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References

Aktuell

Balter 2015

Michael Balter, *Can epigenetics explain homosexuality puzzle?* science **350** (2015), 148.

Study in twin brothers finds link between DNA methylation and sexual orientation.

Twin studies suggested, moreover, that gene sequences can't be the full explanation. For example, the identical twin of a gay man, despite having the same genome, only has a 20 % to 50 % chance of being gay himself. That's why some have suggested that epigenetics —instead of or in addition to traditional genetics— might be involved.

Such ideas inspired Tuck Ngun, a postdoc in Vilain's lab, to study the methylation patterns at 140,000 regions in the DNA of 37 pairs of male identical twins who were discordant—meaning that one was gay and the other straight—and 10 pairs who were both gay. After several rounds of analysis —with the help of a specially developed machine-learning algorithm—the team identified five regions in the genome where the methylation pattern appears very closely linked to sexual orientation. To test how important the five regions are, the team divided the discordant twin pairs into two groups. They looked at the associations between specific epi-marks and sexual orientation in one group, then tested how well those results could predict sexual orientation in the second group. They were able to reach almost 70 % accuracy, although the presentation makes clear that—in contrast to what a provocative ASHG press release about the study suggested—this predictive ability applies only to the study sample and not to the wider population.

Vilain's team stresses that the findings shouldn't be used to produce tests for homosexuality or a misguided "cure." Bailey says he's not worried about such misuse. "We will not have the potential to manipulate sexual orientation anytime soon," he says.

Berkowitz 2015

Talia Berkowitz, Marjorie W. Schaeffer, Erin A. Maloney, Lori Peterson, Courtney Gregor, Susan C. Levine & Sian L. Beiloc, *Math at home adds up to achievement in school.* science **350** (2015), 196–198.

s350-0196-Supplement1.pdf, s350-0196-Supplement2.xlsx

With a randomized field experiment of 587 first-graders, we tested an educational intervention designed to promote interactions between children and parents relating to math. We predicted that increasing math activities at home would increase children's math achievement at school. We tested this prediction by having children engage in math story time with their parents. The intervention, short numerical story problems delivered through an iPad app, significantly increased children's math achievement across the school year compared to a reading (control) group, especially for children whose parents are habitually anxious about math. Brief, high-quality parent-child interactions about math at home help break the intergenerational cycle of low math achievement.

Chang 2015

Chi-Shan Chang, Hsiao-Lei Liu, Ximena Moncada, Andrea Seelenfreund, Daniela Seelenfreund & Kuo-Fang Chung, *A holistic picture of Austronesian migrations revealed by phylogeography of Pacific paper mulberry*. PNAS **112** (2015), 13537–13542.

The peopling of Remote Oceanic islands by Austronesian speakers is a fascinating and yet contentious part of human prehistory. Linguistic, archaeological, and genetic studies have shown the complex nature of the process in which different components that helped to shape Lapita culture in Near Oceania each have their own unique history. Important evidence points to Taiwan as an Austronesian ancestral homeland with a more distant origin in South China, whereas alternative models favor South China to North Vietnam or a Southeast Asian origin. We test these propositions by studying phylogeography of paper mulberry, a common East Asian tree species introduced and clonally propagated since prehistoric times across the Pacific for making barkcloth, a practical and symbolic component of Austronesian cultures. Using the hypervariable chloroplast ndhF-rpl32 sequences of 604 samples collected from East Asia, Southeast Asia, and Oceanic islands (including 19 historical herbarium specimens from Near and Remote Oceania), 48 haplotypes are detected and haplotype cp-17 is predominant in both Near and Remote Oceania. Because cp-17 has an unambiguous Taiwanese origin and cp-17–carrying Oceanic paper mulberries are clonally propagated, our data concur with expectations of Taiwan as the Austronesian homeland, providing circumstantial support for the "out of Taiwan" hypothesis. Our data also provide insights into the dispersal of paper mulberry from South China "into North Taiwan," the "out of South China–Indochina" expansion to New Guinea, and the geographic origins of post-European introductions of paper mulberry into Oceania.

Keywords: Broussonetia papyrifera | commensal approach | DNA of herbarium specimens | out of Taiwan hypothesis | Voyaging Corridor Triple I

Significance: Paper mulberry, a common East Asian tree used for paper making, is propagated across the Pacific for making barkcloth, a practical and symbolic component of Austronesian material culture. Using chloroplast DNA sequences, we demonstrate a tight genealogical link between its populations in South China and North Taiwan, and South Taiwan and Remote Oceania by way of Sulawesi and New Guinea, presenting the first study, to our knowledge, of a commensal plant species transported to Polynesia whose phylogeographic structure concurs with expectations of the "out of Taiwan" hypothesis of Austronesian expansion. As a commensal plant likely transported across the full range of Austronesian expansion from South China to East Polynesia, paper mulberry may also be the most widely transported fiber crop in human prehistory.

Dennell 2015

Robin Dennell, *Homo sapiens in China 80,000 years ago*. nature **526** (2015), 647–648.

A discovery in southern China of human teeth dated to more than 80,000 years old indicates that Homo sapiens was present in the region considerably earlier than had previously been suspected.

Excavation of other caves in the region will undoubtedly add to the findings from Fuyan. What is especially needed now is archaeological evidence (sadly lacking in Fuyan Cave) to indicate whether the initial dispersal of our species was caused or facilitated by cognitive developments (such as symbolism or complex exchange systems), or was simply an example of opportunistic range extension. More revelations about our species' history can surely be expected from southern China.

Ehret 2015

Christopher Ehret, *Bantu history, Big advance, although with a chronological contradiction.* PNAS **112** (2015), 13428–13429.

What is most important is that the authors essentially bring closure to four decades of debate, at least with respect to the geography of the early stages and routes of expansion of Bantu speakers across vast portions of the African continent.

However, in interpreting habitat history, Grollemund et al. (1) do not take into account a particular environmental factor. Even in the wettest periods of the Holocene, intercalary savannas existed, especially on sandier soils, in parts of the Sangha corridor and in the areas around the stretches of the Congo between the Sangha and Kwa confluences. So, even without climate change, Bantu settlements could have hopscotched ahead from one patch of savanna to another. Not accounting for this factor leads Grollemund et al. (1) to propose ascribing the "initial northsouth migration of Bantu speech communities across the Equator" to the period of the "Sangha River Interval" of around 2500 B.P. (1). Unfortunately, that idea is not chronologically supported in the archaeology.

Archaeologists have known for three decades that already by the 10th century B.C.E.—500 y before 2500 B.P.—the forefront of Bantu expansion had reached the eastern side of Lake Tanganyika (9–11), more than 1,500 km beyond the Sangha and Kwa confluences with the Congo River.

Gibbons 2015

Ann Gibbons, *Prehistoric Eurasians streamed into Africa, genome shows.* science **350** (2015), 149.

First genome of an ancient African suggests widespread mixing with farmers from the Middle East.

Population geneticist David Reich of Harvard University is struck by the magnitude of the mixing between Africans and Eurasians. He notes that "a profound migration of farmers moving from Mesopotamia to North Africa has long been speculated." But, he says, "a western Eurasian migration into every population they study in Africa—into the Mbuti pygmies and the Khoisan? That's surprising and new."

Gibbons 2015

Ann Gibbons, *First modern humans in China.* science **350** (2015), 264.

Contemporary-looking teeth found in cave suggest that Homo sapiens left Africa much earlier than expected.

The dates come from a small stalagmite, part of a flowstone that capped the layer holding the teeth. The team used the radioactive decay of uranium to thorium to date this stalagmite to 80,000 years ago—a minimum age for the teeth. Fossils of extinct elephants, hyenas, and pandas in the hominin layer are 120,000 years old at most, so the team concluded that the teeth are 80,000 to 120,000 years old, says co-author Maria Martinón-Torres of University College London.

But the dated stalagmite came from a different trench than the teeth, and may be of a different age, says paleoanthropologist Russell Ciochon of the University of Iowa in Iowa City: "The actual dates reported for Fuyan Cave are probably good but I doubt that the teeth are that old."

Kupferschmidt 2015

Kai Kupferschmidt, *Buzz Food.* science **350** (2015), 267–269.

Feeding insect meal to livestock could help the planet, but will it be good for people?

Crickets need only 1.7 kilograms of feed to gain a kilogram of body weight; a typical U.S. chicken consumes 2.5 kilograms, pigs 5 kilograms, and cattle 10 kilograms. Another advantage: Most insects can be eaten whole. Only about half of a chicken or a pig is edible; for a cow the fraction is even less.

Lim 2015

XiaoZhi Lim, *How to make the most of Carbon Dioxide*. nature **526** (2015), 628–630.

Researchers hope to show that using the gas as a raw material could make an impact on climate change.

As with other efforts to make fuels from CO2, however, the challenge is to do it efficiently: even in the laboratory, the known methods consume far more energy than the resulting fuels can provide.

"We need at least 15 years of good research" to do better, estimates Aresta. And even then, he says, the conversion will probably not have a net benefit for climate unless the manufacturing plants can make extensive use of cheap energy from solar, wind and other renewables. "If we don't use these kinds of energy, we will never be able to go to large-scale deployment," he says.

Matisoo-Smith 2015

Elizabeth A. Matisoo-Smith, *Tracking Austronesian expansion into the Pacific via the paper mulberry plant*. PNAS **112** (2015), 13432–13433.

Anthropologie

Liu 2015

Wu Liu et al., *The earliest unequivocally modern humans in southern China*. nature **526** (2015), 696–699.

n526-0696-Supplement1.pdf, n526-0696-Supplement2.pdf

Wu Liu, María Martinón-Torres, Yan-jun Cai, Song Xing, Hao-wen Tong, Shu-wen Pei, Mark Jan Sier, Xiao-hong Wu, R. Lawrence Edwards, Hai Cheng, Yi-yuan Li, Xiong-xin Yang, José María Bermúdez de Castro & Xiu-jie Wu

The hominin record from southern Asia for the early Late Pleistocene epoch is scarce. Well-dated and well-preserved fossils older than 45,000 years that can be unequivocally attributed to Homo sapiens are lacking1–4. Here we present evidence from the newly excavated Fuyan Cave in Daoxian (southern China). This site has provided 47 human teeth dated to more than 80,000 years old, and with an inferred maximum age of 120,000 years. The morphological and metric assessment of this sample supports its unequivocal assignment to H. sapiens. The Daoxian sample is more derived than any other anatomically modern humans, resembling middle-to-late Late Pleistocene specimens and even contemporary humans. Our study shows that fully modern morphologies were present in southern China 30,000–70,000 years earlier than in the Levant and Europe5–7. Our data fill a chronological and geographical gap that is relevant for understanding when H. sapiens first appeared in southern Asia. The Daoxian teeth also support the hypothesis that during the same period, southern China was inhabited by more derived populations than central and northern China. This evidence is important for the study of dispersal routes of modern humans. Finally, our results are relevant to exploring the reasons for the relatively late entry of H. sapiens into Europe. Some studies have investigated how the competition with H. sapiens may have caused Neanderthals' extinction (see ref. 8 and references therein). Notably, although fully modern humans were already present in southern China at least as early as

80,000 years ago, there is no evidence that they entered Europe before 45,000 years ago. This could indicate that H. neanderthalensis was indeed an additional ecological barrier for modern humans, who could only enter Europe when the demise of Neanderthals had already started.

Bibel

Dever 1984

William G. Dever, *Gezer Revisited, New Excavations of the Solomonic and Assyrian Period Defenses*. Biblical Archaeologist **47** (1984), 206–218.

Several critics pointed out that our Late Bronze date for the "Outer Wall" was anomalous: Every other known fortification system in use in ancient Palestine at this time was simply a reuse of the Middle Bronze Age city walls. We held out for an original construction during the Late Bronze Age, however, not only on the basis of our new evidence but also on the assumption that at Gezer there was no other candidate for a Late Bronze Age wall. The Middle Bronze walls had been destroyed around 1500 B.C. and never reused, but in our view it was unthinkable that Gezer had remained unwalled in the Amarna Age.

An initial surprise awaited us when the first element on the lower terrace, the "Gatehouse," was cleared. It was constructed of rather fine ashlar masonry, preserved five courses high in the north wall. The ashlar blocks and their courses were nearly identical to the well-known Solomonic masonry at Megiddo and other sites.

Macalister had, of course, removed all occupational material down to street levels. But in soundings well below that we found deep, densely packed fills that served as the "Gatehouse" foundations. They produced consistent mid- to late-tenthcentury-B.C. sherds-the first hard evidence we had for the date of the "Gatehouse."

Dever 1985

William G. Dever, *Solomonic and Assyrian Period 'Palaces' at Gezer*. Israel Exploration Journal **35** (1985), 217–230.

Dever 1986

William G. Dever, *Late Bronze Age and Solomonic Defenses at Gezer, New Evidence*. Bulletin of the American Schools of Oriental Research **262** (1986), 9–34.

The 1984 season at Gezer was designed to resolve the long-standing controversy over the date of Macalister's "Outer Wall." The results contradict the view of the critics of Gezer I and Gezer II (Dever, Lance, and Wright 1970; Dever et al. 1974) placing the wall in the Iron Age, and confirm our previous date and phasing. The original construction is LB II, with the addition of ashlar towers and upper courses in the Solomonic era, and bastions/final repairs in the Hellenistic period. The new evidence also clarifies the construction of the outer Gatehouse, upper casemate wall, and a new "palace-barracks, "thus enabling us to comprehend the Solomonic double defense system as a whole.

Dever 1993

William G. Dever, *Further Evidence on the Date of the Outer Wall at Gezer*. Bulletin of the American Schools of Oriental Research **289** (1993), 33–54.

This article reports on the results of the 1990 season of excavations at Gezer. The specific objectives in Fields III and XI were to continue the investigation of the 1984 season, further testing alternative models that had been proposed that would date the original phase of Gezer's Outer Wall system not to the Late Bronze Age but to the Iron Age. Substantial new data, particularly in Field XI, seem to confirm a Late Bronze Age date for the Outer Wall, with rebuild phases in the 10th and 9th/8th centuries B.C.E.

Finkelstein 2009

Israel Finkelstein & Eli Piasetzky, *Radiocarbon-Dated Destruction Layers, A skeleton for Iron Age chronology in the Levant*. Oxford Journal of Archaeology **28** (2009), 255–274.

We present a full-sequence radiocarbon-based chronological system for the Iron Age in the Levant, anchored on the dating of ten destruction layers for the years 1130–730 BC. We establish the sequence using two methods – the 'uncalibrated weighted average' and the Bayesian modelling. Utilizing four dating tools in combination – radiocarbon measurements, field stratigraphy, pottery typology and ancient Near Eastern historical records – facilitates solutions to chronological problems that are far beyond the resolving power of 14C dating alone. The results shed light on disputed issues related to biblical and ancient Near Eastern history, such as the expansion of the early Israelite polity from the highlands to the lowlands; the nature of the Shoshenq I campaign to Canaan; and the evolution of the conflict between northern Israel and Aram Damascus.

Lehmann 2014

Gunnar Lehmann & Hermann Michael Niemann, *When did the Shephelah become Judahite?* Tel Aviv: Archaeology **41** (2014), 77–94.

The paper maintains that during the Iron I and much of the early Iron IIA the Shephelah was inhabited by independent—or at least autonomous—%

rural kinship groups that were not dominated by the 'United Monarchy'; that over the course of the early Iron IIA the region became increasingly politically dominated by the city-state of Gath; and that it was only after the destruction of Gath by Hazael in the 9th century BCE that the Shephelah eventually became part of the kingdom of Judah.

Keywords: Judah | Shephelah | Gath

Ussishkin 1966

D. Ussishkin, *King Solomon's Palace and Building 1723 in Megiddo*. Israel Exploration Journal **16** (1966), 174–186.

In 1 Kings 7:1-12 the biblical record gives a brief account of Solomon's royal palace in Jerusalem which obviously was the largest building ever constructed by that king. The shortness of the account may be due to the attitude of the editors of the Book of Kings who included in the text a detailed description of the 'house of of the Lord', while hardly paying attention to the neighbouring palace. Though the record appears to be accurate, its briefness prevents the possibility of a reliable reconstruction of the edifice and its ground-plan based on the written evidence alone. Several scholars have attempted to interpret the text and reconstruct the ground-plan of the palace using comparative archaeological data.2 The present article, a different is an in the same direction.

Wright 1950

G. Ernest Wright, *The Discoveries at Megiddo 1935–39*. Biblical Archaeologist **13** (1950), 28–46.

In the reign of Solomon Megiddo was made the capital of his fifth administrative district. The new fortification wall and gate were built. It is also highly probable that the various stables for horses were erected (cf. 1 Kings 9:15-19), since the city gives evidence of having been planned and built as a whole. The excavators attributed them to Stratum IV, but their foundations were dug down into the debris below. In any event, the latest groups of pottery immediately below them which I have been able to discover do not appear to date later than the early tenth century. Furthermore, the courtyard pavements show two levels of construction in places. In other words, there seems to be no archaeological reason whatever for not assuming that they were erected in Stratum V A-IV B; all that we know is that they were later than Stratum V proper.

Yadin 1957

Y. Yadin, *Excavations at Hazor, 1956, Preliminary Communiqué.* Israel Exploration Journal **7** (1957), 118–123.

The second season of excavation?so rich in finds?has not only shed light on the material culture of the north of the country, during both Canaanite and Israelite periods, but has also helped to clarify the stratification of these periods and to establish their relation to the historical events known to us from ex ternal sources and from the Bible.

Yadin 1958

Y. Yadin, *Excavations at Hazor, 1957, Preliminary Communiqué.* Israel Exploration Journal **8** (1958), 1–14, 68.

Between the structures and the casemate wall the pavement of a street was once more dis covered. The interest in deepening the excavation here springs from the fact that the next stratum, XI, seems by its pottery to belong to the Late Bronze Age II. The full bearing of this fact upon the fall of Canaanite Hazor in Joshua's time and its relation to the story told about the city in the book of Judges (De borah's times), can only be elucidated next season. But even now one can say that there is a clear gap between the Canaanite era with its Late Bronze Age II pottery, and the restoration of the town by Solomon. Iron Age I pottery was very scarce, and the few pieces discovered indicate a temporary settlement only.

The outstanding find in area A is without doubt the gate of stratum X, belonging to the Solomonic casemate wall (PI. 2A). This gate, discovered in the northern part of the excavation, consists of six chambers, three on either side, with square towers on the outside walls. Its plan and measurements (it is some 20 m. long) are identical with the Solomonic gate found at Megiddo (stratum IVB). This fact not only confirms quite clearly the biblical narrative (1 Kings, ix, 15) that Megiddo and Hazor were both rebuilt by Solomon, but even suggests that both gates were built by the same royal architect. Thus ends, in my opinion, the controversy over the date of the gate at Megiddo, to which some scholars assigned a date later than Solomon.

Yadin 1960

Yigael Yadin, *New Light on Solomon's Megiddo.* Biblical Archaeologist **23** (1960), 62–68.

1. The first and most important conclusion to be drawn from the above facts is that the southern palace, or Fort, discovered by the excavators of Megiddo, should no longer be considered as an isolated fort built in an undefended city; on the contrary, it was part of a big city (Stratum VA-IVB), well defended by casemate walls, the formidable sixchambered city gate and the newly discovered northern Fort which dominated from above the approaches to the city gate. To these two

forts should be attributed quite a number of public and private buildings, some of which were considered by the excavators as belonging generally to Stratum V or more specifically to VA. Such a city, of the 10th century, was probably not built by David, if we base our judgment both on general historical considerations and especially on I Kings 9:15. This city, with its system of fortifications similar to those of Hazor and Gezer, must have been the Solomonic city referred to in the above Biblical verse.
2. The second automatic and unavoidable conclusion is that city IV proper (IVA) with its solid city wall of the "offsets and insets" type (built in part on a filling of the older casemate wall), the two complexes of stables and the four-chambered city gate (the unfinished IIIB gate in the terminology of the excavators),19 is not Solomonic but was built after the destruction of the Solomonic city by Pharaoh Shishak in the fifth year of the reign of Rehoboam. The work was that of a later sovereign, most probably King Ahab, whose great force of 2000 chariots is mentioned in the annals of Shalmaneser III. This does not exclude the possibility that Solomon's city had stables too, but these were not the excavated ones, nor would they have been in the area in which these were found.

Yadin 1966

Y. Yadin, *Megiddo*. Israel Exploration Journal **16** (1966), 278–280.

The 1960 excavations proved that both the stables and the wall with jutting out and reentrant angles are from the time of Ahab. Beneath them a casemate wall and a palace were discovered, certainly datable to the Solomonic period.

This discovery is of importance also in ascertaining the date of the hewn shaft and tunnel of the complex water system. It is clear that the gallery is earlier than this system, since upon the completion of the hewing the spring exit was blocked up, preventing access to it through the gal lery. Thus, the water system is either late Jeroboam), or?and this seems more prob able?from the days of Ahab, at which time Megiddo changed from a mere adminis trative-military centre to a large chariot by massive walls.

Yadin 1967

Y. Yadin, *Megiddo*. Israel Exploration Journal **17** (1967), 119–121.

b) The Casemate Wall of the City: Work was concentrated on the casemates discovered in I960, below the solid wall, and previously attributed erroneously to Solomon. The purpose of the current ex cavation was to examine the relation of the foundations of the casemates to those of the earlier strata. It was proved be yond doubt that these casemates not only served as the fortifications of Solomonic Megiddo, but were actually erected at that period and were not a survival from stratum Vb. One section, a wall belong ing to Vb, was found actually Sand wiched' between the foundations of the casemate wall and the top debris of stra tum VIA. It is interesting to note that the casemate wall at Megiddo, like that at Tell Beit Mirsim, formed the exterior part of houses built adjacent to it inside the city.

c) The Exterior Approaches to the Me giddo Water System: Last year's work proved conclusively that the gallery was built in Solomon's time (strata IVb Va), whilst the famous tunnel and shaft were cut in the following period, i. e. that of Ahab (IVa).

Datierung

Gilboa 2013

Ayelet Gilboa, Ilan Sharon & Elisabetta Boaretto, *Radiocarbon dating of the Iron Age levels*. In: Israel Finkelstein, David Uss-

ishkin & Eric H. Cline (Hrsg.), *Megiddo V, The 2004–2008 Seasons*. Monograph series, Tel Aviv, Nadler Institute of Archaeology 31 (Winona Lake 2013), 1117–1127.

Level H-5 Ceramically, this level should be attributed to a late horizon within the Iron IIA (Chapter 13), which should place it, according to both contesting chronologies, in the last third of the 9th century BCE. The excavators correlate it with Stratum VA-IVB of the University of Chicago excavations. The two dates from this phase (Samples 3948, 3949) hardly overlap, the former encompassing mostly the 9th century and the latter the 10th. This is problematic for a level that cannot have been of very long duration (it is one of four Iron IIA layers in Area H). The younger sample (3948) is compatible with both chronologies. The older sample (3949) is much too high for both.

Both the present study and earlier ones conducted in the framework of the Iron Age Dating Project established that it is possible to exclude bias in the analytical measurement, since there is a very good agreement between laboratories dating the same material, with standard deviation in the order of 20–25 years. This is the same order of magnitude as the measurement error itself. In this light, the fact that such a sequence of short-lived samples, from a meticulous stratigraphic excavation, produces such a fuzzy chronological picture means that the solution lies in a more precise consideration of contextual issues, such as residuality or intrusiveness, and of other aspects of site formation processes (Boaretto 2007; 2009), which we are presently trying to tackle.

Grabung

Finkelstein 2013

Israel Finkelstein, David Ussishkin & Eric H. Cline (Hrsg.), *Megiddo V, The 2004–2008 Seasons*. Monograph series, Tel Aviv, Nadler Institute of Archaeology 31 (Winona Lake 2013).

Klima

Clement 2015

Amy Clement, Katinka Bellomo, Lisa N. Murphy, Mark A. Cane, Thorsten Mauritsen, Gaby Rädel & Bjorn Stevens, *The Atlantic Multidecadal Oscillation without a role for ocean circulation*. science **350** (2015), 320–324.

s350-0320-Supplement.pdf

The Atlantic Multidecadal Oscillation (AMO) is a major mode of climate variability with important societal impacts. Most previous explanations identify the driver of the AMO as the ocean circulation, specifically the Atlantic Meridional Overturning Circulation (AMOC). Here we show that the main features of the observed AMO are reproduced in models where the ocean heat transport is prescribed and thus cannot be the driver. Allowing the ocean circulation to interact with the atmosphere does not significantly alter the characteristics of the AMO in the current generation of climate models. These results suggest that the AMO is the response to stochastic forcing from the mid-latitude atmospheric circulation, with thermal coupling playing a role in the tropics. In this view, the AMOC and other ocean circulation changes would be largely a response to, not a cause of, the AMO.

Lamy 2015

Frank Lamy et al., *Glacial reduction and millennial-scale variations in Drake Passage throughflow*. PNAS **112** (2015), 13496–13501.

Frank Lamy, Helge W. Arz, Rolf Kilian, Carina B. Lange, Lester Lembke-Jene, Marc Wengler, Jérôme Kaiser, Oscar Baeza-Urrea, Ian R. Hall, Naomi Harada & Ralf Tiedemann

The Drake Passage (DP) is the major geographic constriction for the Antarctic Circumpolar Current (ACC) and exerts a strong control on the exchange of physical, chemical, and biological properties between the Atlantic, Pacific, and Indian Ocean basins. Resolving changes in the flow of circumpolar water masses through this gateway is, therefore, crucial for advancing our understanding of the Southern Ocean's role in global ocean and climate variability. Here, we reconstruct changes in DP throughflow dynamics over the past 65,000 y based on grain size and geochemical properties of sediment records from the southernmost continental margin of South America. Combined with published sediment records from the Scotia Sea, we argue for a considerable total reduction of DP transport and reveal an up to ≈40 % decrease in flow speed along the northernmost ACC pathway entering the DP during glacial times. Superimposed on this long-term decrease are high-amplitude, millennialscale variations, which parallel Southern Ocean and Antarctic temperature patterns. The glacial intervals of strong weakening of the ACC entering the DP imply an enhanced export of northern ACC surface and intermediate waters into the South Pacific Gyre and reduced Pacific–Atlantic exchange through the DP ("cold water route"). We conclude that changes in DP throughflow play a critical role for the global meridional overturning circulation and interbasin exchange in the Southern Ocean, most likely regulated by variations in the westerly wind field and changes in Antarctic sea ice extent.

Keywords: paleoceanography | Drake Passage | Antarctic Circumpolar Current | glacial–interglacial changes | sedimentology

Significance: The Drake Passage (DP) represents the most important oceanic gateway along the pathway of the world's largest current: the Antarctic Circumpolar Current (ACC). Resolving changes in the flow of circumpolar water masses through the DP is crucial for advancing our understanding of the Southern Ocean's role in affecting ocean and climate change on a global scale. We reconstruct current intensity frommarine sediment records around the southern tip of South America with unprecedented millennialscale resolution covering the past ≈65,000 y. For the last glacial period, we infer intervals of strong weakening of the ACC entering the DP, implying an enhanced export of northern ACC surface and intermediate waters into the South Pacific Gyre and reduced Pacific–Atlantic exchange through the cold water route.

Stuecker 2015

Malte F. Stuecker, Fei-Fei Jin & Axel Timmermann, *El Niño-Southern Oscillation frequency cascade*. PNAS **112** (2015), 13490–13495.

The El Niño-Southern Oscillation (ENSO) phenomenon, the most pronounced feature of internally generated climate variability, occurs on interannual timescales and impacts the global climate system through an interaction with the annual cycle. The tight coupling between ENSO and the annual cycle is particularly pronounced over the tropical Western Pacific. Here we show that this nonlinear interaction results in a frequency cascade in the atmospheric circulation, which is characterized by deterministic high-frequency variability on near-annual and subannual timescales. Through climate model experiments and observational analysis, it is documented that a substantial fraction of the anomalous Northwest Pacific anticyclone variability, which is the main atmospheric link between ENSO

and the East Asian Monsoon system, can be explained by these interactions and is thus deterministic and potentially predictable.

Keywords: ENSO | frequency cascade | combination mode | annual cycle | monsoon

Significance: This study identifies a mechanism to generate atmospheric variability on near-annual and subannual timescales. Responding nonlinearly to both the El Niño-Southern Oscillation (ENSO) and the annual cycle in sea surface temperatures, the atmosphere develops a wide range of deterministic spectral peaks and corresponding spatial patterns. It is demonstrated that the resulting deterministic variability, which projects onto one of the major modes of East Asian Monsoon variability, exhibits similar predictability as ENSO.

Story or Book

Shvartsman 2015

Alex Shvartsman, *Staff meeting, as seen by the spam filter*. nature **526** (2015), 734.