

## References

### Aktuell

#### BLOMENKEMPER 2018

Patrick Blomenkemper, Hans Kerp, Abdalla Abu Hamad, William A. DiMichele & Benjamin Bomfleur, *A hidden cradle of plant evolution in Permian tropical lowlands*. [science 362 \(2018\), 1414–1416](#).

The latitudinal biodiversity gradient today has deep roots in the evolutionary history of Earth's biota over geologic time. In the marine realm, earliest fossil occurrences at low latitudes reveal a tropical cradle for many animal groups. However, the terrestrial fossil record—especially from drier environments that are thought to drive evolutionary innovation—is sparse. We present mixed plant-fossil assemblages from Permian equatorial lowlands in present-day Jordan that harbor precocious records of three major seed-plant lineages that all became dominant during the Mesozoic, including the oldest representative of any living conifer family. These finds offer a glimpse of the early evolutionary origins of modern plant groups in disturbance-prone tropical habitats that are usually hidden from observation.

#### CAMANNI 2019

Giovanni Camanni, *From competition to collaboration*. [science 363 \(2019\), 422](#).

It was just like any other morning. I was at the bus stop, on my way to the lab where I was a postdoctoral fellow. But as I watched the people around me—headphones dangling from their ears, eyes cast down, unsmiling faces—something began to stir inside me. They looked unhappy. And, I realized, I was one of them. Suddenly, I could no longer continue with my work life. I turned around, went back to my flat, and booked a one-way ticket to fly home the next morning. I didn't know how long I would be away or what would come next. All I knew was that, even though I loved science and research, what I had been doing wasn't working.

#### MILO 2019

Anat Milo, *Democratizing synthesis by automation*. [science 363 \(2019\), 122–123](#).

#### NIRODY 2018

Jasmine A. Nirody, Judy Jinn, Thomas Libby, Timothy J. Lee, Ardian Jusufi, David L. Hu & Robert J. Full, *Geckos Race Across the Water's Surface Using Multiple Mechanisms*. [Current Biology 28 \(2018\), 4046–4051](#).

[CurrBiol28-4046-Supplement.pdf](#)

In Brief: Nirody, Jinn, et al. describe quadrupedal locomotion at the air-water interface. Geckos race along the water's surface at speeds exceeding conventional surface swimming limits. The authors show that interfacial locomotion in intermediated animals utilizes a combination of strategies: surface slapping, undulatory motion, and surface tension.

Highlights:

- Geckos can race quadrupedally along the water’s surface at close to land-running speeds
- Intermediate-sized geckos use multiple strategies for interfacial locomotion
- Mechanisms include surface slapping, body and tail undulation, and surface tension
- Superhydrophobic skin likely reduces drag during semiplaning

Acrobatic geckos can sprint at high speeds over challenging terrain [1], scamper up the smoothest surfaces [2], rapidly swing underneath leaves [3], and right themselves in midair by swinging only their tails [4, 5]. From our field observations, we can add racing on the water’s surface to the gecko’s list of agile feats. Locomotion at the air-water interface evolved in over a thousand species, including insects, fish, reptiles, and mammals [6]. To support their weight, some larger-legged vertebrates use forces generated by vigorous slapping of the fluid’s surface followed by a stroke of their appendage [7–12], whereas smaller animals, like arthropods, rely on surface tension to walk on water [6, 13]. Intermediate-sized geckos (*Hemidactylus platyurus*) fall squarely between these two regimes. Here, we report the unique ability of geckos to exceed the speed limits of conventional surface swimming. Several mechanisms likely contribute in this intermediate regime. In contrast to bipedal basilisk lizards [7–10], geckos used a stereotypic trotting gait with all four limbs, creating air cavities during slapping to raise their head and anterior trunk above water. Adding surfactant to the water decreased velocity by half, confirming surface tension’s role. The superhydrophobic skin could reduce drag during semi-planing. Geckos laterally undulated their bodies, including their submerged posterior trunk and tail, generating thrust for forward propulsion, much like water dragons [14] and alligators [15]. Geckos again remind us of the advantages of multifunctional morphologies providing the opportunity for multiple mechanisms for motion.

PARSONS 2019

John Parsons, Jacopo Buongiorno, Michael Corradini & David Petti, *A fresh look at nuclear energy*. [science 363 \(2019\), 105](#).

In the September report of the MIT Energy Initiative, *The Future of Nuclear Energy in a Carbon-Constrained World*, we show that extending the life of the existing fleet of nuclear reactors worldwide is the least costly approach to avoiding an increase of carbon emissions in the power sector.

PENNISI 2018

Elizabeth Pennisi, *Fossils push back origin of key plant groups millions of years*. [science 362 \(2018\), 1340](#).

Finds from Middle East point to the dry tropics as cradle for plant evolution 250 million years ago.

It’s not clear how the newfound Permian plants made it through the great dying, a 100,000-year period when, for reasons that are still unclear, 90% of marine life and 70% of life on land disappeared. But their presence in the Permian raises the possibility that other plant groups thought to have later origins actually emerged then in the tropics, says UF plant evolutionary biologist Pamela Soltis. If these select plants survived the mass extinction, she says, “Perhaps the communities they supported may have been more stable as well.

RADOŠEVIĆ 2018

Katarina Radošević, *Forced to change—for good*. [science 362 \(2018\), 1442](#).

“Can’t stop loving you . . . “ My 3-year-old son was singing along with Phil Collins from his car seat. We were on our commute, spending a few hours of quality time in Dutch rush-hour traffic. But I was not in the mood to sing along. My manager at the biotech company where I had been working for a bit more than a year had just told me that, in spite of my excellent performance, he did not foresee giving me more responsibilities in the near future. I was working part time so that I could spend more time with my young children, and he believed the career growth I sought required a full-time employee. The message hit me hard. But it precipitated a change that, in the end, taught me the power of embracing opportunities, no matter where they come from.

#### SCHICK 2019

Robert S. Schick, *The scars we bear*. [science 363 \(2019\), 198](#).

I was introduced to a whale named Lucky during my first year of grad school. I study North Atlantic right whales—many of whom are scarred by traumatic injuries. Lucky’s were dramatic: jagged marks from a brush with a large ship propeller when she was a juvenile. My own story, I’ve come to realize, is similar, although my scars are less obvious. Eleven years ago, when I was a third-year Ph.D. student, my son Silas died in my arms. He was just 3 days old. The birth nearly took my wife’s life as well. Graduating the next year felt like nothing short of a miracle. I was Dr. Schick—the first in my family! I thought it meant that I had recovered from the depths of my loss and had a bright academic future. But there was more to my story—and to Lucky’s.

#### STEINER 2019

Sebastian Steiner et al., *Organic synthesis in a modular robotic system driven by a chemical programming language*. [science 363 \(2019\), 144 + 1–8](#).

[s363-0144-Supplement.pdf](#)

Sebastian Steiner, Jakob Wolf, Stefan Glatzel, Anna Andreou, Jaroslaw M. Granda, Graham Keenan, Trevor Hinkley, Gerardo Aragon-Camarasa, Philip J. Kitson, Davide Angelone and Leroy Cronin

The synthesis of complex organic compounds is largely a manual process that is often incompletely documented. To address these shortcomings, we developed an abstraction that maps commonly reported methodological instructions into discrete steps amenable to automation. These unit operations were implemented in a modular robotic platform by using a chemical programming language that formalizes and controls the assembly of the molecules. We validated the concept by directing the automated system to synthesize three pharmaceutical compounds, diphenhydramine hydrochloride, rufinamide, and sildenafil, without any human intervention. Yields and purities of products and intermediates were comparable to or better than those achieved manually. The syntheses are captured as digital code that can be published, versioned, and transferred flexibly between platforms with no modification, thereby greatly enhancing reproducibility and reliable access to complex molecules.

#### WANCHISEN 2019

Barbara A. Wanchisen, *Lessons from the ‘real world’*. [science 363 \(2019\), 98](#).

When I left my tenured professorship for a nonacademic job, I thought I had already done the hard part: making the decision to leave the professional world that had been my home for many years. I had little inkling of the culture shock that awaited me in my new sphere of science policy and how disorienting it would

be. In the 17 years since, I've seen that I'm far from the only one who struggles with this transition. Regardless of career stage, leaving academia requires some adjusting. For those who, like me, make the move later in their careers, after decades as established academics, it can be even harder. Knowing what to expect beforehand can take some of the shock out of the transition to the world outside academia.

## Bibel

GROSSMAN 2019

Jonathan Grossman, *Did David Actually Conquer Jerusalem? The Blind, the Lame, and the Šinnôr*. *Vetus Testamentum* **69** (2019), 46–59.

One of the most cryptic narratives in Samuel is the story of David's conquest of the city of Jebus-Jerusalem. This paper proposes that David did not conquer the city through battle, but through the Jebusites' peaceful surrender. This understanding illuminates the meaning of the obscure reference to "the blind and the lame," as well as the word "Šinnôr."

Keywords: David | Jerusalem | the blind and the lame | Šinnôr | Jebus

MAEIR 2018

Aren M. Maeir, *The Philistines be upon thee, Samson (Jud. 16:20), Reassessing the Martial Nature of the Philistines – Archaeological Evidence vs. Ideological Image?* In: ŁUKASZ NIESIOŁOWSKI-SPANÒ & MAREK WĘCOWSKI (Hrsg.), *Change, Continuity, and Connectivity, North-Eastern Mediterranean at the turn of the Bronze Age and in the early Iron Age*. *Philippika* 118 (Wiesbaden 2018), 158–168.

In summary, let me reiterate that while it is clear that if one compares the Philistine culture to that of the early Israelites and Judahites, it does appear that the former had distinct technological, organizational and most probably military advantages. That said, the biblical and contemporary image of the Philistines as the mighty enemy of the early Israelites might very be the result of ideological narratives, narratives in which the prowess of the Philistines was exaggerated in the context of the depiction of early Israelite/Judahite foundation at narratives. What does this mean? That attempts to recreate the social, political and military characteristics of the Philistines, and their relations with other contemporary cultures, should be cautious in acceptance of age-old images of who the Philistines were. Instead, we should strive to base this on the actual historical and archaeological data.

## Biologie

ASHTON 2019

L. A. Ashton et al., *Termites mitigate the effects of drought in tropical rainforest*. *science* **363** (2019), 174–177.

s363-0174-Supplement.pdf

L. A. Ashton, H. M. Griffiths<sup>4</sup>, C. L. Parr, T. A. Evans, R. K. Didham, F. Hasan, Y. A. Teh, H. S. Tin, C. S. Vairappan & P. Eggleton

Termites perform key ecological functions in tropical ecosystems, are strongly affected by variation in rainfall, and respond negatively to habitat disturbance.

However, it is not known how the projected increase in frequency and severity of droughts in tropical rainforests will alter termite communities and the maintenance of ecosystem processes. Using a large-scale termite suppression experiment, we found that termite activity and abundance increased during drought in a Bornean forest. This increase resulted in accelerated litter decomposition, elevated soil moisture, greater soil nutrient heterogeneity, and higher seedling survival rates during the extreme El Niño drought of 2015–2016. Our work shows how an invertebrate group enhances ecosystem resistance to drought, providing evidence that the dual stressors of climate change and anthropogenic shifts in biotic communities will have various negative consequences for the maintenance of rainforest ecosystems.

#### CHEN 2019

Jiani Chen, Yuqi Zou, Yue-Hua Sun & Carel ten Cate, *Problem-solving males become more attractive to female budgerigars*. [science 363 \(2019\), 166–167](#).

[s363-0166-Supplement.pdf](#)

Darwin proposed that mate choice might contribute to the evolution of cognitive abilities. An open question is whether observing the cognitive skills of an individual makes it more attractive as a mate. In this study, we demonstrated that initially less-preferred budgerigar males became preferred after females observed that these males, but not the initially preferred ones, were able to solve extractive foraging problems. This preference shift did not occur in control experiments in which females observed males with free access to food or in which females observed female demonstrators solving these extractive foraging problems. Our results suggest that direct observation of problem-solving skills increases male attractiveness and that this could contribute to the evolution of the cognitive abilities underlying such skills.

#### GIBBONS 2019

Ann Gibbons, *Spotting evolution among us*. [science 363 \(2019\), 21–23](#).

#### SERVICE 2019

Robert F. Service, *Seeing the dawn*. [science 363 \(2019\), 116–119](#).

A cataclysm may have jump-started life on Earth. A new scenario suggests that some 4.47 billion years ago—a mere 60 million years after Earth took shape and 40 million years after the moon formed—a moon-size object sideswiped Earth and exploded into an orbiting cloud of molten iron and other debris. The metallic hailstorm that ensued likely lasted years, if not centuries, ripping oxygen atoms from water molecules and leaving hydrogen behind. The oxygens were then free to link with iron, creating vast rust-colored deposits of iron oxide across our planet's surface. The hydrogen formed a dense atmosphere that likely lasted 200 million years as it ever so slowly dissipated into space. After things cooled down, simple organic molecules began to form under the blanket of hydrogen. Those molecules, some scientists think, eventually linked up to form RNA, a molecular player long credited as essential for life's dawn. In short, the stage for life's emergence was set almost as soon as our planet was born.

#### STRIEDTER 2019

Georg F. Striedter & Nancy T. Burley, *Are clever males preferred as mates? Testing this Darwinian hypothesis is a tough nut to crack*. [science 363 \(2019\), 120–121](#).

However, the fact that females lacked the opportunity to perform the foraging task themselves suggests that they may have had little basis for understanding

the exercise as a problem in need of a clever solution. Instead, they might have attributed male success in opening the containers to superior physical strength. Alternatively, the extensive training paradigm may have elicited subtle behavioral differences between trained and untrained males, such that (for example) the untrained males showed less foraging effort during the observation period or less exploratory behavior during the posttraining choice trials. Unfortunately, it is difficult to rule out such alternative explanations in most studies of comparative cognition.

## Klima

### CHENG 2019

Lijing Cheng, John Abraham, Zeke Hausfather & Kevin E. Trenberth, *How fast are the oceans warming?* [science 363 \(2019\), 128–129](#).

Observational records of ocean heat content show that ocean warming is accelerating.

### GEBBIE 2019

G. Gebbie & P. Huybers, *The Little Ice Age and 20th-century deep Pacific cooling*. [science 363 \(2019\), 70–74](#).

s363-0070-Supplement.pdf

Proxy records show that before the onset of modern anthropogenic warming, globally coherent cooling occurred from the Medieval Warm Period to the Little Ice Age. The long memory of the ocean suggests that these historical surface anomalies are associated with ongoing deep-ocean temperature adjustments. Combining an ocean model with modern and paleoceanographic data leads to a prediction that the deep Pacific is still adjusting to the cooling going into the Little Ice Age, whereas temperature trends in the surface ocean and deep Atlantic reflect modern warming. This prediction is corroborated by temperature changes identified between the HMS Challenger expedition of the 1870s and modern hydrography. The implied heat loss in the deep ocean since 1750 CE offsets one-fourth of the global heat gain in the upper ocean.

### LEHMANN 2018

J. Lehmann, F. Mempel & D. Coumou, *Increased Occurrence of Record-Wet and Record-Dry Months Reflect Changes in Mean Rainfall*. [Geophysical Research Letters 45 \(2018\), 13468–13476](#).

GeoResLet45-13468-Supplement.docx

Climate change alters the hydrological cycle, which is expected to increase the risk of heavy rainfall events and prolonged droughts. Sparse rainfall data, however, have made it difficult to answer the question of whether robust changes can already be seen in the short observational time period. Here we use a comprehensive statistical tool to quantify changes in record-breaking wet and dry months. The global-mean number of record-wet months has significantly increased over the recent decades and is now nearly 20% higher than would be expected in a stationary climate with no long-term trends. This signal primarily comes from pronounced changes in the northern middle to high latitudes where the occurrence of record-wet months has increased by up to 37% regionally. The tropics have seen opposing trends: More record-wet months in Southeast Asia in contrast to more record-dry months in Africa. These changes are broadly consistent with observed trends in mean rainfall.

Plain Language Summary Record-breaking weather events are prominently placed in the media as they are usually associated with severe consequences for the environment and society. Recent examples from 2017 include the record amount of rainfall dumped over Texas by Hurricane Harvey and the unprecedented drought in Cape Town, South Africa. There seems to be an accumulation of such weather extremes over the last decades. However, the question whether this feeling stands up to a statistical verification has been challenging to answer. Here we show that there has been a statistically significant increase in the number of record-wet months in the global-mean. This increase is particularly pronounced in Central/East United States, Northern Europe, and Russia, that is, regions which have experienced extreme rainfall events in the recent past leading to severe floods. In contrast, Central Africa has seen an increased occurrence of record-dry months indicating that between 1980 and 2013 roughly one third of all dry-records would not have happened without long-term changes in the climate.

#### LÉZINE 2019

Anne-Marie Lézine, Kenji Izumi, Masa Kageyama & Gaston Achoundong, *A 90,000-year record of Afromontane forest responses to climate change*. [science](#) **363** (2019), 177–181.

[s363-0177-Supplement.pdf](#)

Pollen records from African highlands are scarce; hence, the paleoecology of the Afromontane forest and its responses to glacial cycles are poorly known. Lake Bambili (Cameroon) provides a record of vegetation changes in the tropical mountains of Africa over the past 90,000 years, with high temporal resolution. Pollen data and biome reconstructions show a diverging response of forests to climate changes; the upper tree line was extremely unstable, shifting substantially in response to glacial-interglacial climate alternation, whereas the transition between the montane and lowland forests remained remarkably stable. Such ecological instability may have had a critical influence on species richness in the Afromontane forests.

#### VOOSEN 2018

Paul Voosen, *Antarctic ice melt 125,000 years ago offers warning*. [science](#) **362** (2018), 1339.

Ice sheet apparently collapsed in a previous warm period.

Temperatures during this time, called the Eemian, were barely higher than in today's greenhouse-warmed world. Yet proxy records show sea levels were 6 to 9 meters higher than they are today, drowning huge swaths of what is now dry land.

#### VOOSEN 2019

Paul Voosen, *Tropical uplift may set Earth's thermostat, Indonesia's mountains could be cause of current glacial age*. [science](#) **363** (2019), 13.

Most geologists agree that long-term changes in the planet's temperature are governed by shifts in CO<sub>2</sub>, and that plate tectonics somehow drives those shifts as it remakes the planet's surface.

Having the right rocks to drive the CO<sub>2</sub>-chewing reaction is not sufficient. Climate matters, too. For example, the Siberian Traps, a region that saw devastating volcanic eruptions 252 million years ago, are rich in such rocks but absorb little, says Dennis Kent, a geologist at Rutgers University in New Brunswick, New Jersey. "It's too damn cold," he says. Saudi Arabia has the heat and the rocks but lacks another ingredient. "It's hotter than Hades but it doesn't rain." Indonesia's location in the rainy tropics is just right. "That is probably what's keeping us centered in an ice age," Kent adds.

## Metallzeiten

NIESIOŁOWSKI-SPANÒ 2018

ŁUKASZ NIESIOŁOWSKI-SPANÒ & MAREK WĘCOWSKI (Hrsg.), *Change, Continuity, and Connectivity, North-Eastern Mediterranean at the turn of the Bronze Age and in the early Iron Age*. Philippika 118 (Wiesbaden 2018).

## Methoden

DOMÍNGUEZ-RODRIGO 2019

Manuel Domínguez-Rodrigo et al., *Spilled ink blots the mind, A reply to Merritt et al. (2018) on subjectivity and bone surface modifications*. *Journal of Archaeological Science* **102** (2019), 80–86.

JAS086-0014-Dominguez-Rodrigo.pdf, JAS102-0071-Merritt.pdf

Manuel Domínguez-Rodrigo, Palmira Saladié, Isabel Cáceres, Rosa Huguet, José Yravedra, Antonio Rodríguez-Hidalgo, Martín Patricia, Pineda Antonio, Marín Juan, Gené Clara, Julia Aramendi & Lucia Cobo-Sánchez

Categorical variables identifying microscopic features of cut marks produce high accuracy in discrimination of bone surface modifications, but are vulnerable to variable degrees of inter-analyst subjectivity. Metric analyses of cut mark width and depth are presented by Merritt et al. (2018) as a more objective method of identifying cut marks. However, this uni(bi)variate method has shown very high rates of mark classification error when structurally similar marks are compared. Furthermore, within-sample comparison carried out via subsampling shows that different datasets of metric values, obtained with the same type of tool and raw material, are subject to such a high degree of variability that significant differences of homogeneous subsamples are repeatedly obtained, thus preventing any useful analogs to be made. Additionally, this much higher stochastic variability depends on limited knowledge of the contextual processes that intervene in cut mark metric properties, as well as on a mismatch between theoretical premises on the immanent-configurational process-trace dynamics and their confusion during experimental praxis. The selection of specific contextual variables and disregard of others, in addition to the combination of different tool types and raw materials, distorts the resulting cut mark properties. This indicates that even when attempting to use exclusively metric numeric variables, subjectivity is a conditioning factor in analyzing and interpreting cut marks.

**Keywords:** Cut mark | Bone surface modifications | Morphology | Taphonomy | Statistical power | Heuristics

MERRITT 2019

Stephen R. Merritt, Michael C. Pante, Trevor L. Keevil, Jackson K. Njau & Robert J. Blumenshine, *Don't cry over spilled ink, Missing context prevents replication and creates the Rorschach effect in bone surface modification studies*. *Journal of Archaeological Science* **102** (2019), 71–79.

JAS086-0014-Dominguez-Rodrigo.pdf, JAS102-0080-Dominguez-Rodrigo.pdf

The scientific replicability crisis has recently focused on bone surface modification (BSM) analysis, which underlies zooarchaeological and anthropological conclusions about the ecology and evolution of tool-assisted carcass consumption behavior. We review a recent blind test of inter-analyst correspondence in

morphometric analysis of experimentally generated butchery marks that advocates algorithmic methods for diagnosing and measuring BSM in an effort to standardize methodology and minimize inter-analyst error (Domínguez-Rodrigo et al., 2017. Use and abuse of cut mark analyses: The Rorschach effect. *Journal of Archaeological Science*, 86, 14–23. <http://doi.org/10.1016/j.jas.2017.08.001>). This study overstates concern about the inaccuracy of BSM measurement and interpretation, concluding that BSM analysis is a subjective, non-scientific endeavor. Based on a minimally described sample of cut marks, it measures variables that involve inherent inaccuracy and subjectivity and overlooks how the contexts of experimental sample generation – particularly the difference between immanent and configurational processes – differentially affect cut mark morphometrics. We illustrate this discussion with experimental taphonomic examples focused on analytical context including sample construction and control over factors that affect cut mark cross-sectional size. Our analysis suggests the relationship between tool attributes and cut mark morphology is not generalizable to all experimental and archaeological butchery contexts. We show that our experimental samples capture metric variability observed in archaeological cut marks, but that intentionally incised marks and realistic defleshing marks differ in width and depth. Further, when controlling for factors that impact cut mark size including animal size class, tool type, butcher experience, and density across bone portions, overlapping cut mark widths and depths produced by phonolite and ignimbrite flakes lead to poor classification of marks according to causal flake material, which casts doubt on the ability to discriminate cut marks made by different materials. We build datasets that include diverse experimental contexts and suggest that meta-analysis can disentangle how multiple configurational factors contribute to cut mark morphometric attributes. Ultimately, progress in BSM analysis rests on inter-analyst replicability, which must be preceded by clear discussion of all parts of the inferential loop – from the design of experiments that generate actualistic analogues, to their use in supporting archaeological arguments. Otherwise, problematic expert knowledge traditions may mask arguments from authority in sophisticated methodological language and underreported experimental context.

Keywords: Experimental taphonomy | Cut marks | Butchery | Generality | Realism | Context | Expert knowledge

## Mittelpaläolithikum

GREENBAUM 2019

Gili Greenbaum, David E. Friesem, Erella Hovers, Marcus W. Feldman & Oren Kolodny, *Was inter-population connectivity of Neanderthals and modern humans the driver of the Upper Paleolithic transition rather than its product?* *Quaternary Science Reviews* (2019), preprint, 1–14. DOI:10.1016/j.quascirev.2018.12.011.

The transition from the Middle Paleolithic (MP) to the Upper Paleolithic (UP), circa 40kya, is viewed as a major turning point in human evolution, in terms of the material culture, demography, and geographical expansion of modern humans. However, attempts to identify an origin of this so-called ‘revolution’ in the form of a particular stone-tool techno-complex, representing cultural modernity, which spread across the human range, have failed. Instead, the archaeological record of this period comprises multiple ‘transitional techno-complexes’, some associated with modern humans and others with Neanderthals. The cultures that these techno-complexes represent are characterized by precursors of the material cultures of the UP, often alongside features that suggest local cultural continuity. The

broadly simultaneous appearance of these transitional cultures, despite a lack of a clear common origin, is puzzling. We suggest that these local ‘revolutions’ had a common underlying driver, which explains the simultaneous appearance of transitional techno-complexes, but that this driver did not determine the particular form of each local revolution. We propose that the driver of the transition to the UP was an increase in interpopulation connectivity, both within- and between-species, which allowed local cultures to rapidly evolve and to attain greater complexity than ever before. We suggest that this change was driven by the interaction between modern humans and Neanderthals. In this article we outline processes that are likely to have influenced inter-population connectivity, bringing together evolutionary and ecological perspectives alongside insights from the field of cultural evolution.

**Keywords:** Transitional techno-complexes | Initial Upper Paleolithic | Middle-Upper Paleolithic transition | Cultural revolution | Cultural evolution | Neanderthals | Modern humans | Population connectivity | Paleogeography | Levant

## STEWART 2019

J. R. Stewart, O. García-Rodríguez, M. V. Knul, L. Sewell, H. Montgomery, M. G. Thomas & Y. Diekmann, *Palaeoecological and genetic evidence for Neanderthal power locomotion as an adaptation to a woodland environment*. *Quaternary Science Reviews* (2019), preprint, 1–6. DOI:10.1016/j.quascirev.2018.12.023.

The prevailing explanation for Neanderthal body form is the cold (glacial) adaptation hypothesis. However, palaeoecological associations appear to indicate a less cold woodland environment. Under such conditions, encounter and ambush (rather than pursuit) hunting – and thus muscular power and sprint (rather than endurance) capacity – would have been favoured. We hypothesise that the highly muscular Neanderthal body form reflects an adaptation to hunting conditions rather than cold, and here both review the palaeoecological evidence that they inhabited a mainly woodland environment, and present preliminary genetic analyses in support of this new hypothesis.

**Keywords:** Endurance | Power | Running | Encounter/ambush hunting | Human evolution