

References

Anthropologie

GRABOWSKI 2018

Mark Grabowski, Kevin G. Hatala & William L. Jungers, *Body mass estimates of the earliest possible hominins and implications for the last common ancestor*. [Journal of Human Evolution](#) **122** (2018), 84–92.

A common chimpanzee-like size has significant implications for the locomotor modes of the Pan-Homo last common ancestor, strongly arguing against small-bodied models (e.g., the hylobatidian model; Keith, 1923; Tuttle, 1981) and providing less support for an above-branch arboreal quadruped (Straus, 1949; Lovejoy, 2009).

Many hypotheses regarding the paleobiology of the earliest possible hominins, *Orrorin tugenensis* and *Ardipithecus ramidus*, are dependent upon accurate body mass estimates for these taxa. While we have previously published body mass predictions for *Orrorin* and *Ardipithecus*, the accuracies of those estimates depend on the assumption that the postcranial skeletal dimensions and body masses of these taxa followed scaling patterns that were similar to those observed in modern humans. This assumption may not be correct because certain aspects of postcranial morphology in *Orrorin* and *Ardipithecus* differ from modern humans, and suggest that their overall body plans might be unique but more similar to modern non-human great apes than to modern humans. Here we present individual body mass predictions for *O. tugenensis* and *Ar. ramidus* assuming that they followed postcranial scaling patterns similar to those of chimpanzees. All estimates include individual prediction intervals as measures of uncertainty. In addition, we provide equations for predicting body mass from univariate postcranial measurements based on the largest sample ($n = 25$) yet compiled of common chimpanzee skeletons with known body masses, which is vital for calculating prediction intervals for individual fossils. Our results show that estimated body masses in *Orrorin* and *Ardipithecus* are generally larger when derived from a chimpanzee-like scaling pattern compared to estimates that assume a human-like pattern, though the prediction intervals of the two sets of estimates overlap. In addition, the more complete of the two known *Orrorin* femora has an overall scaling pattern that is more similar to common chimpanzees than to modern humans, supporting the application of a non-human great ape comparative model. Our new estimates fall near the male (*Ardipithecus*) average and in between the male and female averages (*Orrorin*) for wild-caught common chimpanzees. If a chimpanzee-like pattern of scaling between postcranial dimensions and body mass did exist in these earliest hominins, our results suggest the large body masses found in some early australopiths were already present in taxa near the origins of our lineage, and perhaps also in the Pan-Homo last common ancestor.

Keywords: Human evolution | Paleoanthropology | *Orrorin* | *Ardipithecus* | Last common ancestor

RYAN 2018

Timothy M. Ryan, Kristian J. Carlson, Adam D. Gordon, Nina Jablonski, Colin N. Shaw & Jay T. Stock, *Human-like hip joint loading*

in *Australopithecus africanus* and *Paranthropus robustus*. *Journal of Human Evolution* **121** (2018), 12–24.

Adaptations indicative of habitual bipedalism are present in the earliest recognized hominins. However, debate persists about various aspects of bipedal locomotor behavior in fossil hominins, including the nature of gait kinematics, locomotor variability across different species, and the degree to which various australopith species engaged in arboreal behaviors. In this study, we analyze variation in trabecular bone structure of the femoral head using a sample of modern humans, extant non-human hominoids, baboons, and fossil hominins attributed to *Australopithecus africanus*, *Paranthropus robustus*, and the genus *Homo*. We use mCT data to characterize the fabric anisotropy, material orientation, and bone volume fraction of trabecular bone to reconstruct hip joint loading conditions in these fossil hominins. Femoral head trabecular bone fabric structure in australopiths is more similar to that of modern humans and Pleistocene *Homo* than extant apes, indicating that these australopith individuals walked with humanlike hip kinematics, including a more limited range of habitual hip joint postures (e.g., a more extended hip) during bipedalism. Our results also indicate that australopiths have robust femoral head trabecular bone, suggesting overall increased loading of the musculoskeletal system comparable to that imposed by extant apes. These results provide new evidence of human-like bipedal locomotion in Pliocene hominins, even while other aspects of their musculoskeletal systems retain ape-like characteristics.

Keywords: Trabecular bone | Hominin evolution | Bipedalism | Anisotropy

Bibel

RITMEYER 2018

Leen Ritmeyer, *The Temple Mount in the Herodian Period (37 BC – 70 A.D.)*. *Bible History Daily* **2018**, Aug. 3. <<http://www.biblicalarchaeology.org/daily/biblical-sitesplaces/temple-at-jerusalem/the-temple-mount-in-theherodian-period/>>.

In 19 B.C. the master-builder, King Herod the Great, began the most ambitious building project of his life—the rebuilding of the Temple and the Temple Mount in lavish style. To facilitate this, he undertook a further expansion of the Hasmonean Temple Mount by extending it on three sides, to the north, west and south. Today’s Temple Mount boundaries still reflect this enlargement.

In 70 A.D., this splendid structure that had taken 46 years to build (John 2.20) was destroyed by the Romans. The only vestiges of the compound to survive the destruction were the four retaining walls that supported the Temple platform; the best known today is the Western Wall.

SNYDER 2016

Frankie Snyder, Gabriel Barkay & Zachi Dvira, *What the Temple Mount Floor Looked Like*. *Biblical Archaeology Review* **42** (2016), vi, 56–59.

The Temple Mount Sifting Project has recovered more than a hundred geometrically cut and polished stone tiles known as opus sectile, from which we learn how Jerusalem’s majestic Herodian Temple Mount was paved. Opus sectile floors were more prestigious than mosaic ones and were typically used in more important areas of buildings. Along with using frescoed walls, stucco decorations and elegantly carved columns, King Herod the Great (r. 37–4 B.C.E.) introduced this paving technique to Israel to decorate many of his palaces, including Masada, Jericho, Herodium and Cypros.

Datierung

BEN-TOR 2018

Daphna Ben-Tor, *The Sealings from the Administrative Unit at Tell Edfu, Chronological and Historical Implications*. In: IRENE FORSTNER-MÜLLER & NADINE MOELLER (Hrsg.), *The Hyksos Ruler Khyan and the Early Second Intermediate Period in Egypt: Problems and Priorities of Current Research, Proceedings Workshop Austrian Archaeological Institute and the Oriental Institute Chicago, Vienna July 4–5, 2014*. Ergänzungshefte zu den Jahresheften des Österreichischen Archäologischen Institutes 17 (Wien 2018), 83–90.

Considering the ceramic assemblages associated with these sealings, which display typical Upper Egyptian pottery of the late Middle Kingdom, the excavators suggested a possible overlap between the 13th and 15th Dynasties, and argued for considerably reducing the generally suggested chronological gap of at least 100 years between Sobekhotep IV and Khyan¹³. This assumption has implications on the chronological definition of the Second Intermediate Period, which challenges the generally accepted chronological range of this period.

Finding seal impressions made by significantly earlier scarabs is not surprising as it is consistent with the customary use of earlier scarabs both as amulets and as seals in almost every group found in Egypt and the Levant. In fact, the only excavated group of scarabs that did not include a single heirloom comes from the foundation deposits of Hatshepsut's mortuary temple at Deir el-Bahri⁵⁵. Almost all other groups whether comprising scarabs or seal impressions in Egypt or the Levant include examples earlier than the contexts in which they were found.

Considering all the above, it is a methodological oversight to draw chronological conclusions based on the existence of scarabs or seal impressions of different periods in the same archaeological context.

EHRlich 2018

Yael Ehrlich, Lior Regev & Elisabetta Boaretto, *Radiocarbon analysis of modern olive wood raises doubts concerning a crucial piece of evidence in dating the Santorini eruption*. *Scientific Reports* 8 (2018), 11841. DOI:10.1038/s41598-018-29392-9.

SciRep08-11841-Supplement.pdf

Charred olive wood is abundant in the archaeological record, especially around the Mediterranean. As the outermost ring closest to the bark is assumed to represent the latest time that the tree was alive, the radiocarbon date obtained from the outermost rings of an olive branch buried during the Santorini volcanic eruption is regarded as crucial evidence for the date of this cataclysmic event. The date of this eruption has far reaching consequences in the archaeology of the Aegean, Egypt and the Levant, and the understanding of their interconnections. We analyzed the radiocarbon concentrations in crosssections from a modern olive tree trunk as well as from a living branch, and obtained near-annual resolution dates using the radiocarbon “bomb peak”. In both cases we show that radiocarbon dates of the last formed wood along the circumference are not chronologically homogenous, and can differ by up to a few decades. Thus the outermost wood layer does not necessarily represent the date of the last year of growth. These findings challenge the interpretation of the results obtained from dating the olive branch from the Santorini volcanic eruption, as it could predate the eruption by a few decades. In addition, our results are also significant for any future studies based on archaeologically preserved olive wood.

FORSTNER-MÜLLER 2018

Irene Forstner-Müller & Chiara Reali, *King Khyan and Avaris, Some Considerations Concerning Khyan Seal Impressions from Area R/III at Tell el-Dab'a*. In: IRENE FORSTNER-MÜLLER & NADINE MOELLER (Hrsg.), *The Hyksos Ruler Khyan and the Early Second Intermediate Period in Egypt: Problems and Priorities of Current Research, Proceedings Workshop Austrian Archaeological Institute and the Oriental Institute Chicago, Vienna July 4–5, 2014*. Ergänzungshefte zu den Jahreshften des Österreichischen Archäologischen Institutes 17 (Wien 2018), 91–123.

Not a single Khyan sealing found at Tell el-Daba was from a primary context. This is true for both area R/III and for the so-called Khyan's palace in area F/II. The Khyan contexts found in the latter area are not connected directly to the phases of this large building. Even if they were found in good or contemporary contexts, this would not allow an ad-hoc dating of the structure, as royal name sealings are often found in later periods and contexts and therefore do not necessarily permit the connection of buildings with kings.

In consideration of the these issues, it may be concluded that the available data about Khyan are insufficient or not sufficiently comprehensible to rely completely on them. Therefore caution is required in attributing a specific position to this king for measuring and corroborating absolute chronologies.

HÖFLMAYER 2018

Felix Höflmayer, *An Early Date for Khyan and Its Implications for Eastern Mediterranean Chronologies*. In: IRENE FORSTNER-MÜLLER & NADINE MOELLER (Hrsg.), *The Hyksos Ruler Khyan and the Early Second Intermediate Period in Egypt: Problems and Priorities of Current Research, Proceedings Workshop Austrian Archaeological Institute and the Oriental Institute Chicago, Vienna July 4–5, 2014*. Ergänzungshefte zu den Jahreshften des Österreichischen Archäologischen Institutes 17 (Wien 2018), 143–171.

To conclude this somewhat lengthy treatment of mid-2nd millennium B.C. Eastern Mediterranean chronology: The reassessment of Khyan's place in the sequence of Second Intermediate Period rulers based on the occurrence of his seal impressions together with kings of the 13th Dynasty in Tell el-Dab'a and Tell Edfu and the radiocarbon sequence for Tell el-Dab'a solves the last (archaeological) problem of the High radiocarbon-based chronology for the Aegean Bronze Age. The new high date for Khyan, contemporary with the late 13th Dynasty is corroborated by radiocarbon data from Tell el-Dab'a and Tell Edfu and makes the Middle Minoan III context of the Khyan-lid at Knossos a valid terminus post quem for the start of the Late Bronze Age in the Aegean basin and thus for the Minoan Santorini eruption, dateable to the late 17th century B.C.

SCHNEIDER 2018

Thomas Schneider, *Khyan's Place in History, A New Look at the Chronographic Tradition*. In: IRENE FORSTNER-MÜLLER & NADINE MOELLER (Hrsg.), *The Hyksos Ruler Khyan and the Early Second Intermediate Period in Egypt: Problems and Priorities of Current Research, Proceedings Workshop Austrian Archaeological Institute and*

the Oriental Institute Chicago, Vienna July 4–5, 2014. Ergänzungshefte zu den Jahreshften des Österreichischen Archäologischen Institutes 17 (Wien 2018), 277–285.

The basic hypothesis that spurred this workshop is a proposed contemporaneity or close chronological proximity of king Sobekhotep IV of the 13th Dynasty and the 15th Dynasty Hyksos Khyan (correct ‘Khayran’), suggested by the presence of seals of the two rulers within the same closed archaeological context at Edfu. A corollary hypothesis to facilitate this synchronism is to place Khyan early and not late in the 15th Dynasty. The chronological implications of this new hypothesis would be significant, including a larger overlap of the two dynasties than traditionally assumed, a possible shortening of the Second Intermediate Period, and new parameters for its overall political situation.

In what follows I will present three different chronological scenarios. The first one is negative, forcing us to conclude that a proposed contemporaneity or close chronological proximity of king Sobekhotep IV of the 13th and king Khyan of the 15th Dynasty is precluded by the known data. By adjusting one key parameter, I will then suggest two alternative scenarios. They will, on the very contrary, determine that a close proximity or contemporaneous rule of the two kings is indeed feasible, that this is in accordance with the evidence, and thus historically coherent.

Energie

CHA 2018

Junyoung Cha, Young Suk Jo, Hyangsoo Jeong, Jonghee Han, Suk Woo Nam, Kwang Ho Song & Chang Won Yoon, *Ammonia as an efficient CO_x-free hydrogen carrier, Fundamentals and feasibility analyses for fuel cell applications. Applied Energy 224 (2018), 194–204.*

Highlights:

- Pelletized Ru/La-Al₂O₃ catalysts have superior NH₃ dehydrogenation activity.
- The CO_x-free H₂ generator is integrated to produce hydrogen on demand from NH₃.
- The H₂ generator powers a 1 kW-class fuel cell without performance degradation.
- Reformer efficiency of >84% is achieved by recirculating H₂ from a fuel cell.
- A potential H₂ storage density of the system is ca. 7.0 wt% (system based).

A CO_x-free 1 kW-class hydrogen power pack fueled by liquid ammonia is presented. For applications in a practical-scale hydrogen production system in conjunction with a polymer electrolyte membrane fuel cell, Ru catalysts supported on La-doped alumina (Ru/La(x)-Al₂O₃) were pelletized by varying the lanthanum doping content (x mol%) to control catalytic activities. An optimized Ru(1.06 wt%)/La(20)-Al₂O₃ pellet catalyst presents a >99.7% conversion efficiency at 500 °C under a gas hourly space velocity of 5000 mL g_{cat}⁻¹ h⁻¹. Various materials were screened to remove residual ammonia from the product stream, and the X zeolite was chosen as a highly capable adsorbent. Based on the synthesized catalyst and screened adsorbent, a power pack consisting of a dehydrogenation reactor, an adsorbent tower, and a 1 kW-class polymer electrolyte membrane fuel cell was designed and manufactured. The as-integrated system can convert 9 L min⁻¹ of ammonia into 13.4 L min⁻¹ of hydrogen, powering a 1 kW-class fuel-cell continuously for >2 h without any performance degradation. To achieve autothermal and CO_x-free operations, heat required for ammonia dehydrogenation was provided by unutilized hydrogen from the fuel cell, drastically increasing the overall efficiency of the system to >49% while removing the external heat source, isobutane. Finally, a drone tethered to the system was operated, demonstrating the feasibility of an

elongated flight time of >4 h, much longer than 14 min with Lipolymer battery loaded on the drone. The system is expected to meet the United States Department of Energy's 2020 gravimetric and volumetric hydrogen storage targets of 4.5 wt % and 30 gH₂ L⁻¹ at system weights of 43 kg and 50 kg, respectively.

Keywords: Ammonia dehydrogenation | Hydrogen storage | Energy storage | Catalysis | Carbon-free energy conversion | Fuel-cell

NESHUMAYEV 2018

Dmitri Neshumayev, Leo Rummel, Alar Konist, Arvo Ots & Teet Parve, *Power plant fuel consumption rate during load cycling*. [Applied Energy](#) **224** (2018), 124–135.

Highlights:

- The fuel consumption rate during the load cycling is experimentally determined.
- The experimental method of fuel consumption rate online measurement is introduced.
- The method is validated by performing large-scale tests on a 200MWel power unit.
- The relative changes in fuel consumption rate are compared to previous studies.

A major challenge in the modern power system is the load cycling (ramping down and up) of thermal power plants due to the increase in electricity production from renewable power plants and other sources. The motivation for this paper is to quantify the effect of this on fuel consumption and as a result, variable costs. In this study, an experimental method for determining the fuel flow rate and corresponding power unit characteristics in a load-ramping operating regime was introduced and experimentally tested. The method is based on the static pressure drop of flue gas flowing through some convective heating surfaces of a boiler being proportional to the gas velocity, that is, in turn, proportional to the mass fuel rate. Therefore, after measuring the pressure drop during a steady-state regime, for example, in a tubular air preheater as the heat surface that is less susceptible to contamination from particle laden gas flow, and at the same time calculating the fuel mass flow rate through an indirect heat balance, the two parameters can be interrelated. The semi-empirical relationship obtained in this way can then be used for determining the actual fuel mass flow rate during transient boiler loads. The proposed method was used to determine the technical and economical characteristics of a pulverized combustion power unit utilizing oil-shale. Large-scale experiments were conducted in a high-pressure pulverized combustion steam generator TP-101, with a rated capacity of 300 MWth. The dual-boiler unit load ramping was constrained to 2.5MWel/min. The results show that during ramping down the load to 50 % maximum continuous rating, the mean fuel consumption decreased by 10 %, and during ramp-up back to 100 % maximum continuous rating, the mean fuel consumption increased by 14 %. The total increase in fuel consumption during ramping cycle at given conditions, was approximately 4 %.

Keywords: Power plant cycling | Large-scale dynamic experiments | Load cycling | Fuel consumption | Boiler transient operation

Judentum

DEXINGER 1992

FERDINAND DEXINGER & REINHARD PUMMER (Hrsg.), *Die Samaritaner*. Wege der Forschung 604 (Darmstadt 1992).

Kultur

FORTH 2018

Gregory Forth, *Elderly People Growing Tails, The Constitution of a Nonempirical Idea*. [Current Anthropology 59 \(2018\), 397–414](#).

Since the inception of the discipline, anthropologists have endeavored to explain why people the world over develop ideas that lack empirical support and how such ideas are accepted as true. This article deals with a claim found among the Nage people of eastern Indonesia, namely, that extremely elderly people grow tails. The idea is discussed in relation to local experiences of aging and the elderly and in relation to cosmological beliefs with which it appears consistent, and it is further analyzed in the context of Nage folk biology. By drawing on cognitivist theory, it is then demonstrated how the representation comprises a counterintuitive idea that readily combines with intuitive knowledge relating to observable processes of physical change in elderly humans. Also discussed are a notional taboo on looking at the putative tails that reinforces the belief, in part by adding to its counterintuitive appeal, and the idea's potential for enabling younger people to distance themselves ontologically from senility.

ROWLANDS 2018

Michael Rowlands & Dorian Q. Fuller, *Deconstructing Civilisation, A 'Neolithic' Alternative*. In: KRISTIAN KRISTIANSEN, THOMAS LINDKVIST & JANKEN MYRDAL (Hrsg.), *Trade and Civilisation, Economic Networks and Cultural Ties, from Prehistory to the Early Modern Era*. ([Cambridge 2018](#)), 172–194.

In a world systems perspective, these interactions and 'trade routes' between Africa, the Gulf Region, and India by the end of the third or early second millennium BC would be seen as either periphery or semiperiphery to the urban centres of Mesopotamia and Egypt. But this would be the wrong perspective. There is increasing evidence of the independence of these networks. Their origin does not require any prior involvement in trade with the urban Bronze Age centres of Southern Mesopotamia.

It requires another perspective to know exactly how what appears to be long-distance exchanges between small-scale agro-pastoral societies in the African Sahel linked to i shing/ seafaring communities on the Arabian Sea coasts and hunter-gatherer communities on the West Indian coasts would encourage commitment to long-distance movements and transport of probably highly valued ritual and exotic substances and their preservation outside of any complex urban-based mercantile systems. In other words, the Africa-India and Southeast Asia corridors – including both earlier coastal and, later, direct trans-Indian Ocean routes that brought the island Southeast Asian products (plantains, bananas, taro, and chickens) and Austronesian speakers to the East African coast and Madagascar – were 'Neolithic' and self-contained rather than a peripheral product of Bronze Age urban systems.

SNOECK 2018

Christophe Snoeck et al., *Strontium isotope analysis on cremated human remains from Stonehenge support links with west Wales*. [Scientific Reports 8 \(2018\), 10790](#). DOI:10.1038/s41598-018-28969-8.

Christophe Snoeck, John Pouncett, Philippe Claeys, Steven Goderis, Nadine Mattielli, Mike Parker Pearson, Christie Willis, Antoine Zazzo, Julia A. Lee-Thorp & Rick J. Schulting

Cremated human remains from Stonehenge provide direct evidence on the life of those few select individuals buried at this iconic Neolithic monument. The practice of cremation has, however, precluded the application of strontium isotope analysis of tooth enamel as the standard chemical approach to study their origin. New developments in strontium isotopic analysis of cremated bone reveal that at least 10 of the 25 cremated individuals analysed did not spend their lives on the Wessex chalk on which the monument is found. Combined with the archaeological evidence, we suggest that their most plausible origin lies in west Wales, the source of the bluestones erected in the early stage of the monument's construction. These results emphasise the importance of inter-regional connections involving the movement of both materials and people in the construction and use of Stonehenge.

Mesolithikum

HOLST 2018

Daniela Holst, *Als sich von Nüssen und Fischen gut leben ließ, Kölner Forschungen zur Mittelsteinzeit in Norddeutschland*. In: JÜRGEN RICHTER (Hrsg.), *111 Jahre Prähistorische Archäologie in Köln*. Kölner Studien zur Prähistorischen Archäologie 9 ([Rahden 2018](#)), 131–139.

Metallzeiten

MARAN 2008

Joseph Maran, *Nach dem Ende, Tiryns – Phönix aus der Asche*. In: BADISCHES LANDESMUSEUM KARLSRUHE (Hrsg.), *Zeit der Helden – Die „dunklen Jahrhunderte“ Griechenlands 1200–700 v. Chr. Katalog zur Ausstellung im Badischen Landesmuseum Schloss Karlsruhe 25. 10. 2008–15. 2. 2009*. ([Karlsruhe 2008](#)), 63–73.

Um 1200 v. Chr.: Die mykenischen Paläste liegen zerstört und verlassen – so glaubte man bis vor Kurzem. Neue Forschungen haben dieses Bild jedoch revidiert. Nicht nur, dass die Kulturentwicklung im 12. Jahrhundert v. Chr. von Landschaft zu Landschaft sehr unterschiedlich verlief – einem Palastort stand nach seinem Ende sogar eine geradezu atemberaubende Entwicklung bevor.

MARAN 2016

Joseph Maran & Alkestis Papadimitriou, *Gegen den Strom der Geschichte, Die nördliche Unterstadt von Tiryns: ein gescheitertes Urbanisierungsprojekt der mykenischen Nachpalastzeit*. [Archäologischer Anzeiger 2016](#), ii, 19–118.

Against the Currents of History. The Northern Lower Town of Tiryns: An Aborted Urbanization Project of the Mycenaean Post-Palatial Period

The 12th cent. B.C. was a period during which Tiryns developed differently than all other former Mycenaean palatial centers since it expanded, while the latter were shrinking or were even abandoned. Aside from the Upper Citadel, this unusual dynamic is most clearly reflected in the Northern Lower Town. Results of a new research project focusing on the Northwestern Lower Town indicate that, starting with the earliest part of LH IIIC, a new quarter was created whose foundation is likely to have brought a final palatial master plan to a conclusion. It

seems that just two generations after the destruction of the palace the systematic development of the Northern Lower Town stalled and eventually was abandoned. In this way, a process of urbanization that bears a certain resemblance to town planning in 12th cent. B.C. Cyprus came to an end. Thus, the period in which Tiryns developed ‘against the currents of history’ seems to have passed its zenith long before the end of the post-palatial period.

Keywords: Tiryns | Lower Town | Mycenaean period | post-palatial period | Late Helladic IIIC | cultural transformation | urbanization | cultural practice | early Iron Age

Das 12. Jh. v. Chr. war ein Abschnitt, während dem sich Tiryns gegenläufig zu allen anderen vormaligen mykenischen Palastzentren entwickelte, indem es expandierte, als diese schrumpften oder sogar verlassen wurden. Es gibt, abgesehen von der Oberburg, keinen anderen Siedlungsteil, in dem sich diese außergewöhnliche Dynamik derart klar manifestiert wie in der nördlichen Unterstadt. Ergebnisse eines neuen Forschungsprojekts in der nordwestlichen Unterstadt zeigen, dass dort ab dem frühesten Abschnitt von SH IIIC ein neuer Siedlungsteil entstand, dessen Gründung einen endpalastzeitlichen ‘Masterplan’ zu Ende geführt haben dürfte. Die unmittelbar nach der Zerstörung des Palastes eingeleitete systematische Erschließung der nördlichen Unterstadt scheint schon nach rund zwei Generationen ins Stocken geraten zu sein, was dazu führte, dass ein Prozess der Urbanisierung, der durchaus mit zyprischen Stadtplanungen des 12. Jhs. v. Chr. vergleichbar ist, beendet wurde. Der Zeitabschnitt, in dem Tiryns sich ‘gegen den Strom der Geschichte’ entwickelt hat, scheint damit bereits lange vor dem Ende der mykenischen Nachpalastzeit seinen Zenit überschritten zu haben.

Keywords: Tiryns | Unterstadt | Mykenische Zeit | Nachpalastzeit | Späthelladisch IIIC | Kulturwandel | Urbanisierung | kulturelle Praxis | Frühe Eisenzeit
mit Beiträgen von Daniel Fallu, Virginia García-Díaz, Annelou van Gijn, Raphael Kahlenberg, Peggy Morgenstern, Tyede H. Schmidt-Schultz, Michael Schultz und Ruth Shahack-Gross

Neolithikum

BERTHON 2018

Rémi Berthon, Lenka Kovaèiková, Anne Tresset & Marie Balasse, *Integration of Linearbandkeramik cattle husbandry in the forested landscape of the mid-Holocene climate optimum, Seasonal-scale investigations in Bohemia. Journal of Anthropological Archaeology* **51** (2018), 16–27.

Domestic animals and plants were introduced to Europe from the Near East and subsequently spread across Europe, entailing adaptations to different environments with consequences for the biology of organisms, agropastoral technical systems and socio-economic organisation. Agriculture was introduced to Central Europe by Linearbandkeramik (LBK) societies between 5600 and 4900 cal. BC, in predominantly forested environments. LBK farming systems involved intensive permanent field cultivation in natural openings. Milking was practiced as evidenced from cattle mortality profiles and lipid residues in ceramics. Questions arise as to what extent LBK cattle husbandry relied on woodland, and as to whether the seasonal scarcity of fodder conditioned cattle reproduction cycles, with consequences on milk availability. Results from the $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ analysis of cattle tooth enamel at Chotibudice and Èerný Vùl (Bohemia, Czech Republic) suggest a limited use of dense forest for cattle herding, even on a seasonal scale: cattle were kept in the open component of the forest/steppe mosaic landscape. Winter forest

browsing/provision of leafy fodder was evidenced in one specimen. At Chotibudice, cattle births mainly occurred over a two to three-month period, suggesting environmental constraints on cattle fertility cycles, and possibly seasonal fodder scarcity. A direct consequence of this would be a shorter period of milk availability throughout the year.

Keywords: Linearbandkeramik | Cattle | Birth seasonality | Forest | Enamel | Carbon isotopes | Oxygen isotopes | Chotibudice | Èerný Vùl | Czech Republic

Physik

ARNDT 1999

Markus Arndt, Olaf Nairz, Julian Vos-Andreae, Claudia Keller, Gerbrand van der Zouw & Anton Zeilinger, *Wave-particle duality of C₆₀ molecules*. [nature 401 \(1999\), 680–682](#).

Quantum superposition lies at the heart of quantum mechanics and gives rise to many of its paradoxes. Superposition of de Broglie matter waves¹ has been observed for massive particles such as electrons², atoms and dimers³, small van der Waals clusters⁴, and neutrons⁵. But matter wave interferometry with larger objects has remained experimentally challenging, despite the development of powerful atom interferometric techniques for experiments in fundamental quantum mechanics, metrology and lithography⁶. Here we report the observation of de Broglie wave interference of C₆₀ molecules by diffraction at a material absorption grating. This molecule is the most massive and complex object in which wave behaviour has been observed. Of particular interest is the fact that C₆₀ is almost a classical body, because of its many excited internal degrees of freedom and their possible couplings to the environment. Such couplings are essential for the appearance of decoherence^{7,8}, suggesting that interference experiments with large molecules should facilitate detailed studies of this process.

BOHM 1952

David Bohm, *A Suggested Interpretation of the Quantum Theory in Terms of “Hidden” Variables. I*. [Physical Review 85 \(1952\), 166–179](#).

[PhysRev085-0166-Comment.pdf](#)

The usual interpretation of the quantum theory is self-consistent, but it involves an assumption that cannot be tested experimentally, *ms.*, that the most complete possible specification of an individual system is in terms of a wave function that determines only probable results of actual measurement processes. The only way of investigating the truth of this assumption is by trying to find some other interpretation of the quantum theory in terms of at present “hidden” variables, which in principle determine the precise behavior of an individual system, but which are in practice averaged over in measurements of the types that can now be carried out. In this paper and in a subsequent paper, an interpretation of the quantum theory in terms of just such “hidden” variables is suggested. It is shown that as long as the mathematical theory retains its present general form, this suggested interpretation leads to precisely the same results for all physical processes as does the usual interpretation. Nevertheless, the suggested interpretation provides a broader conceptual framework than the usual interpretation, because it makes possible a precise and continuous description of all processes, even at the quantum level. This broader conceptual framework allows more general mathematical formulations of the theory than those allowed by the usual interpretation. Now, the usual mathematical formulation seems to lead to insoluble difficulties when it is extrapolated into the domain of distances of the order of 10⁻¹⁰ cm or less. It is therefore entirely

possible that the interpretation suggested here may be needed for the resolution of these difficulties. In any case, the mere possibility of such an interpretation proves that it is not necessary for us to give up a precise, rational, and objective description of individual systems at a quantum level of accuracy.

BOHM 1952

David Bohm, *A Suggested Interpretation of the Quantum Theory in Terms of “Hidden” Variables. II.* [Physical Review **85** \(1952\), 180–193.](#)

[PhysRev085-0166-Comment.pdf](#)

In this paper, we shall show how the theory of measurements is to be understood from the point of view of a physical interpretation of the quantum theory in terms of hidden variables developed in a previous paper. We find that in principle, these “hidden” variables determine the precise results of each individual measurement process. In practice, however, in measurements that we now know how to carry out, the observing apparatus disturbs the observed system in an unpredictable and uncontrollable way, so that the uncertainty principle is obtained as a practical limitation on the possible precision of measurements. This limitation is not, however, inherent in the conceptual structure of our interpretation. We shall see, for example, that simultaneous measurements of position and momentum having unlimited precision would in principle be possible if, as suggested in the previous paper, the mathematical formulation of the quantum theory needs to be modified at very short distances in certain ways that are consistent with our interpretation but not with the usual interpretation.

We give a simple explanation of the origin of quantum-mechanical correlations of distant objects in the hypothetical experiment of Einstein, Podolsky, and Rosen, which was suggested by these authors as a criticism of the usual interpretation. Finally, we show that von Neumann’s proof that quantum theory is not consistent with hidden variables does not apply to our interpretation, because the hidden variables contemplated here depend both on the state of the measuring apparatus and the observed system and therefore go beyond certain of von Neumann’s assumptions.

In two appendixes, we treat the problem of the electromagnetic field in our interpretation and answer certain additional objections which have arisen in the attempt to give a precise description for an individual system at the quantum level.

KELLER 1953

Joseph B. Keller, *Bohm’s Interpretation of the Quantum Theory in Terms of “Hidden” Variables.* [Physical Review **89** \(1953\), 1040–1041.](#)

An analysis of Bohm’s theory, emphasizing the role of probability in it, is presented.

The conclusion is that Bohm’s interesting interpretation of quantum mechanics, based on the introduction of “hidden” variables, is not an ordinary statistical mechanics of a deterministic theory, unless Eq. (10) can be shown to follow from the other postulates. If not, the theory involves probability in an additional and deeper manner, expressed by Eq. (10). However, if Eq. (10) ‘can be deduced from the other postulates of the theory, as Bohm contends in his latest paper, then probability enters the theory just as in any statistical mechanics.

RAE 1999

Alastair I. M. Rae, *Waves, particles and fullerenes.* [nature **401** \(1999\), 651–653.](#)