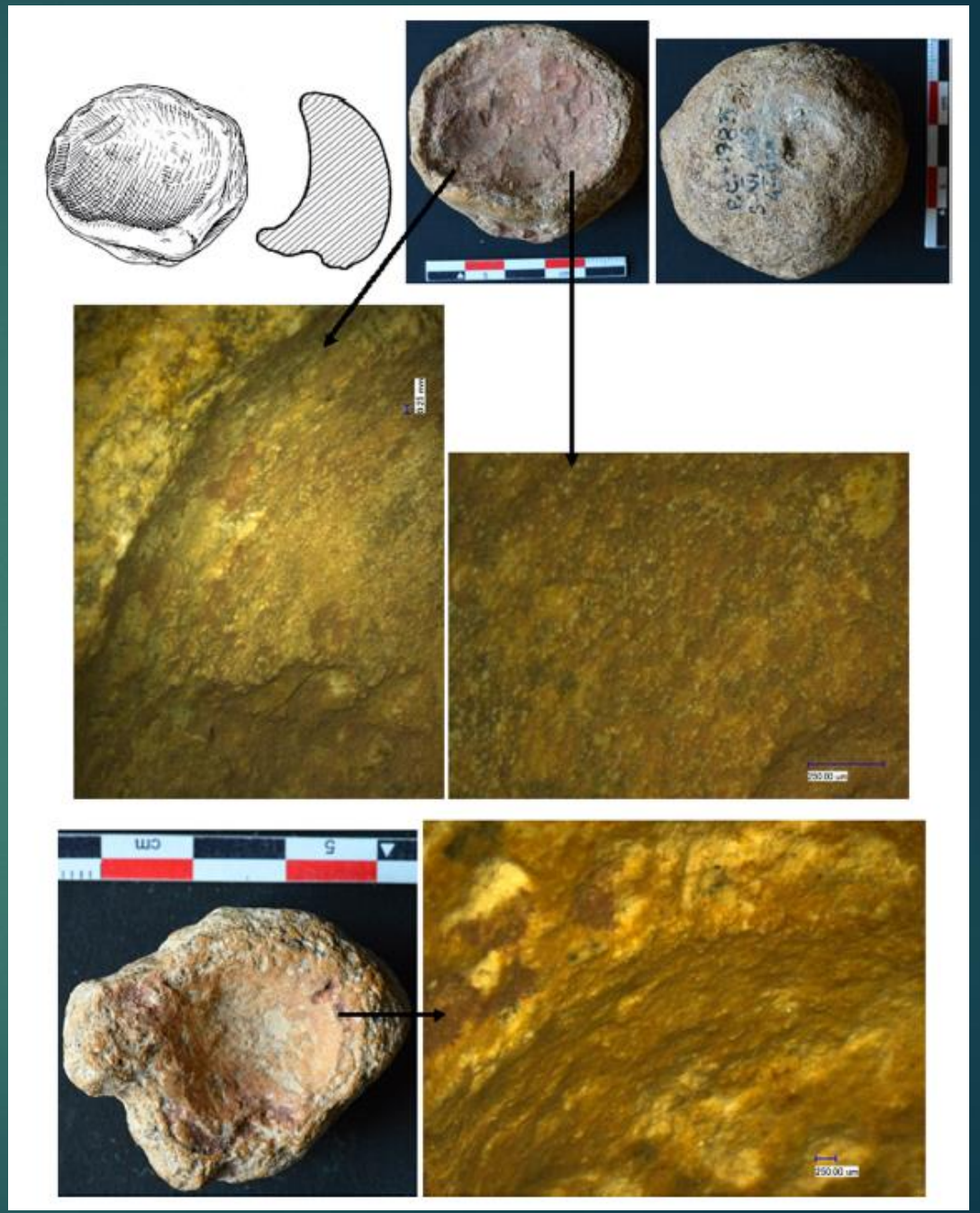
Ochre preparation containers used by Ns

- Cioarei-Boroș, teni Cave, Romania, exposed, in the Mousterian layer (47.9 Ka), a spherical-ellipsoidal geode.
- Discovery of 8 ochre preparation containers in the Mousterian layers, dated more than 50.000 years; are direct material evidence of mixing the pigments in order to use it for painting various surfaces



Marin Cârciumarua, et al., 2014


250.00 um



Actual MP use of powdered minerals

- Powdered ocher and manganese uses: body decoration, adhesive in hafting, anti-microbial in hide preservation, hide tanning, fire starting
- However, we do not know whether this pigment use was symbolic or not.
- Without the two engraved ocher pieces from Blombos Cave, a merely functional interpretation for the use of ocher in other areas could be applied
- The utilized ochers from Blombos and other MSA sites, and the used manganese pieces from Mousterian sites of Europe, do not, in themselves, signify symbolic behavior. They only represent a step in the production of a residue which may or may not result in the production of symbolic representations.

2019: Ochre engraving on bone, site of Lingjing, in Xuchang China, ~110 Ka

Same site as Xuchang Skull

D. Manganese Dioxide as N fire starter

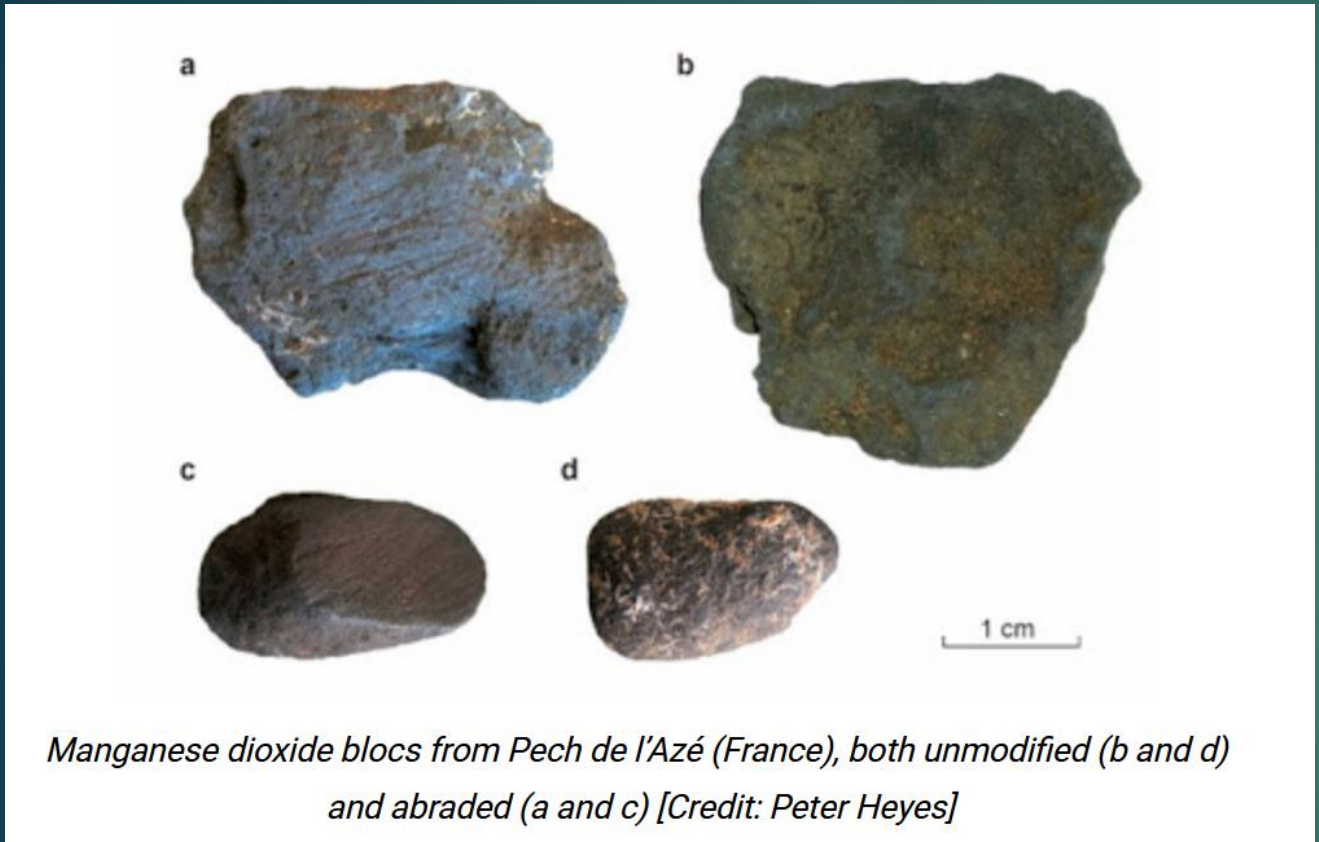
- The usual interpretation is that ‘manganese oxides’ were collected for their coloring properties and used in body decoration, potentially for symbolic expression.

- Neanderthals habitually used fire and if they needed black material for decoration, soot and charcoal were readily available, whereas obtaining manganese oxides would have incurred considerably higher costs.

- Compositional analyses lead us to infer that late Neanderthals at Pech-de-l’Azé were deliberately selecting manganese dioxide.

Peter J. Heyes, et al., 2016

Manganese dioxide blocs from Pech de l'Azé



Manganese dioxide blocs from Pech de l'Azé (France), both unmodified (b and d) and abraded (a and c) [Credit: Peter Heyes]

- Statistically designed combustion experiments and thermo-gravimetric (TGA) measurements demonstrate that
- manganese dioxide reduces wood's auto-ignition temperature and substantially increases the rate of char combustion;

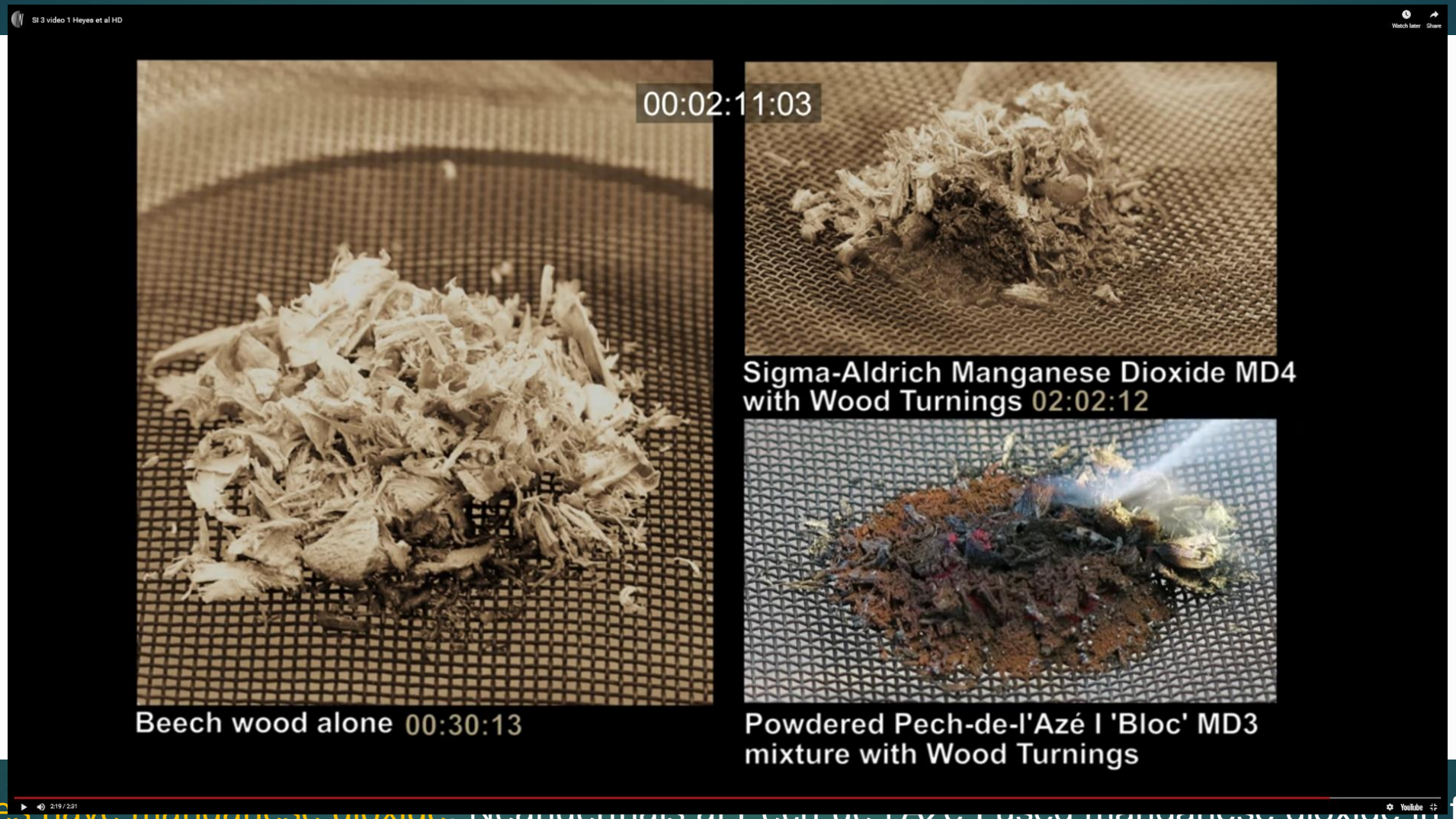
- in other words manganese dioxide facilitates fire making. It can lower the ignition temperature from 350 to 250 degrees.

Fire starter

- Fire experiments lead us to conclude that the most beneficial use for manganese dioxide was in fire-making.

- With archaeological evidence for fire places and the conversion of the manganese dioxide to powder, we argue that Neanderthals at Pech-de-l'Azé I used manganese dioxide in fire-making and produced fire on demand.

Fire starting: Use of Manganese Dioxide to ignite fires



40 N sites have manganese dioxide. Neanderthals at Pech de l'Azé I used manganese dioxide in fire-making and produced fire on demand. Manganese dioxide reduces wood's auto-ignition temperature and substantially increases the rate of combustion,

Peter J. Heyes, et al., Nature, 2016

Ns and Manganese dioxide

- 40 N sites have manganese dioxide evidence, 40-60 Ka
- 100s of blocs at Pech-de-l'Azé, at 51 Ka; majority show use striations; via recovered sandstone grindstone still covered with black residue; consistent with the conversion to powder necessary for use in fire-starting
- Also found at Châtelperronian of the Grotte-du-Renne
- Spark-lit tinder with manganese dioxide powder is one simple yet effective means of starting wood fires with substantially lower wood auto-ignition temperatures and high rate of combustion.

E. Collection of Exotic items

- Had sense of beauty:
  - Kept a small beautiful piece of unused mineral crystal in the cultural layers of Chagyrskaya Cave, of Altai Mts.

- Rare objects such as crystals and fossils were apparently collected at Mousterian sites such as Combe Grenal and Chez Pourré-Chez-Comte

- Transport and coloring of exotic objects and their possible use as pendants

Art appreciation: artistic handaxes

- Rare objects such as crystals and fossils were apparently collected at Mousterian sites such as Combe Grenal and Chez Pourré-Chez-Comte
- beauty of some bifaces beyond functional need
- selection of fossiliferous chert or rock crystals for tools
- flaking of handaxes in a way that single fossils are centrally located
- long distance transport of fossiliferous cherts and whale teeth

Transportation of exotic raw tool material; over 100s of Kms; trading networks

An elegant Acheulean handaxe was carefully shaped so as to display a fossil shell of Spondylus spinosus at its center. It was made around 200,000 years ago by a Neanderthal.

Fossil left in Acheulean hand axe at Swanscombe, England

Oakley, 1973, 1981

Some “exotics” (non-local) tools

Krapina 144.305: A curiosity

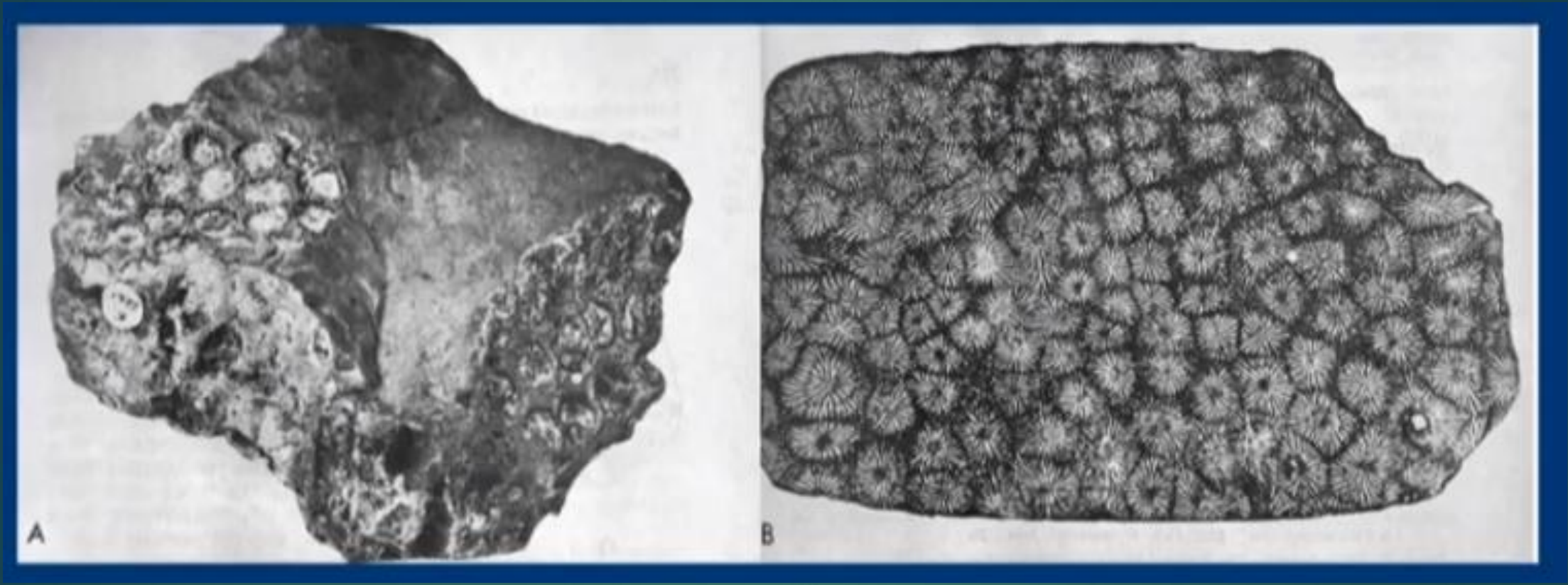
Strange rock: not tool, never retouched; no use wear; carried to site; a curio

Micritic limestone (mudstone); No cortex; Weathered outer surface

Arrays of black dendrites; large dark stain along base and up side

Krapina 144.305: Dendrites

Swanscombe: coral bearing chert, transported 193 km



Oakley, 1981

F. MH Ornaments: Blombos Cave

- Early modern human-associated perforated marine shells from Africa and the Near East is widely accepted as evidence for body ornamentation, implying behavioral modernity.

- Convincing evidence for the use of personal ornaments, consisting of perforated marine shells belonging to a single species at each site, is found from caves in south Africa, north Africa and the Middle East dated to between 120 and 70 ka.

- At Blombos Cave, deliberately perforated Nassarius kraussianus shell beads with clear evidence of use-wear, some bearing traces of ochre come from ~ 75 ka old levels.

- The perforated Conus shell from Border Cave, associated with the burial of a young individual may be as old as 76 ka.

MH Ornaments

- Perforated Nassarius gibbosulus shells were recovered at the Aterian site of Oued Djebbana, Algeria, and Skhul from approximately 100 ka levels that include 10 Homo sapiens burials.

- Perforated shells of the same species showing traces of intentional modifications, possible deliberate heating to change the color of the bead, use-wear and traces of red ochre were recovered from approximately 80–70 ka levels at Grotte des Pigeons, Rhafas, Ifri n'Ammar and Contrebandiers in Morocco.

- Beads seemingly disappeared in Africa and the Levant between approximately 70 ka and 40 ka, and reappeared almost everywhere in Africa and Eurasia after this time span;
- Later shell beads differ from their approximately 120– 70 ka antecedents in that they take the form of hundreds of discrete types, identifying regional patterns.

Ornamentation: Perforated shells

- 2010: Two N sites of Middle Paleolithic of Iberia yielded naturally perforated and pigment-stained marine shells
  - Perforated shells and red and yellow pigments in Cueva de los Aviones (115-120 ka) and Cueva Antón (50 ka), both in Murcia (Spain), and Cueva Fumane (45-47 ka) in Italy.

- Iberian finds show that European Neandertals were no different from MH Africans in this regard. (Zilhão *et al.*, 2010).

The perforated shells from level II of Cueva de los Aviones (after cleaning): (1) Acanthocardia tuberculata; (2–3).

Holes drilled by a Marine snail

Collected by Ns for stringing together

Ornaments

- N Use as ornaments/jewelry:
  - perforated shells in Slovenia, 50 Ka
  - bird feathers (Finlayson et al., 201 2)
  - Eagle talons (Radovcic et al., 2015)
  - perforated animal teeth of different species;

- Yellow pigments, and shells encrusted with a mixture of several pigments in two caves in Spain, one 60 kilometers from the sea.

- Zilhão & d'Errico claim that this shows that Neanderthals adorned themselves with symbolic artefacts and, since these date back 50,000 years, before modern humans arrived in the area, they also represent independent Neanderthal innovations

N Ornamentation

- Shell jewelry found in Slovenia 50 Ka
  - Pierced, indicating worn as jewelry
  - Pre-dates arrival of modern humans
  - Evidence of pigment on shells - painted

- perforated animal teeth of different species; all well before the Châtelperronian.

Late stage Chatelperronian: begin using antler and bone and teeth

Working both bone and ivory for making tools and ornaments evidence of bone points, awls, perforated bones & teeth, ivory rings, cut antlers, antler digging picks

N jewelry

Neandertal Eagle Talon necklace, 130K

White tail Eagle

Krapina, Croatia

- Presence of eight talons indicates that the Krapina Neandertals acquired and curated eagle talons for some kind of symbolic purpose.

Radovčić D. et al., 2015

Eagle talons at Krapina, Croatia, 130 Ka

- These remains clearly show that the Krapina Neandertals made jewelry well before the appearance of modern humans in Europe, extending ornament production and symbolic activity early into the European Mousterian.

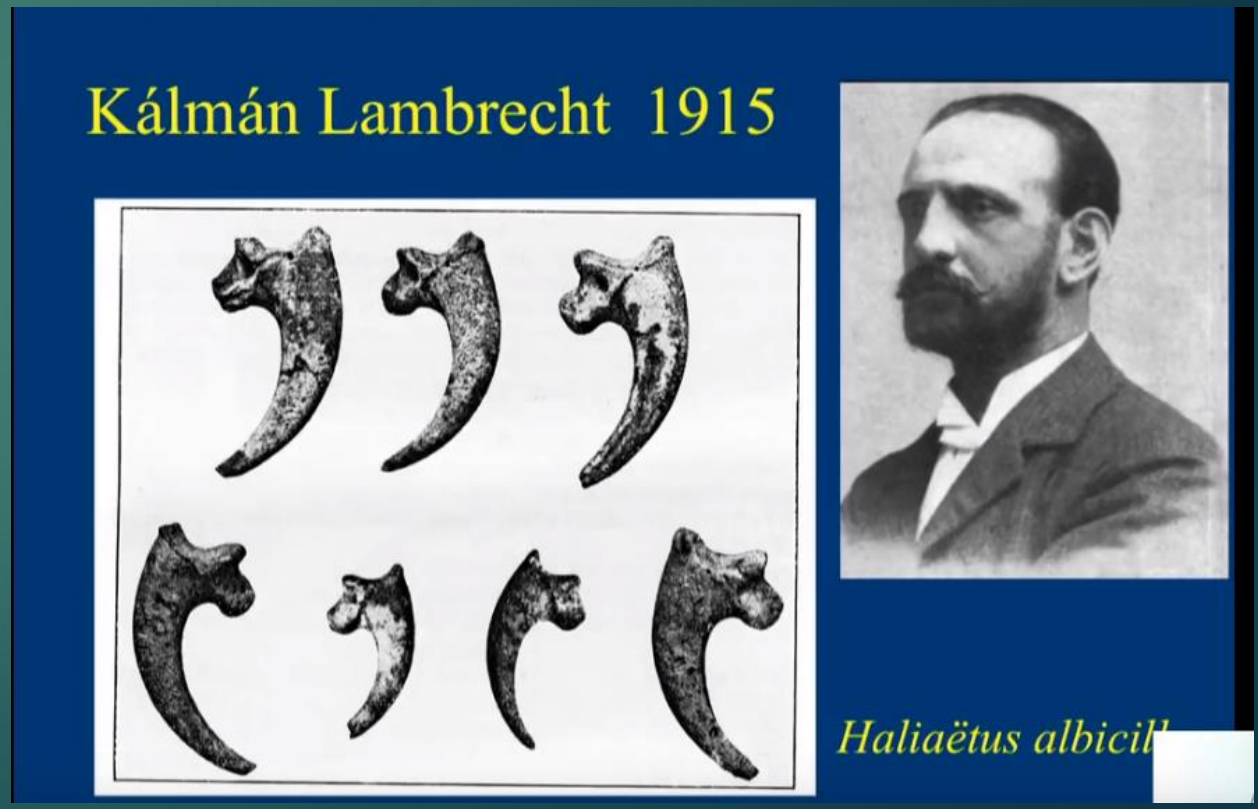
- Eagle talons are rare at other Neandertal localities and no sites have yielded eight talons from white-tailed eagles or any other raptor

- They are the earliest evidence for jewelry in the European fossil record and demonstrate that Neandertals possessed a symbolic culture long before more modern human forms arrived in Europe.

Krapina: 8 eagle talons from top layer 9

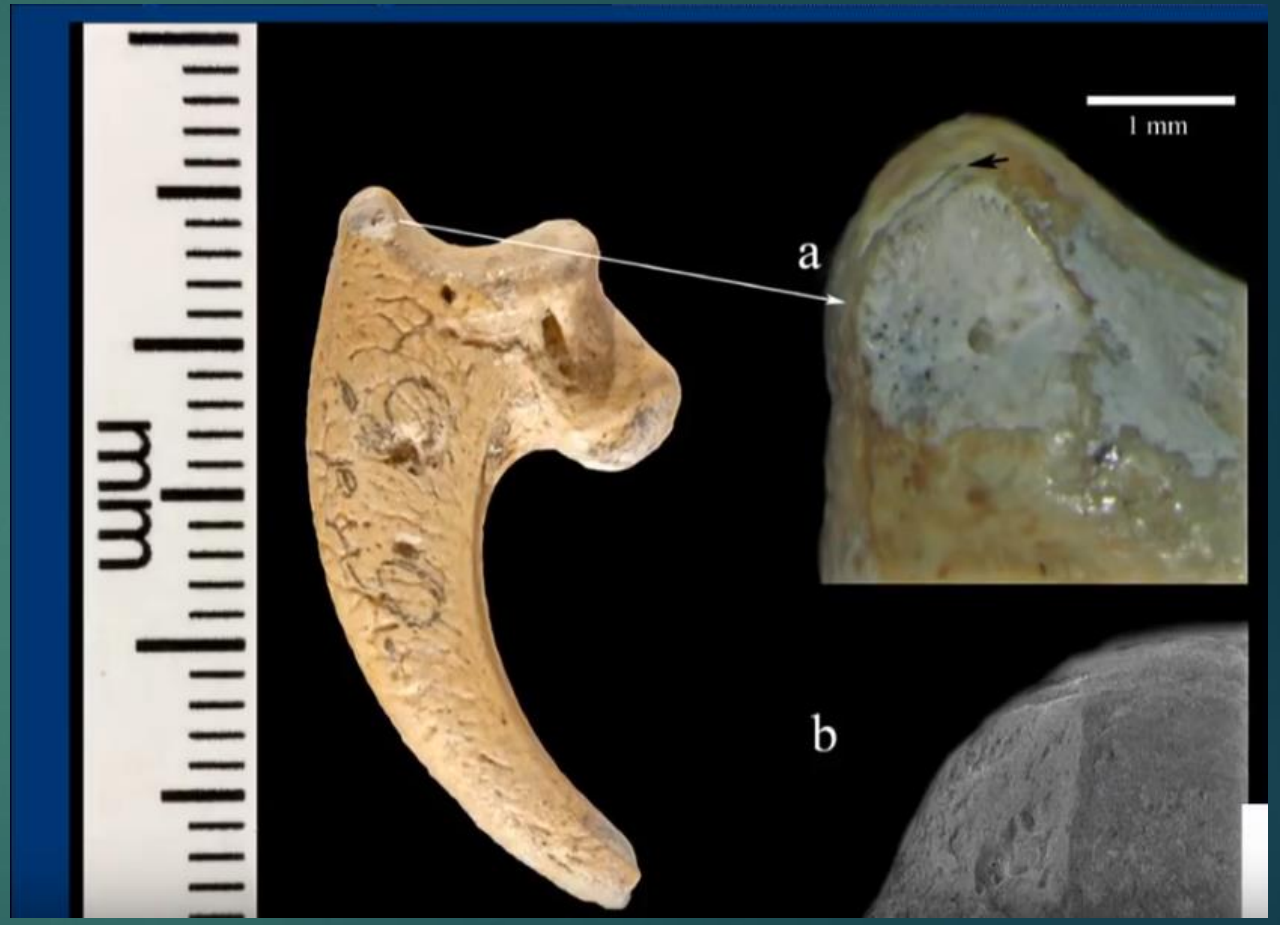
Found before 1901; GK misidentified them as *Aquila*, Golden eagle; came from multiple eagles (3 or 4 right talon 2)

White tailed Eagle



3 cutmarks & 1 polished area

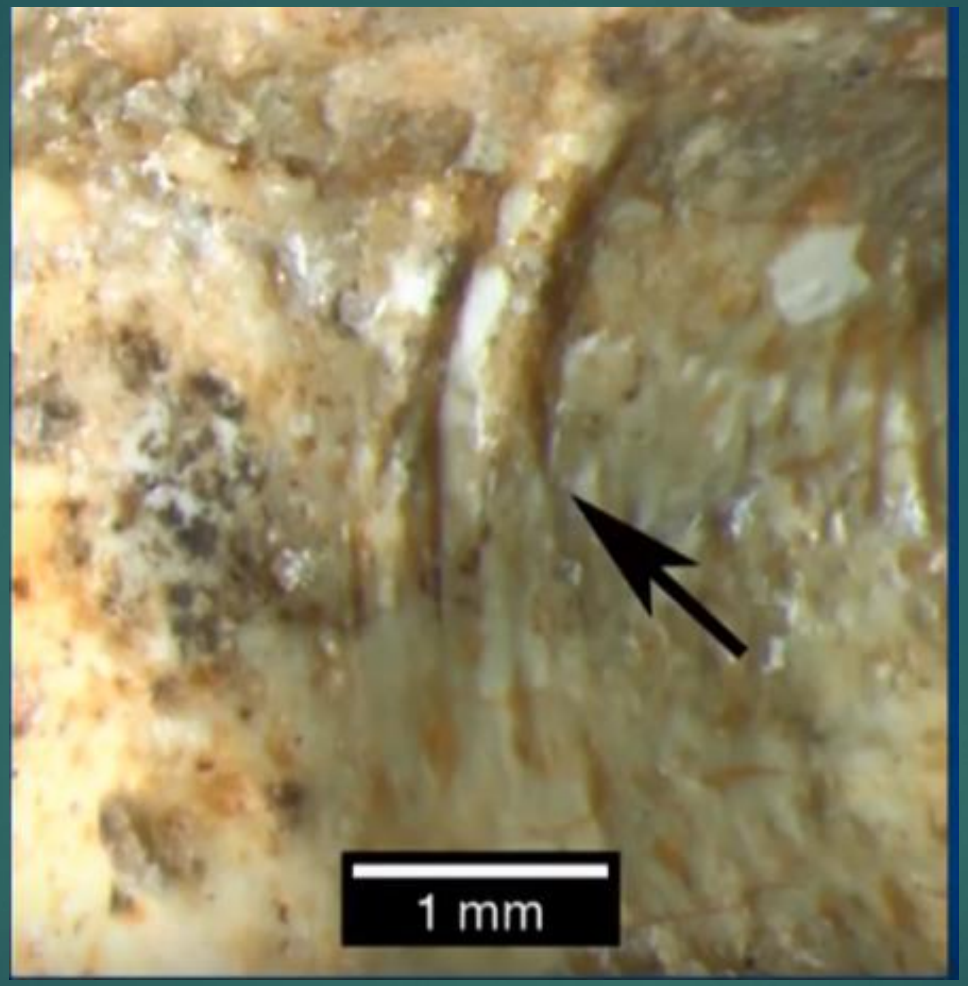
Right talon 2



Left talon 3

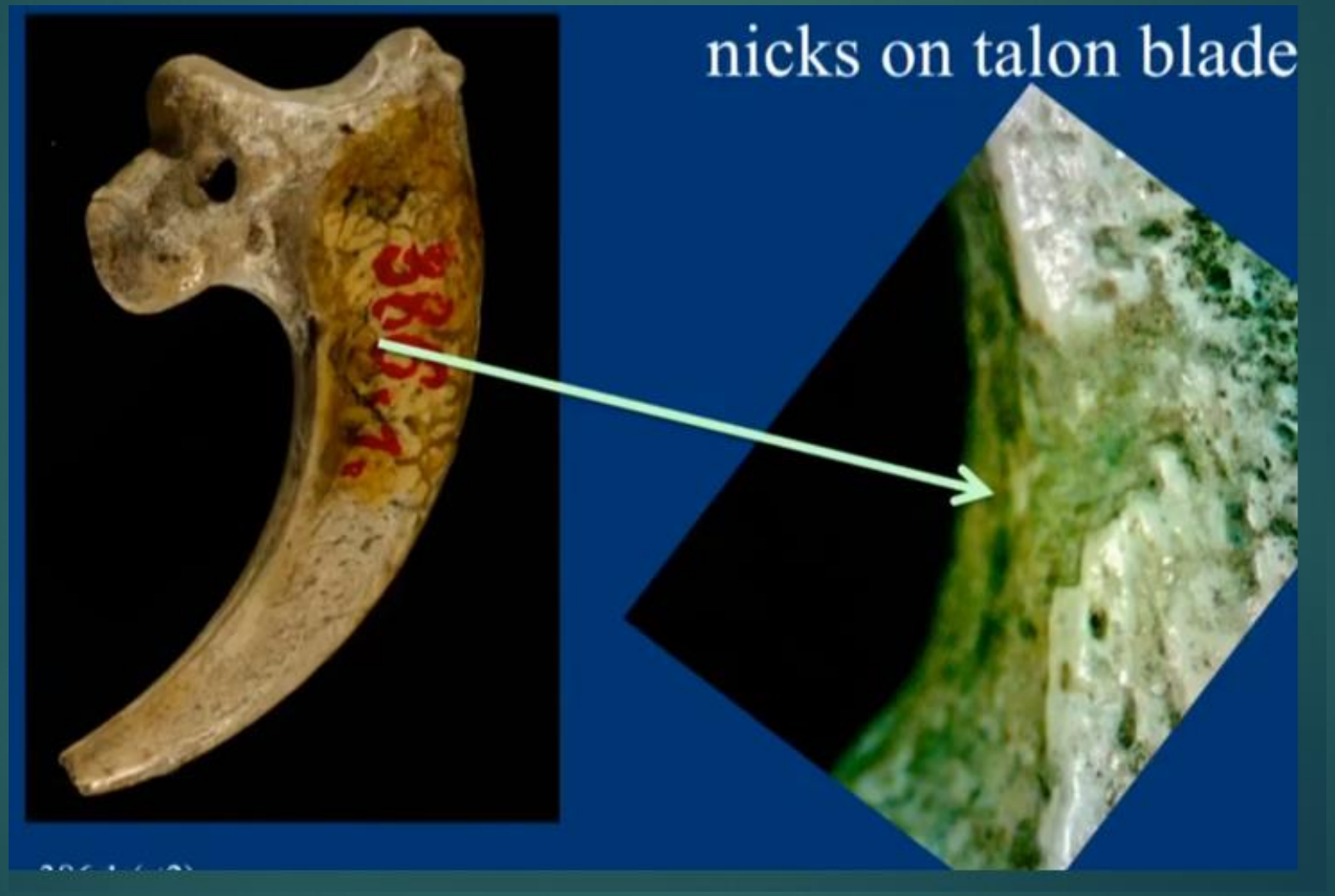
Phalanx with 30 cutmarks

Evidence for mounting into jewelry: cut mark edge smoothing



Necklace, bracelet, or rattle?; all have polished areas

Evidence for mounting into jewelry: nicks on talon blade



N Body ornaments

- Thus, there are actually no grounds for concluding that Neandertal pendants were true symbols; rather, they were more likely to have been indexes of social identity

- All examples of body marking would constitute evidence for symbolic culture, including the indirect evidence for body painting (via ground pigment)

- Of course, the same critique can be – and has been – applied to AMH personal ornaments found in MSA contexts in Africa (Botha, 2008, 2010).

Neandertal indistinguishability claim

- Must it then be concluded that Neandertals and AMH are indistinguishable in this regard?

- When ornament use by Aurignacian people is compared to that of Neandertals, a large difference in quantity is apparent:
- The 10,000-year Aurignacian record has yielded thousands of beads and items of personal decoration, while the entire 200,000+ years of the Neandertal record has yielded fewer than 10.

G. Ritual? Bruniquel Cave: structure (stalagmite circles)

- c. 170 Ka circular constructions from broken stalagmites (collectively weighting more than two tons) more than 300 m deep in the Bruniquel cave, for which it is hard to imagine any reason other than ceremonial

Bruniquel Cave, SW France

- In February 1990, thanks to a 15-year-old boy named Bruno Kowalsczewski, footsteps echoed through the chambers of Bruniquel Cave for the first time in tens of thousands of years. He took 3 years excavating to get to cave via very small crawling entrance.

- Found a burnt bone from an herbivore or cave bear nearby (no radioactive carbon left in it—a sign that the bone was older than 50,000 years)

- Some 336 meters into the cave, he discovered a vast chamber where several stalagmites had been *deliberately* broken.

Bruniquel Cave

- Most of the 400 large, broken-off stalagmites had been arranged into two rings—a large one between 4 and 7 meters across, and a smaller one just 2 meters wide. Others had been propped up against these donuts. Yet others had been stacked into four piles. Traces of fire were everywhere, and there was a mass of burnt bones.

- The researchers think that the pieces were once stacked up to form rudimentary walls. All have signs of burning, suggesting that fires were made within the walls.

- By analyzing calcite accreted on the stalagmites and stumps since they were broken off, the team determined that the structures were made 174,400 to 178,600 years ago.

Bruniquel Cave, SW France

- Using carbon-dating, Francois Rouzaud estimated that a burnt bear bone found within the chamber was 47,600 years old, which meant that the stalagmite rings were older than any known cave painting. It also meant that they couldn't have been the work of *Homo sapiens*.

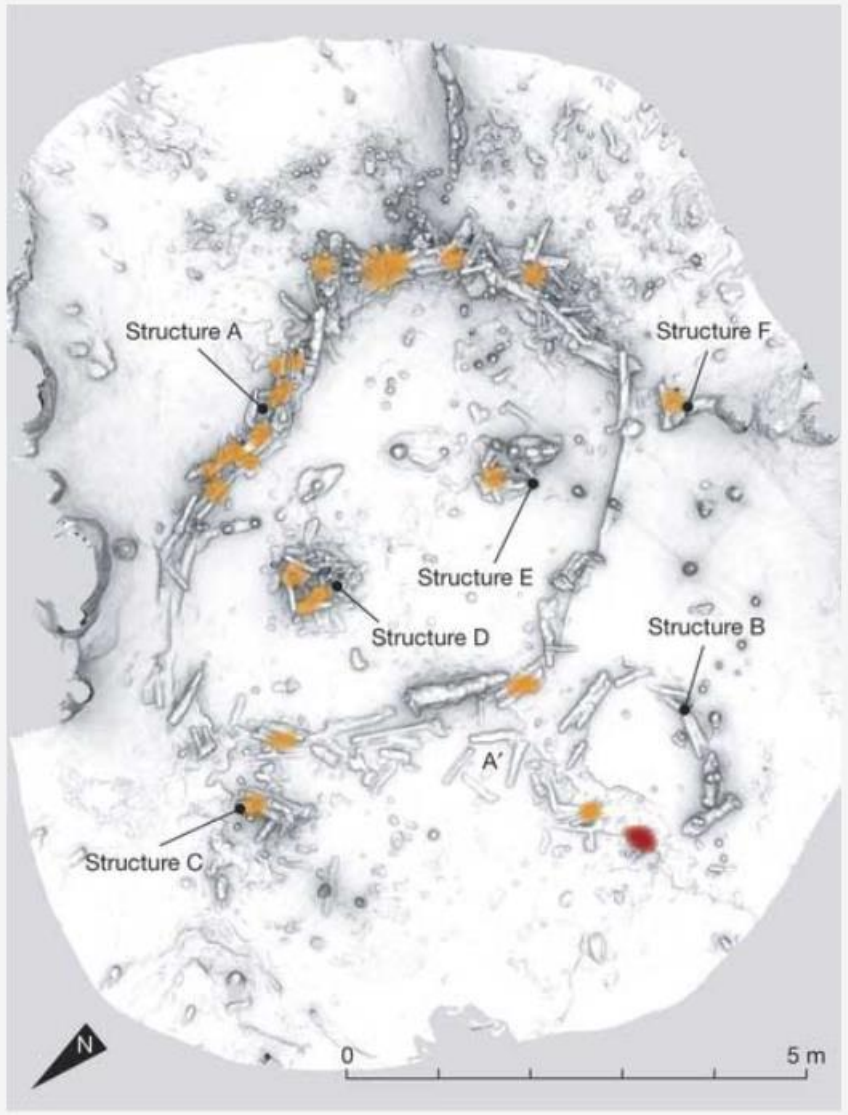
- Rouzaud died in 1999. Sophie Verheyden, caver & stalagmite expert: new uranium dating: 176,500 years old

Bruniquel Cave

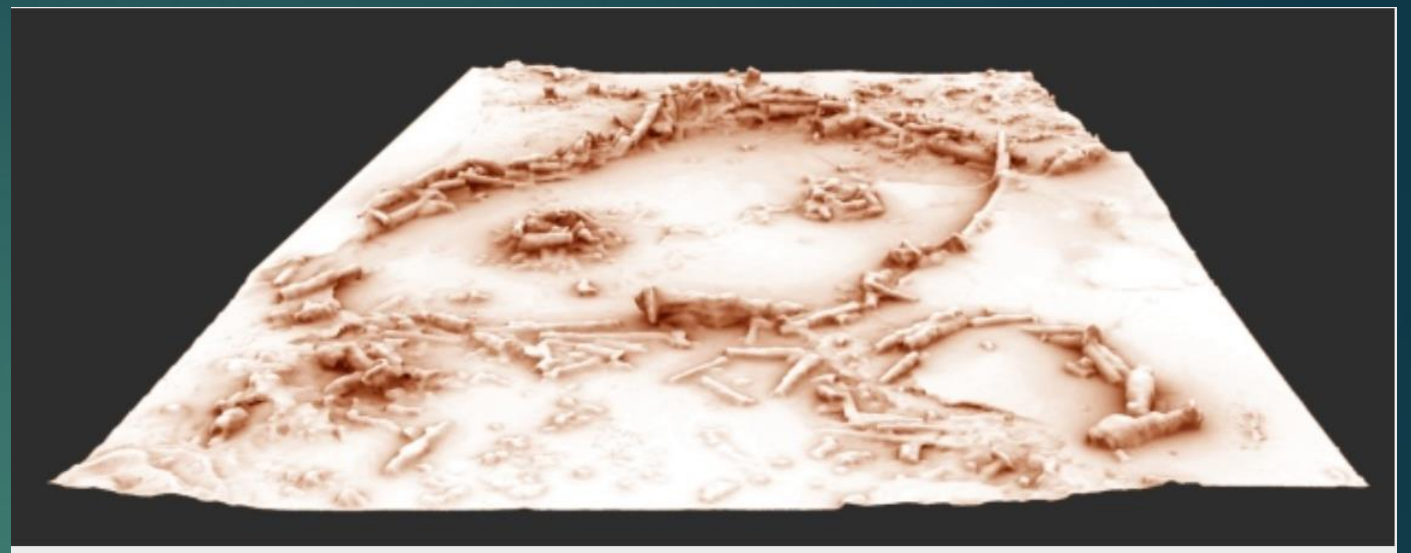
- The chamber contains no stone tools, human bones, or any other sign of permanent occupation, and besides, why build shelter *inside* a cave? A meeting place for some type of ritual social behavior?

- They broke rocks deliberately and arranged them precisely. They used fire, too. More than 120 fragments have red and black streaks that aren't found elsewhere in the chamber or the cave beyond. They were the result of deliberately applied heat, at intensities strong enough to occasionally crack the rock.
- "There must have been some other passage that collapsed."

Stalagmite circle by Ns



Jaubert et al. 2016.



Xavier MUTH - Get in Situ, Archéotransfert, Archéovision -SHS-3D, base photographique Pascal Mora

A 3D reconstruction of the structures in the Bruniquel Cave.

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