

## References

### Aktuell

ANENBERG 2017

Susan C. Anenberg et al., *Impacts and mitigation of excess diesel-related NO<sub>x</sub> emissions in 11 major vehicle markets*. [nature](#) **545** (2017), 467–471.

n545-0467-Supplement.pdf

Susan C. Anenberg, Joshua Miller, Ray Minjares, Li Du, Daven K. Henze, Forrest Lacey, Christopher S. Malley, Lisa Emberson, Vicente Franco, Zbigniew Klimont & Chris Heyes

Vehicle emissions contribute to fine particulate matter (PM<sub>2.5</sub>) and tropospheric ozone air pollution, affecting human health<sup>1–5</sup>, crop yields<sup>5,6</sup> and climate<sup>5,7</sup> worldwide. On-road diesel vehicles produce approximately 20 per cent of global anthropogenic emissions of nitrogen oxides (NO<sub>x</sub>), which are key PM<sub>2.5</sub> and ozone precursors<sup>8,9</sup>. Regulated NO<sub>x</sub> emission limits in leading markets have been progressively tightened, but current diesel vehicles emit far more NO<sub>x</sub> under real-world operating conditions than during laboratory certification testing<sup>10–20</sup>. Here we show that across 11 markets, representing approximately 80 per cent of global diesel vehicle sales, nearly one-third of on-road heavy-duty diesel vehicle emissions and over half of on-road light-duty diesel vehicle emissions are in excess of certification limits. These excess emissions (totalling 4.6 million tons) are associated with about 38,000 PM<sub>2.5</sub>- and ozone-related premature deaths globally in 2015, including about 10 per cent of all ozone-related premature deaths in the 28 European Union member states. Heavy-duty vehicles are the dominant contributor to excess diesel NO<sub>x</sub> emissions and associated health impacts in almost all regions. Adopting and enforcing next-generation standards (more stringent than Euro 6/VI) could nearly eliminate real-world diesel-related NO<sub>x</sub> emissions in these markets, avoiding approximately 174,000 global PM<sub>2.5</sub>- and ozone-related premature deaths in 2040. Most of these benefits can be achieved by implementing Euro VI standards where they have not yet been adopted for heavy-duty vehicles.

DOWTIN 2018

Asia L. Downtin & Delphis F. Levia, *The power of persistence*. [science](#) **360** (2018), 1142.

After months of intense planning, I was finally ready to set up my dissertation research equipment in a patch of urban forest. It was such a perfect summer day that it was hard to imagine anything going wrong. But while installing the first of my stemflow collars—odd-looking devices that I was mounting on tree trunks to investigate part of the water cycle—I was startled by a stern voice demanding my attention. It was a law enforcement officer. I was bewildered. I hadn't called the police, and I could not fathom who would have. Then it hit me: I was an African-American woman in one of the city's most affluent, predominantly white neighborhoods, installing what could be perceived as an unsightly contraption in their prized space.

## HEFT-NEAL 2018

Sam Heft-Neal, Jennifer Burney, Eran Bendavid & Marshall Burke, *Robust relationship between air quality and infant mortality in Africa*. *nature* **559** (2018), 254–258.

Poor air quality is thought to be an important mortality risk factor globally<sup>1–3</sup>, but there is little direct evidence from the developing world on how mortality risk varies with changing exposure to ambient particulate matter. Current global estimates apply exposure–response relationships that have been derived mostly from wealthy, mid-latitude countries to spatial population data<sup>4</sup>, and these estimates remain unvalidated across large portions of the globe. Here we combine household survey-based information on the location and timing of nearly 1 million births across subSaharan Africa with satellite-based estimates<sup>5</sup> of exposure to ambient respirable particulate matter with an aerodynamic diameter less than 2.5  $\mu\text{m}$  (PM<sub>2.5</sub>) to estimate the impact of air quality on mortality rates among infants in Africa. We find that a 10  $\mu\text{g m}^{-3}$  increase in PM<sub>2.5</sub> concentration is associated with a 9% (95% confidence interval, 4–14%) rise in infant mortality across the dataset. This effect has not declined over the last 15 years and does not diminish with higher levels of household wealth. Our estimates suggest that PM<sub>2.5</sub> concentrations above minimum exposure levels were responsible for 22% (95% confidence interval, 9–35%) of infant deaths in our 30 study countries and led to 449,000 (95% confidence interval, 194,000–709,000) additional deaths of infants in 2015, an estimate that is more than three times higher than existing estimates that attribute death of infants to poor air quality for these countries<sup>2,6</sup>. Upward revision of disease-burden estimates in the studied countries in Africa alone would result in a doubling of current estimates of global deaths of infants that are associated with air pollution, and modest reductions in African PM<sub>2.5</sub> exposures are predicted to have health benefits to infants that are larger than most known health interventions.

## MULLER 2018

Mike Muller, *Lessons from Cape Town’s drought*. *nature* **559** (2018), 174–176.

Don’t blame climate change. People and poor planning are behind most urban water shortages, argues Mike Muller.

## RAMOS GOYETTE 2018

Sharon Ramos Goyette, *Hitting the wall*. *science* **360** (2018), 1262.

I landed my dream job: a tenure-track position at a primarily undergraduate institution near my hometown where I would develop a new neuroscience major. I entered that position the way one enters a marriage: expecting it to last forever, assuming I would give it everything I had, hoping that—while it would not always be easy—it would be worth it. Soon, though, something seemed amiss. It felt kind of like sexism—but not exactly. Whatever it was, I experienced it from both women and men, from the department chair to the administrative assistant. It was only after many years and a career upheaval that I learned there was a legal term to describe it.

## Bibel

## FRANKLIN 2018

Norma Franklin, *The Kushite Connection, The Destruction of Lachish and the Salvation of Jerusalem*. In: J. CHADWICK, J. UZIEL &

L. A. HITCHCOCK (Hrsg.), *Tell it in Gath: Studies in the History and Archaeology of Israel, Essays in Honor of A. M. Maeir on the Occasion of his Sixtieth Birthday*. Ägypten und Altes Testament (in press 2018), 1–16.

Sennacherib's third campaign, the only one to the west, consisted of three phases: the advance along the Phoenician coast, the events in Philistia, and the campaign to Judah (Na'aman 1979: 64). In total, these events stretched over a 400 km area from north to south, dealt with 70 polities, and resulted in the deportation of tens of thousands of people. At least 13 walled cities had their rebellious kings replaced, the cities of Eltekeh and Timnah were plundered, the nobles of Ekron were punished, up to 46 Judean cities destroyed, and possibly up to a million people were affected (Richardson 2014: 457). Yet, Jerusalem and Hezekiah survived, comparatively untouched due to Judah's forgotten ally, the 25th Kushite Dynasty, who ruled over both Upper and Lower Egypt.

## Biologie

CUBRY 2018

Philippe Cubry et al., *The Rise and Fall of African Rice Cultivation Revealed by Analysis of 246 New Genomes*. *Current Biology* (2018), preprint, 1–9. DOI:10.1016/j.cub.2018.05.066.

Philippe Cubry, Christine Tranchant-Dubreuil, Anne-Céline Thuillet, Cécile Monat, Marie-Noelle Ndjiondjop, Karine Labadie, Corinne Cruaud, Stefan Engelen, Nora Scarcelli, Bénédicte Rhoné, Concetta Burgarella, Christian Dupuy, Pierre Larmande, Patrick Wincker, Olivier François, François Sabot & Yves Vigouroux

African rice (*Oryza glaberrima*) was domesticated independently from Asian rice. The geographical origin of its domestication remains elusive. Using 246 new whole-genome sequences, we inferred the cradle of its domestication to be in the Inner Niger Delta. Domestication was preceded by a sharp decline of most wild populations that started more than 10,000 years ago. The wild population collapse occurred during the drying of the Sahara. This finding supports the hypothesis that depletion of wild resources in the Sahara triggered African rice domestication. African rice cultivation strongly expanded 2,000 years ago. During the last 5 centuries, a sharp decline of its cultivation coincided with the introduction of Asian rice in Africa. A gene, PROG1, associated with an erect plant architecture phenotype, showed convergent selection in two rice cultivated species, *Oryza glaberrima* from Africa and *Oryza sativa* from Asia. In contrast, a shattering gene, SH5, showed selection signature during African rice domestication, but not during Asian rice domestication. Overall, our genomic data revealed a complex history of African rice domestication influenced by important climatic changes in the Saharan area, by the expansion of African agricultural society, and by recent replacement by another domesticated species.

### Highlights:

- We report the largest genomic dataset for African rice and its wild relative
- We infer the origin of African rice domestication in Northern Mali
- Rice domestication is associated with depletion of wild rice populations
- Convergent selection occurred during African and Asian rice domestications

**In Brief:** The study of domestication provides insights about where and how major cultural transitions to agriculture have arisen. In this study, Cubry et al. document African rice (*Oryza glaberrima*) domestication, pinpointing its origin to

the region of the Inner Niger Delta. A recent reduction of African rice cultivation is also evident.

## Klima

MAIER 2018

E. Maier et al., *North Pacific freshwater events linked to changes in glacial ocean circulation*. [nature 559 \(2018\), 241–245](#).

E. Maier, X. Zhang, A. Abelmann, R. Gersonde, S. Mulitza, M. Werner, M. Méheust, J. Ren, B. Chaplignin, H. Meyer, R. Stein, R. Tiedemann & G. Lohmann

There is compelling evidence that episodic deposition of large volumes of freshwater into the oceans strongly influenced global ocean circulation and climate variability during glacial periods<sup>1,2</sup>. In the North Atlantic region, episodes of massive freshwater discharge to the North Atlantic Ocean were related to distinct cold periods known as Heinrich Stadials<sup>1–3</sup>. By contrast, the freshwater history of the North Pacific region remains unclear, giving rise to persistent debates about the existence and possible magnitude of climate links between the North Pacific and North Atlantic oceans during Heinrich Stadials<sup>4,5</sup>. Here we find that there was a strong connection between changes in North Atlantic circulation during Heinrich Stadials and injections of freshwater from the North American Cordilleran Ice Sheet to the northeastern North Pacific. Our record of diatom  $\delta^{18}\text{O}$  (a measure of the ratio of the stable oxygen isotopes  $^{18}\text{O}$  and  $^{16}\text{O}$ ) over the past 50,000 years shows a decrease in surface seawater  $\delta^{18}\text{O}$  of two to three per thousand, corresponding to a decline in salinity of roughly two to four practical salinity units. This coincided with enhanced deposition of ice-rafted debris and a slight cooling of the sea surface in the northeastern North Pacific during Heinrich Stadials 1 and 4, but not during Heinrich Stadial 3. Furthermore, results from our isotope-enabled model<sup>6</sup> suggest that warming of the eastern Equatorial Pacific during Heinrich Stadials was crucial for transmitting the North Atlantic signal to the northeastern North Pacific, where the associated subsurface warming resulted in a discernible freshwater discharge from the Cordilleran Ice Sheet during Heinrich Stadials 1 and 4. However, enhanced background cooling across the northern high latitudes during Heinrich Stadial 3—the coldest period in the past 50,000 years<sup>7</sup>—prevented subsurface warming of the northeastern North Pacific and thus increased freshwater discharge from the Cordilleran Ice Sheet. In combination, our results show that nonlinear ocean–atmosphere background interactions played a complex role in the dynamics linking the freshwater discharge responses of the North Atlantic and North Pacific during glacial periods.

THIRUMALAI 2018

Kaustubh Thirumalai, *Hosing the North Pacific Ocean*. [nature 559 \(2018\), 185–186](#).

Climate anomalies punctuated the last ice age, characterized by the discharge of icebergs that released fresh water into the North Atlantic Ocean. It now emerges that fresh water also sometimes flooded the North Pacific.

## Neolithikum

MEYER 2018

Christian Meyer, Corina Knipper, Nicole Nicklisch, Angelina Münster, Olaf Kürbis, Veit Dresely, Harald Meller & Kurt W. Alt, *Early Neolithic executions indicated by clustered cranial trauma in the mass*

grave of Halberstadt. *Nature Communications* **9** (2018), 2472, 1–11. DOI:10.1038/s41467-018-04773-w.

The later phase of the Central European Early Neolithic witnessed a rise in collective lethal violence to a level undocumented up to this date. This is evidenced by repeated massacres of settled communities of the Linearbandkeramik (ca. 5600–4900 cal BC), the first full farming culture in this area. Skeletal remains of several dozen victims of this prehistoric warfare are known from different sites in Germany and Austria. Here we show that the mass grave of Halberstadt, Germany, a new mass fatality site from the same period, reveals further and so far unknown facets of Early Neolithic collective lethal violence. A highly selected, almost exclusively adult male and non-local population sample was killed by targeted blows to the back of the head, indicating a practice of systematic execution under largely controlled conditions followed by careless disposal of the bodies. This discovery significantly increases current knowledge about warfare-related violent behaviour in Early Neolithic Central Europe.

## Politik Energie

MORGAN 2018

M. Granger Morgan, Ahmed Abdulla, Michael J. Ford & Michael Rath, *US nuclear power, The vanishing low-carbon wedge*. *PNAS* **115** (2018), 7184–7189.

Nuclear power holds the potential to make a significant contribution to decarbonizing the US energy system. Whether it could do so in its current form is a critical question: Existing large light water reactors in the United States are under economic pressure from low natural gas prices, and some have already closed. Moreover, because of their great cost and complexity, it appears most unlikely that any new large plants will be built over the next several decades. While advanced reactor designs are sometimes held up as a potential solution to nuclear power’s challenges, our assessment of the advanced fission enterprise suggests that no US design will be commercialized before midcentury. That leaves factory-manufactured, light water small modular reactors (SMRs) as the only option that might be deployed at significant scale in the climate-critical period of the next several decades. We have systematically investigated how a domestic market could develop to support that industry over the next several decades and, in the absence of a dramatic change in the policy environment, have been unable to make a convincing case. Achieving deep decarbonization of the energy system will require a portfolio of every available technology and strategy we can muster. It should be a source of profound concern for all who care about climate change that, for entirely predictable and resolvable reasons, the United States appears set to virtually lose nuclear power, and thus a wedge of reliable and low-carbon energy, over the next few decades.

Keywords: decarbonization | nuclear power | wedges | SMRs