

References

Aktuell

ALTER 2021

Galit Alter et al., *Immunogenicity of Ad26.COV2.S vaccine against SARS-CoV-2 variants in humans.* [nature](#) **596** (2021), 268–272.

[DOI:10.1038/s41586-021-03681-2](https://doi.org/10.1038/s41586-021-03681-2).

The Ad26.COV2.S vaccine^{1–3} has demonstrated clinical efficacy against symptomatic COVID-19, including against the B.1.351 variant that is partially resistant to neutralizing antibodies¹. However, the immunogenicity of this vaccine in humans against SARS-CoV-2 variants of concern remains unclear. Here we report humoral and cellular immune responses from 20 Ad26.COV2.S vaccinated individuals from the COV1001 phase I–IIa clinical trial² against the original SARS-CoV-2 strain WA1/2020 as well as against the B.1.1.7, CAL.20C, P.1 and B.1.351 variants of concern. Ad26.COV2.S induced median pseudovirus neutralizing antibody titres that were 5.0-fold and 3.3-fold lower against the B.1.351 and P.1 variants, respectively, as compared with WA1/2020 on day 71 after vaccination. Median binding antibody titres were 2.9-fold and 2.7-fold lower against the B.1.351 and P.1 variants, respectively, as compared with WA1/2020. Antibody-dependent cellular phagocytosis, complement deposition and natural killer cell activation responses were largely preserved against the B.1.351 variant. CD8 and CD4 T cell responses, including central and effector memory responses, were comparable among the WA1/2020, B.1.1.7, B.1.351, P.1 and CAL.20C variants. These data show that neutralizing antibody responses induced by Ad26.COV2.S were reduced against the B.1.351 and P.1 variants, but functional non-neutralizing antibody responses and T cell responses were largely preserved against SARS-CoV-2 variants. These findings have implications for vaccine protection against SARS-CoV-2 variants of concern.

Galit Alter, Jingyou Yu, Jinyan Liu, Abishek Chandrashekar, Erica N. Borducchi, Lisa H. Tostanoski, Katherine McMahan, Catherine Jacob-Dolan, David R. Martinez, Aiquan Chang, Tochi Anioke, Michelle Lifton, Joseph Nkolola, Kathryn E. Stephenson, Caroline Atyeo, Sally Shin, Paul Fields, Ian Kaplan, Harlan Robins, Fatima Amanat, Florian Krammer, Ralph S. Baric, Mathieu Le Gars, Jerald Sadoff, Anne Marit de Groot, Dirk Heerwegh, Frank Struyf, Macaya Douoguih, Johan van Hoof, Hanneke Schuitemaker & Dan H. Barouch

BALL 2021

Philip Ball, *Surprise dip in UK Covid cases baffles researchers.* [nature](#) **596** (2021), 175–176.

Few researchers anticipated July’s sharp drop in recorded infections.

CALLAWAY 2021

Ewen Callaway, *Covid vaccine boosters, The most important questions.* [nature](#) **596** (2021), 178–180.

Concerns over waning immunity and SARS-CoV-2 variants have convinced some countries to deploy extra vaccine doses — but it’s not clear to scientists whether most people need them.

LIU 2021

Jianying Liu et al., *BNT162b2-elicited neutralization of B.1.617 and other SARS-CoV-2 variants.* *nature* **596** (2021), 273–275.

[DOI:10.1038/s41586-021-03693-y](https://doi.org/10.1038/s41586-021-03693-y).

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is continuing to evolve around the world, generating new variants that are of concern on the basis of their potential for altered transmissibility, pathogenicity, and coverage by vaccines and therapeutic agents^{1–5}. Here we show that serum samples taken from twenty human volunteers, two or four weeks after their second dose of the BNT162b2 vaccine, neutralize engineered SARS-CoV-2 with a USA-WA1/2020 genetic background (a virus strain isolated in January 2020) and spike glycoproteins from the recently identified B.1.617.1, B.1.617.2, B.1.618 (all of which were first identified in India) or B.1.525 (first identified in Nigeria) lineages. Geometric mean plaque reduction neutralization titres against the variant viruses—particularly the B.1.617.1 variant—seemed to be lower than the titre against the USA-WA1/2020 virus, but all sera tested neutralized the variant viruses at titres of at least 1:40. The susceptibility of the variant strains to neutralization elicited by the BNT162b2 vaccine supports mass immunization as a central strategy to end the coronavirus disease 2019 (COVID-19) pandemic globally.

Jianying Liu, Yang Liu, Hongjie Xia, Jing Zou, Scott C. Weaver, Kena A. Swanson, Hui Cai, Mark Cutler, David Cooper, Alexander Muik, Kathrin U. Jansen, Ugur Sahin, Xuping Xie, Philip R. Dormitzer & Pei-Yong Shi

PLANAS 2021

Delphine Planas et al., *Reduced sensitivity of SARS-CoV-2 variant Delta to antibody neutralization.* *nature* **596** (2021), 276–280.

[DOI:10.1038/s41586-021-03777-9](https://doi.org/10.1038/s41586-021-03777-9).

The SARS-CoV-2 B.1.617 lineage was identified in October 2020 in India^{1–5}. Since then, it has become dominant in some regions of India and in the UK, and has spread to many other countries⁶. The lineage includes three main subtypes (B.1.617.1, B.1.617.2 and B.1.617.3), which contain diverse mutations in the N-terminal domain (NTD) and the receptor-binding domain (RBD) of the SARS-CoV-2 spike protein that may increase the immune evasion potential of these variants. B.1.617.2—also termed the Delta variant—is believed to spread faster than other variants. Here we isolated an infectious strain of the Delta variant from an individual with COVID-19 who had returned to France from India. We examined the sensitivity of this strain to monoclonal antibodies and to antibodies present in sera from individuals who had recovered from COVID-19 (hereafter referred to as convalescent individuals) or who had received a COVID-19 vaccine, and then compared this strain with other strains of SARS-CoV-2. The Delta variant was resistant to neutralization by some anti-NTD and anti-RBD monoclonal antibodies, including bamlanivimab, and these antibodies showed impaired binding to the spike protein. Sera collected from convalescent individuals up to 12 months after the onset of symptoms were fourfold less potent against the Delta variant relative to the Alpha variant (B.1.1.7). Sera from individuals who had received one dose of the Pfizer or the AstraZeneca vaccine had a barely discernible inhibitory effect on the Delta variant. Administration of two doses of the vaccine generated a neutralizing response in 95% of individuals, with titres three- to fivefold lower against the Delta variant than against the Alpha variant. Thus, the spread of the Delta variant is associated with an escape from antibodies that target non-RBD and RBD epitopes of the spike protein.

Delphine Planas, David Veyer, Artem Baidaliuk, Isabelle Staropoli, Florence Guivel-Benhassine, Maaran Michael Rajah, Cyril Planchais, Françoise Porrot,

Nicolas Robillard, Julien Puech, Matthieu Prot, Floriane Gallais, Pierre Gantner, Aurélie Velay, Julien Le Guen, Najiby Kassis-Chikhani, Dhiaeddine Edriss, Laurent Belec, Aymeric Seve, Laura Courtellemont, H el ene P er e, Laurent Hocqueloux, Samira Fafi-Kremer, Thierry Prazuck, Hugo Mouquet, Timoth ee Bruel, Etienne Simon-Lori ere, Felix A. Rey & Olivier Schwartz

WANG 2021

Lingshu Wang et al., *Ultrapotent antibodies against diverse and highly transmissible SARS-CoV-2 variants.* [science 373 \(2021\), eabh1766.](#)

[DOI:10.1126/science.abh1766.](#)

[s373-eabh1766-Supplement.pdf](#)

The emergence of highly transmissible SARS-CoV-2 variants of concern (VOCs) that are resistant to therapeutic antibodies Highlights the need for continuing discovery of broadly reactive antibodies. We identified four receptor binding domain-targeting antibodies from three early-outbreak convalescent donors with potent neutralizing activity against 23 variants, including the B.1.1.7, B.1.351, P.1, B.1.429, B.1.526, and B.1.617 VOCs. Two antibodies are ultrapotent, with subnanomolar neutralization titers [halfmaximal inhibitory concentration (IC50) 0.3 to 11.1 nanograms per milliliter; IC80 1.5 to 34.5 nanograms per milliliter). We define the structural and functional determinants of binding for all four VOC-targeting antibodies and show that combinations of two antibodies decrease the in vitro generation of escape mutants, suggesting their potential in mitigating resistance development.

Lingshu Wang, Tongqing Zhou, Yi Zhang, Eun Sung Yang, Chaim A. Schramm, Wei Shi, Amarendra Pegu, Olamide K. Oloniniyi, Amy R. Henry, Samuel Darko, Sandeep R. Narpala, Christian Hatcher, David R. Martinez, Yaroslav Tsybovsky, Emily Phung, Olubukola M. Abiona, Avan Antia, Evan M. Cale, Lauren A. Chang, Misook Choe, Kizzmekia S. Corbett, Rachel L. Davis, Anthony T. DiPiazza, Ingelise J. Gordon, Sabrina Helmold Hait, Tandile Hermanus, Prudence Kgagudi, Farida Laboune, Kwanyee Leung, Tracy Liu, Rosemarie D. Mason, Alexandra F. Nazzari, Laura Novik, Sarah O’Connell, Sijy O’Dell, Adam S. Olia, Stephen D. Schmidt, Tyler Stephens, Christopher D. Stringham, Chloe Adrienna Talana, I-Ting Teng, Danielle A. Wagner, Alicia T. Widge, Baoshan Zhang, Mario Roederer, Julie E. Ledgerwood, Tracy J. Ruckwardt, Martin R. Gaudinski, Penny L. Moore, Nicole A. Doria-Rose, Ralph S. Baric, Barney S. Graham, Adrian B. McDermott, Daniel C. Douek, Peter D. Kwong, John R. Mascola, Nancy J. Sullivan & John Misasi

YUAN 2021

Meng Yuan et al., *Structural and functional ramifications of antigenic drift in recent SARS-CoV-2 variants.* [science 373 \(2021\), 818–823.](#)

[DOI:10.1126/science.abh1139.](#)

[s373-0818-Supplement.pdf](#)

Neutralizing antibodies (nAbs) elicited against the receptor binding site (RBS) of the spike protein of wild-type severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) are generally less effective against recent variants of concern. RBS residues Glu484, Lys417, and Asn501 are mutated in variants first described in South Africa (B.1.351) and Brazil (P.1). We analyzed their effects on angiotensin-converting enzyme 2 binding, as well as the effects of two of these mutations (K417N and E484K) on nAbs isolated from COVID-19 patients. Binding and neutralization of the two most frequently elicited antibody families (IGHV3-53/3-66 and IGHV1-2), which can both bind the RBS in alternative binding modes, are abrogated by K417N, E484K, or both. These effects can be structurally explained by

their extensive interactions with RBS nAbs. However, nAbs to the more conserved, cross-neutralizing CR3022 and S309 sites were largely unaffected. The results have implications for next-generation vaccines and antibody therapies.

Meng Yuan, Deli Huang, Chang-Chun D. Lee, Nicholas C. Wu, Abigail M. Jackson, Xueyong Zhu, Hejun Liu, Linghang Peng, Marit J. van Gils, Rogier W. Sanders, Dennis R. Burton, S. Momsen Reincke, Harald Prüss, Jakob Kreye, David Nemazee, Andrew B. Ward & Ian A. Wilson

Archäologie

BOCHKAREV 2021

V. S. Bochkarev, *Archaeology at the Crossroads between the Humanities and Natural Sciences*. *Vestnik of Saint Petersburg University. History* **66** (2021), 516–530.

In this study archaeological sites are defined as objects comprised of two major components. One of them is regarded as culturological, and the other one — as natural-historical. The first component is mainly represented by the artefacts, and thus it supplies cultural-historical information, examination and interpretation of which is one of the primary tasks of archaeology as a discipline of the humanities. The second component includes eco-facts, nature-facts and so-called cultural-natural objects. All of them have natural origin or were shaped under a strong influence of the natural environment, which makes it reasonable to deem this second component the basis for natural-scientific repository of archaeology. It provides materials for geological, palaeobotanical, palaeozoological, chemical and other researches. It must be strongly emphasized that such knowledge without a cultural-historical context has no purpose or focus. This article demonstrates that the natural-historical component is an integral part of any archaeological site. It is inseparable from the culturological component. A vivid material embodiment of the link between the two is provided by the cultural layer. Essentially, it is impossible to meaningfully examine the two components in isolation — independently of each other. As a result, the actual material archaeologists work with, its content and character place archaeology at the crossroads between the humanities and natural sciences. It is hoped that in the future it will develop as a multi-disciplinary subject with a prevalence of the humanitarian dimension.

Keywords: essence of archaeological sites | cultural-historical and natural-historical components of archaeological sites | archaeology as a multi-disciplinary subject.

Bibel

HÖFLMAYER 2021

Felix Höflmayer, Haggai Misgav, Lyndelle Webster & Katharina Streit, *Early alphabetic writing in the ancient Near East, The ‘missing link’ from Tel Lachish*. *Antiquity* **95** (2021), 705–719.

The origin of alphabetic script lies in second-millennium BC Bronze Age Levantine societies. A chronological gap, however, divides the earliest evidence from the Sinai and Egypt—dated to the nineteenth century BC—and from the thirteenth-century BC corpus in Palestine. Here, the authors report a newly discovered Late Bronze Age alphabetic inscription from Tel Lachish, Israel. Dating to the fifteenth century BC, this inscription is currently the oldest securely dated alphabetic inscription from the Southern Levant, and may therefore be regarded

as the ‘missing link’. The proliferation of early alphabetic writing in the Southern Levant should be considered a product of Levantine-Egyptian interaction during the mid second millennium BC, rather than of later Egyptian domination.

Keywords: Israel | Lachish | Late Bronze Age | early alphabet | epigraphy | radiocarbon dating

Biologie

WOOLLER 2021

Matthew J. Wooller et al., *Lifetime mobility of an Arctic woolly mammoth*. [science](#) **373** (2021), 806–808.

[s373-0806-Supplement.pdf](#)

Little is known about woolly mammoth (*Mammuthus primigenius*) mobility and range. Here we use high temporal resolution sequential analyses of strontium isotope ratios along an entire 1.7-meter-long tusk to reconstruct the movements of an Arctic woolly mammoth that lived 17,100 years ago, during the last ice age. We use an isotope-guided random walk approach to compare the tusk’s strontium and oxygen isotope profiles to isotopic maps. Our modeling reveals patterns of movement across a geographically extensive range during the animal’s ≈ 28 -year life span that varied with life stages. Maintenance of this level of mobility by megafaunal species such as mammoth would have been increasingly difficult as the ice age ended and the environment changed at high latitudes.

Matthew J. Wooller, Clement Bataille, Patrick Druckenmiller, Gregory M. Erickson, Pamela Groves, Norma Haubenstein, Timothy Howe, Johanna Irrgeher, Daniel Mann, Katherine Moon, Ben A. Potter, Thomas Prohaska, Jeffrey Rasic, Joshua Reuther, Beth Shapiro, Karen J. Spaleta & Amy D. Willis

Grabung

GEBHARD 2020

Rupert Gebhard & Rüdiger Krause, *Kritische Anmerkungen zum Fundkomplex der sog. Himmelsscheibe von Nebra*. [Archäologische Informationen](#) **43** (2020), 325–346.

Critical comments on the find complex of the so-called Nebra Sky Disk Abstract – The “Nebra Sky Disk” was reportedly discovered in 1999 as part of a hoard during an illegal excavation. In elaborate and long lasting investigations an attempt was made to verify both the reported site location and the affiliation of the objects independently from the information given by the finders. Yet, a critical examination of the published results by the authors does not allow the conclusion that the site investigated in a re-excavation is correct, nor that the ensemble itself fulfils the criteria of a closed find (hoard). On contrary, according to the excavation findings, the ensemble could not have been in situ at the site named. The scientific examination of the objects contradicts rather than confirms their belonging together. If the disk is considered – as required by these facts – as a single object, it cannot be integrated into the Early Bronze Age motif world. Instead, a chronological embedment into the first millennium BC seems most likely. On the basis of this overall assessment, all further conclusions and interpretations of the cultural context and the meaning of the Nebra disk that have been made so far will have to be subjected to a critical discussion.

Keywords: archaeology | sky disk | star disk | Nebra | hoard | Bronze Age | Pre-Roman Iron Age | Celts | eastern alpine copper | lead isotopes | tin isotopes

Die “Himmelsscheibe von Nebra” wurde 1999 angeblich als Bestandteil eines Hortfundes bei Raubgrabungen entdeckt. In aufwändigen und langjährigen Untersuchungen wurde versucht, sowohl die Zuweisung des angeblichen Fundortes als auch die Zusammengehörigkeit der Objekte unabhängig von den Angaben der Finder zu verifizieren. Eine kritische Betrachtung der publizierten Ergebnisse durch die Autoren lässt derzeit weder den Schluss zu, dass die in einer Nachgrabung untersuchte Fundstelle zutreffend wäre, noch dass das Ensemble selbst die Kriterien eines geschlossenen Fundes erfüllt. Vielmehr kann sich das Ensemble nach dem Grabungsbefund an der Fundstelle dort nicht in situ befinden haben. Die naturwissenschaftlichen Untersuchungen an den Objekten widersprechen eher einer Zusammengehörigkeit als dass sie eine solche bestätigen. Betrachtet man die Scheibe – wie dann geboten – als Einzelobjekt, lässt sie sich nicht in die frühbronzezeitliche Motivwelt einfügen, eine zeitliche Einordnung in das erste Jahrtausend v. Chr. erscheint am ehesten wahrscheinlich. Auf Grundlage dieser Gesamteinschätzung müssen sich alle bisherigen weiterführenden kulturgeschichtlichen Schlussfolgerungen und Interpretationen einer künftigen kritischen Diskussion stellen.

Keywords: Archäologie | Himmelsscheibe | Sternenscheibe | Nebra | Hortfund | Bronzezeit | Vorrömische Eisenzeit | Kelten | Ostalpines Kupfer | Bleiisotope | Zinnisotope

GEBHARD 2020

Rupert Gebhard & Rüdiger Krause, *Geschmiedeter Himmel oder gegossene Scheibe? Eine Ergänzung zu “Kritische Anmerkungen zum Fundkomplex der sog. Himmelsscheibe von Nebra”*. [Archäologische Informationen](#) **43** (2020), 347–356.

Klima

FROITZHEIM 2021

Nikolaus Froitzheim, Jaroslaw Majka & Dmitry Zastrozhnov, *Methane release from carbonate rock formations in the Siberian permafrost area during and after the 2020 heat wave*. [PNAS](#) **118** (2021), e2107632118.

Anthropogenic global warming may be accelerated by a positive feedback from the mobilization of methane from thawing Arctic permafrost. There are large uncertainties about the size of carbon stocks and the magnitude of possible methane emissions. Methane cannot only be produced from the microbial decay of organic matter within the thawing permafrost soils (microbial methane) but can also come from natural gas (thermogenic methane) trapped under or within the permafrost layer and released when it thaws. In the Taymyr Peninsula and surroundings in North Siberia, the area of the worldwide largest positive surface temperature anomaly for 2020, atmospheric methane concentrations have increased considerably during and after the 2020 heat wave. Two elongated areas of increased atmospheric methane concentration that appeared during summer coincide with two stripes of Paleozoic carbonates exposed at the southern and northern borders of the Yenisey-Khatanga Basin, a hydrocarbon-bearing sedimentary basin between the Siberian Craton to the south and the Taymyr Fold Belt to the north. Over the carbonates, soils are thin to nonexistent and wetlands are scarce. The maxima are thus unlikely to be caused by microbial methane from soils or wetlands. We suggest that gas hydrates in fractures and pockets of the carbonate rocks in the permafrost zone became unstable due to warming from the surface. This process may add unknown quantities of methane to the atmosphere in the near future.

Keywords: permafrost | thermogenic methane | gas hydrate | global warming | Siberia

Metallzeiten

DRIESSEN 2021

Jan Driessen, *Revisiting the Minoan palaces, Ritual commensality at Sissi*. *Antiquity* **95** (2021), 686–704.

Scholars have long hypothesised that the central courts of the elaborate Minoan complexes of Crete (c. 1950–1450 BC) were used for ritualised, communal gatherings. New archaeological evidence from the court centre at the site of Sissi offers unique insights into the social practices, regional history and political organisation of this Bronze Age island civilisation. The remains of consumption rituals practised at Sissi's central court, along with the absence of evidence for other specific functions, provide the basis for a more nuanced understanding of the role of different types of Minoan palace. Furthermore, deliberate incorporation of earlier ruins within the Sissi complex suggests that the social power of Minoan palaces drew, in part, on ancestral practices.

Keywords: Crete | Sissi | Bronze Age | Minoan | Santorini eruption | ritual

WHITELAW 2012

Todd Whitelaw, *The Urbanisation of Prehistoric Crete, Settlement Perspectives on Minoan State Formation*. In: ILSE SCHOEP, PETER TOMKINS & JAN DRIESSEN (Hrsg.), *Back to the Beginning, Reassessing Social and Political complexity on crete during the early and Middle Bronze Age*. (Oxford 2012), 114–176.

The settlement perspectives explored in this paper mobilise new data to address a long-debated question and help to define just when 'the beginning' was. A dramatic transformation in the possibilities for social organisation, with widespread implications throughout many aspects of Cretan life, took place late in the Prepalatial period. Analytically, it may be more justified and productive to view this rapid change, not as the culmination of a process initiated much earlier in EM II, but as the starting point of a process which continued well into, if not throughout, the Protopalatial period.

Methoden

BRINKMANN 2020

Johanna Brinkmann, *Arbeitsaufwandsberechnungen zu prähistorischen Bronzeartefakten, Methode, Ziele, Perspektiven, Grenzen*. In: VALESKA BECKER, JAN-HEINRICH BUNNEFELD, ANNELI O'NEILL, GISELA WOLTERMANN, HANS-JÜRGEN BEIER & RALPH EINICKE (Hrsg.), *Varia neolithica X – Go West! Kontakte zwischen Zentral- und Westeuropa, Beiträge AG Neolithikum und Bronzezeit 2017, 9. Deutscher Archäologiekongress, Mainz & Aktuelles Neolithforschung*. Beiträge zur Ur- und Frühgeschichte Mitteleuropas 91 (Langenweissbach 2020), 99–111.

The present article deals with energy expenditure calculations as a feasible analytical tool for the study of prehistoric bronze artefacts and societies which produced them. For the first time, energy expenditure calculations including all steps of the production process were conducted. The calculations are based on data taken from scientific publications on experimental bronze metallurgy. Additionally, a description of the copper and bronze production process is given on the basis of sources from the central European Bronze Age (2200–800 BC). The diachronic comparison of the energy expenditure invested in the production of different artefacts provides insights into the production of metal artefacts in different periods of the Bronze Age. The analysis shows that the energy expenditure for the production of copper and bronze artefacts in the Early Bronze Age differs considerably from that of the Middle and Late Bronze Age. The production of one copper axe weighing 200 grams using Early Bronze Age production techniques requires an average energy expenditure of 46 person hours, consuming 116 kilograms of wood. In contrast, the production of one tin bronze axe using Middle and Late Bronze Age technology needs an average energy expenditure of 36 person hours, consuming 90 kilograms of wood.

Keywords: Energy expenditure calculation | chaîne opératoire | metallurgy | Bronze Age | Central Europe

Im vorliegenden Beitrag werden Arbeitsaufwandsberechnungen als Methode zur Untersuchung prähistorischer Bronzegegenstände und der sie produzierenden Gesellschaften vorgestellt. Dabei werden erstmals Arbeitsaufwandsberechnungen für die gesamte Herstellungskette der Bronzemetallurgie vorgenommen. Die Berechnungen beruhen auf Zeitangaben, welche publizierten archäologischen Experimenten zur Bronzeherstellung entnommen wurden. Ergänzend dazu erfolgt eine Beschreibung der Herstellungsprozesse von Kupfer und Bronze anhand von Befunden aus der mitteleuropäischen Bronzezeit (2200–800 v. Chr.). Durch den diachronen Vergleich des Zeitaufwands für die Herstellung verschiedener Bronzeartefakte lassen sich Erkenntnisse zur Herstellung von Metallartefakten in unterschiedlichen Perioden der Bronzezeit gewinnen. Die Untersuchungen belegen, dass sich der Arbeitsaufwand für die Herstellung von Kupfer- und Bronzeartefakten in der Frühbronzezeit von dem in der Mittel- und Spätbronzezeit unterscheidet. So werden für die Herstellung eines 200 g schweren Kupferbeils mit frühbronzezeitlichen Techniken 46 Personenstunden bei einem Holzbedarf von 116 kg benötigt. Im Gegensatz dazu müssen für die Herstellung eines Beils aus Zinnbronze im mittel- bis spätbronzezeitlichen Verfahren nur 36 Personenstunden bei einem Holzbedarf von 90 kg aufgewendet werden.

Keywords: Arbeitsaufwandsberechnung | Chaîne Opératoire | Metallurgie | Bronzezeit | Mitteleuropa

Mittelpaläolithikum

LEDER 2021

Dirk Leder et al., *A 51,000-year-old engraved bone reveals Neanderthals' capacity for symbolic behaviour*. *Nature Ecology & Evolution* (2021), preprint, 1–17. DOI:10.1038/s41559-021-01487-z.

NatEcoEvo2021.08-Leder-Supplement.pdf

While there is substantial evidence for art and symbolic behaviour in early Homo sapiens across Africa and Eurasia, similar evidence connected to Neanderthals is sparse and often contested in scientific debates. Each new discovery is thus crucial for our understanding of Neanderthals' cognitive capacity. Here we report on the discovery of an at least 51,000-year-old engraved giant deer phalanx

found at the former cave entrance of Einhornhöhle, northern Germany. The find comes from an apparent Middle Palaeolithic context that is linked to Neanderthals. The engraved bone demonstrates that conceptual imagination, as a prerequisite to compose individual lines into a coherent design, was present in Neanderthals. Therefore, Neanderthal's awareness of symbolic meaning is very likely. Our findings show that Neanderthals were capable of creating symbolic expressions before *H. sapiens* arrived in Central Europe.

Dirk Leder, Raphael Hermann, Matthias Hüls, Gabriele Russo, Philipp Hoelzmann, Ralf Nielbock, Utz Böhner, Jens Lehmann, Michael Meier, Antje Schwalb, Andrea Tröller-Reimer, Tim Koddenberg & Thomas Terberger

Neolithikum

OTTONI 2021

Claudio Ottoni, Duan Borić & Emanuela Cristiani et al., *Tracking the transition to agriculture in Southern Europe through ancient DNA analysis of dental calculus*. *PNAS* **118** (2021), e2102116118.

[pnas118-e2102116118-Supplement.pdf](#)

Archaeological dental calculus, or mineralized plaque, is a key tool to track the evolution of oral microbiota across time in response to processes that impacted our culture and biology, such as the rise of farming during the Neolithic. However, the extent to which the human oral flora changed from prehistory until present has remained elusive due to the scarcity of data on the microbiomes of prehistoric humans. Here, we present our reconstruction of oral microbiomes via shotgun metagenomics of dental calculus in 44 ancient foragers and farmers from two regions playing a pivotal role in the spread of farming across Europe—the Balkans and the Italian Peninsula. We show that the introduction of farming in Southern Europe did not alter significantly the oral microbiomes of local forager groups, and it was in particular associated with a higher abundance of the species *Olsenella* sp. oral taxon 807. The human oral environment in prehistory was dominated by a microbial species, Anaerolineaceae bacterium oral taxon 439, that diversified geographically. A Near Eastern lineage of this bacterial commensal dispersed with Neolithic farmers and replaced the variant present in the local foragers. Our findings also illustrate that major taxonomic shifts in human oral microbiome composition occurred after the Neolithic and that the functional profile of modern humans evolved in recent times to develop peculiar mechanisms of antibiotic resistance that were previously absent.

Keywords: ancient DNA | dental calculus | metagenomics | Southern Europe

Claudio Ottoni, Duan Borić, Olivia Cheronet, Vitale Sparacello, Irene Dori, Alfredo Coppa, Dragana Antonović, Dario Vujević, T. Douglas Price, Ron Pinhasi & Emanuela Cristiani

Significance: The oral microbial community living in symbiosis with humans is a rich and diverse driver of health and disease that is strongly influenced by our ecology and lifestyle. However, its evolution across human prehistory remains elusive. By analyzing the DNA entrapped in archaeological dental calculus, we characterize the oral microbiomes of 44 prehistoric foragers and farmers from Southern Europe. We demonstrate that the genome of an oral bacteria diversified geographically and recorded one of the most dramatic changes in our biological and cultural history, the spread of farming. The transition to agriculture did not alter significantly the oral microbiome of ancient humans, whereas more significant changes occurred later in history, including the development of peculiar antibiotic resistance pathways.