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References

Aktuell

He 2023

Daihai He, Lixin Lin, Yael Artzy-Randrup, Haydar Demirhan, Benjamin J. Cowling & Lewi Stone, *Resolving the enigma of Iquitos and Manaus, A modeling analysis of multiple COVID-19 epidemic waves in two Amazonian cities.* PNAS **120** (2023), e2211422120. DOI:10.1073/pnas.2211422120.

pnas120-e2211422120-Supplement.pdf

he two nearby Amazonian cities of Iquitos and Manaus endured explosive COVID-19 epidemics and may well have sufered the world's highest infection and death rates over 2020, the irst year of the pandemic. State-of-the-art epidemiological and modeling studies estimated that the populations of both cities came close to attaining herd immunity (>70 % infected) at the termination of the irst wave and were thus protected. This makes it difficult to explain the more deadly second wave of COVID-19 that struck again in Manaus just months later, simultaneous with the appearance of a new P.1 variant of concern, creating a catastrophe for the unprepared population. It was suggested that the second wave was driven by reinfections, but the episode has become controversial and an enigma in the history of the pandemic. We present a data-driven model of epidemic dynamics in Iquitos, which we also use to explain and model events in Manaus. By reverse engineering the multiple epidemic waves over 2 y in these two cities, the partially observed Markov process model inferred that the irst wave left Manaus with a highly susceptible and vulnerable population (≈40 % infected) open to invasion by P.1, in contrast to Iquitos (≈72 % infected). The model reconstructed the full epidemic outbreak dynamics from mortality data by itting a lexible time-varying reproductive number R0(t) while estimating reinfection and impulsive immune evasion. The approach is currently highly relevant given the lack of tools available to assess these factors as new SARS-CoV-2 virus variants appear with diferent degrees of immune evasion.

Keywords: epidemic | pandemic | model | itting data | COVID

Significance: The nearby cities of Iquitos (Peru) and Manaus (Brazil) experienced the world's highest infection and mortality rates during the irst COVID-19 wave in 2020. Key studies suggested that >70 % of the city populations were infected in this wave and thus close to herd immunity and protected. It remains an enigma as to why a deadly second wave followed in Manaus worse than the irst. To resolve this, we present a data-driven model of epidemic dynamics in Iquitos which we use to help explain and model events in Manaus. The partially observed Markov process model simultaneous its a lexible "variable R0", estimates long-term immunity waning and impulsive immune evasion, and thus provides a comprehensive framework for characterizing and modeling new variants of concern.

Keuschnigg 2023

Marc Keuschnigg, Arnout van de Rijt & Thijs Bol, *The plateauing of cognitive ability among top earners.* European Sociological Review (2023), preprint, 1–14. DOI:10.1093/esr/jcac076.

Are the best-paying jobs with the highest prestige done by individuals of great intelligence? Past studies find job success to increase with cognitive ability, but do not examine how, conversely, ability varies with job success. Stratification theories suggest that social Background and cumulative advantage dominate cognitive ability as determinants of high occupational success. This leads us to hypothesize that among the relatively successful, average ability is concave in income and prestige. We draw on Swedish register data containing measures of cognitive ability and labour-market success for 59,000 men who took a compulsory military conscription test. Strikingly, we find that the relationship between ability and wage is strong overall, yet above E60,000 per year ability plateaus at a modest level of +1 standard deviation. The top 1 per cent even score slightly worse on cognitive ability than those in the income strata right below them. We observe a similar but less pronounced plateauing of ability at high occupational prestige.

Murphy 2023

Nicholas J. Murphy, Joshua S. Davis, Seth M. Tarrant & Zsolt J. Balogh, *Common orthopaedic trauma may explain 31,000-year-old remains*, *Arising from: T. R. Maloney et al. Nature http://doi.org/10.1038/s41586-022-05160-8 (2022).* nature **615** (2023), e13–e14.

Overall, we find that the conclusions drawn by Maloney et al.1 are unconvincing. Performing primary supra-articular transosseous surgical amputation through the thick cortices of the tibia without specialized metallic tools (at least chisel and saw) would be very difficult and is highly improbable. If the people in Borneo were performing lower-limb amputation using 'sharp instruments', it would have been easier to perform transarticular amputation through the soft tissues of the ankle joint, where it is not necessary to transect thick cortical bone. This is not the pattern observed in these skeletal remains.

Stenseth 2023

Nils Chr. Stenseth et al., *How to avoid a local epidemic becoming a global pandemic.* PNAS **120** (2023), e2220080120. DOI:10.1073/pnas.2220080120.

pnas120-e2220080120-Supplement.pdf

Here, we combine international air travel passenger data with a standard epidemiological model of the initial 3 mo of the COVID-19 pandemic (January through March 2020; toward the end of which the entire world locked down). Using the information available during this initial phase of the pandemic, our model accurately describes the main features of the actual global development of the pandemic demonstrated by the high degree of coherence between the model and global data. The validated model allows for an exploration of alternative policy eicacies (reducing air travel and/or introducing diferent degrees of compulsory immigration quarantine upon arrival to a country) in delaying the global spread of SARS-CoV-2 and thus is suggestive of similar eicacy in anticipating the spread of future global disease outbreaks. We show that a lesson from the recent pandemic is that reducing air travel globally is more efective in reducing the global spread than adopting immigration quarantine. Reducing air travel out of a source country has the most important efect regarding the spreading of the disease to the rest of the world. Based upon our results, we propose a digital twin as a further developed tool to inform future pandemic decision-making to inform measures intended to control the spread of disease agents of potential future pandemics. We discuss the design criteria for such a digital twin model as well as the feasibility of obtaining access to the necessary online data on international air travel.

Keywords: Disease X | epidemiology | data science | coupled simulation model | digital twin model

Nils Chr. Stenseth, Rudolf Schlatte, Xiaoli Liu, Roger Pielke Jr., Ruiyun Li, Bin Chen, Ottar N. Bjørnstad, Dimitri Kusnezov, George F. Gao, Christophe Fraser, Jason D. Whittington, Yuqi Bai, Ke Deng, Peng Gong, Dabo Guan, Yixiong Xiao, Bing Xu & Einar Broch Johnsen

Significance: We contribute a proof-of-concept model to inform decision-making on how to avoid a local epidemic developing into a global pandemic by reducing international air travel worldwide, coupled with a compulsory immigration quarantine when traveling between countries. The work Highlights a major innovation: replacing the historical air travel data and ixed parameter values of our case study with a digitaltwin model that continuously incorporates a live feed of air travel data and improved model parameter estimates for any novel infection. This may facilitate the rapid analysis of efects of intervention measures as a local epidemic may escalate into a global pandemic, and thus slow or even stop the spread.

Vlok 2023

Melandri Vlok et al., *Common orthopaedic trauma may explain 31,000-year-old remains, Reply to: Murphy et al. Nature http://doi.org/10.1038/s41586-023-05756-8 (2023).* nature **615** (2023), e15–e18.

We note that a complete systematic differential diagnosis was indeed completed (Extended Data Table 1); this process involved careful consideration of the most common and banal conditions first, such as accidental fracture, before considering the possibility of more rare and unusual circumstances. Through this iterative process, fracture was first eliminated as a possibility, followed by natural causes of amputation. Surgical amputation was the remaining scenario left that completely described the characteristics that we observed in the bone.

Melandri Vlok, Tim Maloney, India Ella Dilkes-Hall, Adhi Agus Oktaviana, Pindi Setiawan, Andika Arief Drajat Priyatno, Marlon Ririmasse, I. Made Geria, Muslimin A. R. Effendy, Budy Istiawan, Falentinus Triwijaya Atmoko, Shinatria Adhityatama, Ian Moffat, Renaud Joannes-Boyau, Adam Brumm & Maxime Aubert

Vogel 2023

Gretchen Vogel, *Do COVID-19 vaccine mandates still make sense?* science **379** (2023), 1072–1073.

Ineffective or outdated requirements could undermine trust, some vaccine researchers say.

Amerika

Lesnek 2023

Alia J. Lesnek, *Windows of opportunity for the peopling of the Americas.* PNAS **120** (2023), e2300979120.

In the final sections of the manuscript, Praetorius et al. bring together a wealth of paleoclimatic data that highlight the dynamic character of Northeast Paciic coastal environments from the LGM to the Holocene, and ultimately suggest that 24.5 to 22 and 16.4 to 14.8 ka were the most environmentally favorable times for coastal migration.

Anthropologie

Callaway 2023

Ewen Callaway, *Ancient genomes show how humans escaped Europe's deep freeze*. nature **615** (2023), 197–198.

A pair of studies offers the most detailed look yet at groups of hunter-gatherers during the last ice age.

Scerri 2017

Eleanor M. L. Scerri, *The North African Middle Stone Age and its place in recent human evolution*. Evolutionary Anthropology **26** (2017), 119–135.

The North African Middle Stone Age (NAMSA, ≈300-24 thousand years ago, or ka) features what may be the oldest fossils of our species as well as extremely early examples of technological regionalization and 'symbolic' material culture (d'Errico, Vanhaeren, Barton, Bouzouggar, Mienis, Richter, Hublin, McPherron, Louzouet, & Klein, 2009; Scerri, 2013a; Richter, Grün, Joannes-Boyau, Steele, Amani, Rue, Fernandes, Raynal, Geraads, Ben-Ncer Hublin, McPherron, 2017). The geographic situation of North Africa and an increased understanding of the wet-dry climatic pulses of the Sahara Desert also show that North Africa played a strategic role in continental-scale evolutionary processes by modulating human dispersal and demographic structure (Drake, Blench, Armitage, Bristow, & White, 2011; Blome, Cohen, Tryon, Brooks, & Russell, 2012). However, current understanding of the NAMSA remains patchy and subject to a bewildering array of industrial nomenclatures that mask underlying variability. These issues are compounded by a geographic research bias skewed toward non-desert regions. As a result, it has been difficult to test long-established narratives of behavioral and evolutionary change in North Africa and to resolve debates on their wider significance. In order to evaluate existing data and identify future research directions, this paper provides a critical overview of the component elements of the NAMSA and shows that the timing of many key behaviors has close parallels with others in sub-Saharan Africa and Southwest Asia.

Keywords: Out of Africa | symbolic material culture | African multiregional evolution | Middle Stone Age | North Africa | human evolution

Datierung

Doumet-Serhal 2023

Claude Doumet-Serhal, Stefanos Gimatzidis, Bernhard Weninger, Constance von Rüden & Karin Kopetzky, *An interdisciplinary approach to Iron Age Mediterranean chronology through combined archaeological and ^{14}C-radiometric evidence from Sidon, Lebanon*. PLoS ONE **18** (2023), e274979. DOI:10.1371/journal.pone.0274979.

The construction of the Iron Age Mediterranean chronology began in the Levant based on historical evidence and has been additionally supported in recent decades by means of radiocarbon analysis, although with variable precision and ratification. It is only in recent years that new evidence in the Aegean and the western Mediterranean has opened discussion towards its further acceptance as an authoritative i.e. highly reliable, and widely applicable historiographic network. Altogether, the Mediterranean Iron Age chronology has only undergone minor changes during the last hundred years. The Phoenician metropolis of Sidon in southern Lebanon

now provides a new, large and robust dataset obtained through a combination of archaeological and 14C-radiometric analysis of materials from stratified contexts that allow their statistical assessment. The appearance of substantial amounts of pottery of Greek, Cypriot and Egyptian origin together with Phoenician local wares in a long stratigraphy is a benefit for the synchronisation of regional pottery styles and allows wider geographic correlation of relative chronological systems. The close association of the archaeological data with a long series of AMS-14C-dates on short-lived samples provides new evidence for the absolute dating of many of the regional pottery styles that are represented in the stratigraphy of Sidon, and contributes towards a considerable improvement of the Mediterranean chronology.

Energie

Kreier 2023

Freda Kreier, *What Chernobyl's dogs could teach us about radiation.* nature **615** (2023), 384–385.

Multi-year project in Ukraine aims to uncover the health effects of chronic radiation exposure.

Spatola 2023

Gabriella J. Spatola et al., *The dogs of Chernobyl, Demographic insights into populations inhabiting the nuclear exclusion zone.* Science Advances **9** (2023), eade2537. DOI:10.1126/sciadv.ade2537.

The 1986 Chernobyl nuclear disaster initiated a series of catastrophic events resulting in long-term and widespread environmental contamination. We characterize the genetic structure of 302 dogs representing three freeroaming dog populations living within the power plant itself, as well as those 15 to 45 kilometers from the disaster site. Genome-wide profiles from Chernobyl, purebred and free-breeding dogs, worldwide reveal that the individuals from the power plant and Chernobyl City are genetically distinct, with the former displaying increased intrapopulation genetic similarity and differentiation. Analysis of shared ancestral genome segments Highlights differences in the extent and timing of western breed introgression. Kinship analysis reveals 15 families, with the largest spanning all collection sites within the radioactive exclusion zone, reflecting migration of dogs between the power plant and Chernobyl City. This study presents the first characterization of a domestic species in Chernobyl, establishing their importance for genetic studies into the effects of exposure to long-term, low-dose ionizing radiation.

Gabriella J. Spatola, Reuben M. Buckley, Megan Dillon, Emily V. Dutrow, Jennifer A. Betz, Małgorzata Pilot, Heidi G. Parker,Wiesław Bogdanowicz, Rachel Thomas, Ihor Chyzhevskyi, Gennadi Milinevsky, Norman Kleiman, Matthew Breen, Elaine A. Ostrander & Timothy A. Mousseau

Klima

Munday 2023

Callum Munday, Nicholas Savage, Richard G. Jones & Richard Washington, *Valley formation aridifies East Africa and elevates Congo Basin rainfall.* nature **615** (2023), 276–279.

East African aridification during the past 8 million years is frequently invoked as a driver of large-scale shifts in vegetation1 and the evolution of new animal

lineages, including hominins2–4. However, evidence for increasing aridity is debated5 and, crucially, the mechanisms leading to dry conditions are unclear6. Here, numerical model experiments show that valleys punctuating the 6,000-km-long East African Rift System (EARS) are central to the development of dry conditions in East Africa. These valleys, including the Turkana Basin in Kenya, cause East Africa to dry by channelling water vapour towards Central Africa, a process that simultaneously enhances rainfall in the Congo Basin rainforest. Without the valleys, the uplift of the rift system leads to a wetter climate in East Africa and a drier climate in the Congo Basin. Results from climate model experiments demonstrate that the detailed tectonic development of Africa has shaped the rainfall distribution, with profound implications for the evolution of African plant and animal lineages.

Smith 2023

C. Smith, J. C. A. Baker & D. V. Spracklen, *Tropical deforestation causes large reductions in observed precipitation*. nature **615** (2023), 270–275.

n615-0270-Supplement.pdf

Tropical forests play a critical role in the hydrological cycle and can influence local and regional precipitation1. Previous work has assessed the impacts of tropical deforestation on precipitation, but these efforts have been largely limited to case studies2. A wider analysis of interactions between deforestation and precipitation—and especially how any such interactions might vary across spatial scales—is lacking. Here we show reduced precipitation over deforested regions across the tropics. Our results arise from a pan-tropical assessment of the impacts of 2003–2017 forest loss on precipitation using satellite, station-based and reanalysis datasets. The effect of deforestation on precipitation increased at larger scales, with satellite datasets showing that forest loss caused robust reductions in precipitation at scales greater than 50 km. The greatest declines in precipitation occurred at 200 km, the largest scale we explored, for which 1 percentage point of forest loss reduced precipitation by 0.25 ± 0.1 mm per month. Reanalysis and station-based products disagree on the direction of precipitation responses to forest loss, which we attribute to sparse in situ tropical measurements. We estimate that future deforestation in the Congo will reduce local precipitation by 8–10 % in 2100. Our findings provide a compelling argument for tropical forest conservation to support regional climate resilience.

Metallzeiten

Mazow 2018

Laura B. Mazow, Siddhartha Mitra, David G. Kimmel & Susanne Grieve, *Extraction and analysis of total lipids in late Iron Age Bath-shaped basins from the Levant as a means of assessing vessel function*. Journal of Archaeological Science: Reports **22** (2018), 193–201.

Four Late Iron Age bath-shaped basins from three sites in the Southern Levant were subjected to organic residue analysis by gas chromatography–mass spectrometry (GC–MS) to test the hypothesis that the vessels were used for wool scouring and fulling. All lipid extracts of the samples contained saturated and unsaturated lipids. These were compared to the same compounds in a series of reference materials selected based on ethno-historical and literary documentation. A final comparison was made to lipids extracted from a bath-shaped basin from Turkey that had previously been found to contain a residue similar in compounds to date

palm kernel oil. Results demonstrate that the total lipid extracts (TLEs) from the bath-shaped basins are more similar to each other and to date palm kernel oil than to the other comparative materials. This supports the accepted view that bath-shaped basins in the Levant, comparable in date and shape, had a common function, but suggests functional alternatives to traditional interpretations of human burial or bathing. While wool working is a viable hypothesis, it was not possible to identify the specific activity as several different behaviors could result in a similar organic residue.

Keywords: Gas chromatography–mass spectrometry | Plant oils and waxes | Date palm kernel oil | Wool processing | Bath-shaped basins | Iron Age

Story or Book

ROBINSON 2023

Andrew Robinson, *Fantastic Numbers and Where To Find Them.* nature **615** (2023), 210.

Fantastic Numbers and Where To Find Them. Antonio Padilla. Allen Lane (2022)

As a maths student, Antonio Padilla got a zero for a correct proof because it lacked rigour. The experience turned him into a theoretical physicist. "With mathematics, the physicist can dance, and with physics, the mathematician can sing," he says in his account of numbers that unlock the Universe, such as the cosmological constant. Although not for the mathematically faint-hearted, it sparkles — even comparing quantum theory's astonishing support of light as a particle rather than a wave with Greta Thunberg suddenly endorsing Donald Trump!