Liste erstellt am 2015-04-03

References

Aktuell

Algara-Siller 2015

G. Algara-Siller, O. Lehtinen, F. C. Wang, R. R. Nair, U. Kaiser, H. A.Wu, A. K. Geim & I. V. Grigorieva, *Square ice in graphene nanocapillaries*. nature **519** (2015), 443–445.

n519-0443-Supplement.mov

Bulk water exists in many forms, including liquid, vapour and numerous crystalline and amorphous phases of ice, with hexagonal ice being responsible for the fascinating variety of snowflakes. Much less noticeable but equally ubiquitous is water adsorbed at interfaces and confined in microscopic pores. Such low-dimensional water determines aspects of various phenomena inmaterials science, geology, biology, tribology and nanotechnology.Theorysuggestsmanypossible phases for adsorbed and confined water, but it has proved challenging to assess its crystal structure experimentally. Here we report high-resolutionelectronmicroscopy imaging of water locked between two graphene sheets, an archetypal example of hydrophobic confinement. The observations show that the nanoconfined water at room temperature forms 'square ice'—a phase having symmetry qualitatively different from the conventional tetrahedral geometry of hydrogen bonding between watermolecules. Square ice has a high packing density with a lattice constant of 2.83 Å and can assemble in bilayer and trilayer crystallites. Molecular dynamics simulations indicate that square ice should be present inside hydrophobic nanochannels independently of their exact atomic nature.

Gibbons 2015

Ann Gibbons, *Deep roots for the genus Homo*. science **347** (2015), 1056–1057.

Hamilton 2015

Andrew J. Hamilton, Robert M. May & Edward K. Waters, *Here be dragons*. nature **520** (2015), 42–43.

Emerging evidence indicates that dragons can no longer be dismissed as creatures of legend and fantasy, and that anthropogenic effects on the world's climate may inadvertently be paving the way for the resurgence of these beasts.

Many ectothermic beasts enter a period of brumation (analogous to hibernation in endotherms) under adverse food and climatic conditions. The Great Sleep coincided with what is generally referred to as the Little Ice Age (Fig. 2). Historical records demonstrate that this period was a time of relative peace, at least with regard to dragon attacks.

Hilfinger 2015

Andreas Hilfinger & Johan Paulsson, *Defiant daughters and coordinated cousins*. nature **519** (2015), 422–423.

Genetically identical cells can have many variable properties. A study of correlations between cells in a lineage explains paradoxical inheritance laws, in which mother and daughter cells seem less similar than cousins.

Some traits, such as table manners or verbal tics, may run in the family; others, such as a passion for science or the law, might generate rebellion in the next generation. Repeated defiance could even cause behavioural traits to skip a generation, so that a child's apparent rebellion turns out to be an unconscious copying of a grandparent. Rebellious cells are harder to imagine...

Contrary to [the] expectation, observations indicate that the time it takes one cell to become two — its doubling time — can show a stronger correlation between cousins than between mother-daughter pairs. It has been unclear whether this surprising result reflects the fact that cells born at different times are exposed to different conditions, just as the teenagers of the 1980s behaved differently from those of the 1990s. But the current study demonstrates that, under tightly controlled conditions, the phenomenon persists. Simple inheritance laws seem to imply that this is impossible: if doubling times become uncorrelated in a single generation, how can they persist between cousins, which are separated by four generations of growth?

Normile 2015

Dennis Normile, *Muons probe Fukushima's ruins*. science **347** (2015), 1052–1053.

Unsung imaging technique deployed to find uranium debris in reactors.

Sandler 2015

Oded Sandler, Sivan Pearl Mizrahi, Noga Weiss, Oded Agam, Itamar Simon & Nathalie Q. Balaban, *Lineage correlations of single cell division time as a probe of cell-cycle dynamics*. nature **519** (2015), 468–471.

n519-0468-Supplement.pdf

Stochastic processes in cells are associated with fluctuations inmRNA1, protein production and degradation2,3, noisy partition of cellular components at division4, and other cell processes. Variability within a clonal population of cells originates fromsuch stochastic processes, which may be amplified or reduced by deterministic factors5. Cell-to-cell variability, such as that seen in the heterogeneous response of bacteria to antibiotics, or of cancer cells to treatment, is understood as the inevitable consequence of stochasticity.Variability in cell-cycle duration was observed long ago;however, its sources are stillunknown. A central question is whether the variance of the observed distribution originates from stochastic processes, orwhether it arises mostly froma deterministic process that only appears to be random. A surprising feature of cell-cycle-duration inheritance is that it seems to be lost within one generation but to be still present in the next generation, generating poor correlation between mother and daughter cells but high correlation between cousin cells6. This observation suggests the existence of underlying deterministic factors that determine themain part of cell-to-cell variability.Wedeveloped an experimental system that precisely measures the cell-cycle duration of thousands ofmammalian cells along several generations and amathematical framework that allows discrimination between stochastic and deterministic processes in lineages of cells. We show that the inter- and intra-generation correlations reveal complex inheritance of the cell-cycle duration. Finally, webuild a deterministic nonlinear toy model for cell-cycle inheritance that reproduces the main features of our data. Our approach constitutes a general method to identify deterministic variability in lineages of cells or organisms, which mayhelp to predict and, eventually, reduce cell-to-cell heterogeneity in various systems, such as cancer cells under treatment.

Soper 2015

Alan K. Soper, *Square ice in a graphene sandwich*. nature **519** (2015), 417–418.

Films of ice less than 1 nanometre thick, sandwiched between sheets of graphene, have been observed to adopt a square lattice structure quite different from the widely occurring hexagonal structure of bulk ice.

Wichura 2015

Henry Wichura et al., *A 17-My-old whale constrains onset of uplift and climate change in east Africa*. PNAS **112** (2015), 3910–3915.

Henry Wichura, Louis L. Jacobs, Andrew Lin, Michael J. Polcyn, Fredrick K. Manthi, Dale A. Winkler, Manfred R. Strecker & Matthew Clemens

Timing and magnitude of surface uplift are key to understanding the impact of crustal deformation and topographic growth on atmospheric circulation, environmental conditions, and surface processes. Uplift of the East African Plateau is linked to mantle processes, but paleoaltimetry data are too scarce to constrain plateau evolution and subsequent vertical motions associated with rifting. Here, we assess the paleotopographic implications of a beaked whale fossil (Ziphiidae) from the Turkana region of Kenya found 740 km inland from the present-day coastline of the Indian Ocean at an elevation of 620 m. The specimen is ≈17 My old and represents the oldest derived beaked whale known, consistent with molecular estimates of the emergence of modern straptoothed whales (Mesoplodon). The whale traveled from the Indian Ocean inland along an eastward-directed drainage system controlled by the Cretaceous Anza Graben and was stranded slightly above sea level. Surface uplift from near sea level coincides with paleoclimatic change from a humid environment to highly variable and much drier conditions, which altered biotic communities and drove evolution in east Africa, including that of primates.

Keywords: east Africa | Ziphiidae | uplift | drainage | paleoenvironment

Altpaläolithikum

Liebermann 2014

Carmen Liebermann & Clemens Pasda, *Silexfunde aus dem Mittelpleistozän von Bilzingsleben (Lkr. Sömmerda)*. Archäologisches Korrespondenzblatt **44** (2014), 443–462.

Flint finds from the Middle Pleistocene travertine site at Bilzingsleben are revised. A discussion of the history of research in this context, and findings of recent excavations are presented. These campaigns targeted the geological context and did not select artefact-type objects. This resulted in a twilight zone between certainly identified non-artefacts and artefact-type exemplars, a zone which remains diffuse and resists qualitative, and thus also quantitative assessment.

Keywords: Thuringia / Lower Palaeolithic / Holstein Intergladal / identification of artefacts / research history

Die Silexfunde aus der mittelpleistozänen Travertinfundstelle Bilzingsleben werden einer Revision unterzogen. Hierzu wird die Forschungsgeschichte erörtert und die Ergebnisse jüngster Ausgrabungen vorgestellt, die explizit dem geologischen Kontext gewidmet waren und ohne Selektion artefaktähnlicher Stücke vonstattengegangen sind. Als Ergebnis wird eine Grauzone formuliert, deren äußere Grenzen eindeutige Nichtartefakte und artefaktähnliche Exemplare bilden, die jedoch insgesamt diffus bleibt, qualitativ nicht zu beurteilen und damit auch quantitativ nicht zu erfassen ist.

Schlüsselwörter: Thüringen / Altpaläolithikum / Holstein-Interglazial / Artefaktidentifikation / Forschungsgeschichte

Datierung

Bauernochse 2014

Andreas Bauerochse, Barbara Leuschner, Thomas Frank, Alf Metzler Grete Höppel & Hanns Hubert Leuschner, *Dendrochronologische Datierungen an Bauhölzern von Moorwegen Nordwestdeutschlands, Ergänzung, Korrektur und Neubewertung.* Archäologisches Korrespondenzblatt **44** (2014), 483–494.

Dendrochronological investigations of wooden track ways enable high-resolution chronologies regarding their construction and utilisation. Therefore, timber from wooden track ways taken from excavations in northwest German peatlands has been dendro-dated already in the 1970s and 1980s. Some of these results show discrepancies or have not been published yet. The missing results are presented and contradictions between published data and data generated by our investigations are discussed and partially revised. The data originate from 17 track ways (1874 samples) of the period 1360 BC to 334 AD.

Keywords: Lower Saxony / peatland archaeology / dendrochronology / track ways

Dendrochronologische Datierungen der Bauhölzer von Moorwegen ermöglichen zeitlich hochauflösende Aussagen zu Bau- und Nutzungsphasen der Wege. Bereits in den 1970er und 1980er Jahren wurden daher bei Ausgrabungen an Moorwegen in Nordwestdeutschland einzelne Bauhölzer beprobt und dendrochronologisch datiert. Die Publikation eines Teils der Ergebnisse stand bisher noch aus bzw. weist Widersprüchlichkeiten auf. Mit der hier vorgelegten Arbeit werden die Datierungen nun vorgestellt sowie Widersprüche zwischen publizierten Daten und den vorhandenen Unterlagen diskutiert und teilweise korrigiert. Die Daten stammen von 17 Moorwegen (1874 Proben) und umfassen den Zeitraum von 1360 v. Chr. bis 334 n. Chr.

Schlüsselwörter: Niedersachsen / Moorarchäologie / Dendrochronologie / Moorwege

Methoden

Alvarez 1970

Luis W. Alvarez et al., *Search for Hidden Chambers in the Pyramids.* science **167** (1970), 832–839.

Luis W. Alvarez, Jared A. Anderson, F. El Bedwei, James Burkhard, Ahmed Fakhry, Adib Girgis, Amr Goneid, Fikhry Hassan, Dennis Iverson, Gerald Lynch, Zenab Miligy, Ali Hilmy Moussa, Mohammed-Sharkawi & Lauren Yazolino

The structure of the Second Pyramid of Giza is determined by cosmic-ray absorption.

Because there are two chambers in the pyramid of Chephren's father (Cheops) and the same number in the pyramid of his grandfather (Sneferu), the absence of any known chambers in the stonework of Chephren's Second Pyramid at Giza suggests that unknown chambers might exist in this apparently solid structure. Cosmic-ray detectors with active areas of 4 square meters and high angular resolution have been installed in the Belzoni Chamber of the Second Pyramid; the

chamber is just below the base of the pyramid, near its center. Cosmic-ray measurements extending over several months of operation clearly show the four diagonal ridges of the pyramid and also outline the shape of the cap of original limestone facing blocks, which gives the pyramid its distinctive appearance. We can say with confidence that no chambers with volumes similar to the four known chambers in Cheops's and Sneferu's pyramids exist in the mass of limestone investigated by cosmic-ray absorption. The volume of the pyramid probed in this manner is defined by a vertically oriented cone, of half-angle 35 degrees, with its point resting in the Belzoni Chamber. The explored volume is 19 percent of the pyramid's volume. We hope that with minor modifications to the apparatus the complete mass of limestone can be searched for chambers.

Ostasien

Roberts 2015

Patrick Roberts et al., *Direct evidence for human reliance on rainforest resources in late Pleistocene Sri Lanka*. science **347** (2015), 1246–1249.

s347-1246-Supplement.pdf

Patrick Roberts, Nimal Perera, Oshan Wedage, Siran Deraniyagala, Jude Perera, Saman Eregama, Andrew Gledhill, Michael D. Petraglia & Julia A. Lee-Thorp

Human occupation of tropical rainforest habitats is thought to be a mainly Holocene phenomenon. Although archaeological and paleoenvironmental data have hinted at pre-Holocene rainforest foraging, earlier human reliance on rainforest resources has not been shown directly. We applied stable carbon and oxygen isotope analysis to human and faunal tooth enamel from four late Pleistocene-to-Holocene archaeological sites in Sri Lanka. The results show that human foragers relied primarily on rainforest resources from at least ≈20,000 years ago, with a distinct preference for semi-open rainforest and rain forest edges. Homo sapiens' relationship with the tropical rainforests of South Asia is therefore long-standing, a conclusion that indicates the time-depth of anthropogenic reliance and influence on these habitats.

Physik

Spergel 2015

David N. Spergel, *The dark side of cosmology, Dark matter and dark energy*. science **347** (2015), 1100–1102.

A simple model with only six parameters (the age of the universe, the density of atoms, the density of matter, the amplitude of the initial fluctuations, the scale dependence of this amplitude, and the epoch of first star formation) fits all of our cosmological data . Although simple, this standard model is strange. The model implies that most of the matter in our Galaxy is in the form of "dark matter," a new type of particle not yet detected in the laboratory, and most of the energy in the universe is in the form of "dark energy," energy associated with empty space. Both dark matter and dark energy require extensions to our current understanding of particle physics or point toward a breakdown of general relativity on cosmological scales.

Story or Book

Cressey 2015

Daniel Cressey, *Making Marie Curie*. nature **519** (2015), 413.

Making Marie Curie: Intellectual Property and Celebrity Culture in an Age of Information. Eva Hemmungs Wirtén. University of Chicago Press (2015)

Marie Curie remains the most famous of female scientists. In the analysis of how the co-discoverer of radium became uniquely idolized, cultural scholar Eva Hemmungs Wirtén uses the prisms of celebrity and intellectual property — Curie and her husband, Pierre, having famously refused to patent radium. Wirtén's picture of a scientist carefully shaping her own image is less angelic than the traditional view of Curie, but might have much to teach her modern successors.