Liste erstellt am 2012-07-12

Literatur

Aktuell

Delcourt 2012

Matthieu Delcourt, Mark W. Blows, J. David Aguirre & Howard D. Rundle, *Evolutionary optimum for male sexual traits characterized using the multivariate Robertson-Price Identity*. PNAS **109** (2012), 10414–10419.
Phenotypes tend to remain relatively constant in natural populations, suggesting a limit to trait evolution. Although stationary phenotypes suggest stabilizing selection, directional selection is more commonly reported. However, selection on phenotypes will have no evolutionary consequence if the traits do not genetically covary with fitness, a covariance known as the Robertson-Price Identity. The nature of this genetic covariance determines if phenotypes will evolve directionally or whether they reside at an evolutionary optimum. Here, we show how a set of traits can be shown to be under net stabilizing selection through an application of the multivariate Robertson-Price Identity. We characterize how a suite of male sexual displays genetically covaries with fitness in a population of Drosophila serrata. Despite strong directional sexual selection on these phenotypes directly and significant genetic variance in them, little genetic covariance was detected with overall fitness. Instead, genetic analysis of trait deviations showed substantial stabilizing selection on the genetic variance of these traits with respect to overall fitness, indicating that they reside at an evolutionary optimum. In the presence of widespread pleiotropy, stabilizing selection on focal traits will arise through the net effects of selection on other, often unmeasured, traits and will tend to be stronger on trait combinations than single traits. Such selection may be difficult to detect in phenotypic analyses if the environmental covariance between the traits and fitness obscures the underlying genetic associations. The genetic analysis of trait deviations provides a way of detecting the missing stabilizing selection inferred by recent metaanalyses.
cuticular hydrocarbons | evolutionary stasis

Eisenberg 2012

Dan T. A. Eisenberg, M. Geoffrey Hayes & Christopher W. Kuzawa, *Delayed paternal age of reproduction in humans is associated with longer telomeres across two generations of descendants*. PNAS **109** (2012), 10251–10256.
Telomeres are repeating DNA sequences at the ends of chromosomes that protect and buffer genes from nucleotide loss as cells divide. Telomere length (TL) shortens with age in most proliferating tissues, limiting cell division and thereby contributing to senescence. However, TL increases with age in sperm, and, correspondingly, offspring of older fathers inherit longer telomeres. Using data and samples from a longitudinal study from the Philippines, we first replicate the finding that paternal age at birth is associated with longer TL in offspring (n = 2,023, P = 1.84 × 10-6). We then show that this association of paternal age with offspring TL is cumulative across multiple generations: in this sample, grandchildren of older paternal grandfathers at the birth of fathers have longer telomeres (n = 234, P = 0.038), independent of, and additive to, the association of their father's age at birth with TL. The lengthening of telomeres predicted by each year that the father's or grandfather's reproduction are delayed is equal to the yearly shortening of TL seen in middle-age to elderly women in this sample, pointing to potentially important impacts on health and the pace of senescent decline in tissues and systems that are

cell-replication dependent. This finding suggests a mechanism by which humans could extend late-life function as average age at reproduction is delayed within a lineage.
adaptation | epigenetics | evolution | parental effects | transgenerational plasticity

Hanna 2012

Jayd Hanna, Abigail S. Bouwman, Keri A. Brown, Mike Parker Pearson & Terence A. Brown, *Ancient DNA typing shows that a Bronze Age mummy is a composite of different skeletons*. Journal of Archaeological Science **39** (2012), 2774–2779.

Excavations at Cladh Hallan, a Bronze Age-Iron Age settlement on South Uist in the Outer Hebrides off the west coast of Scotland, revealed the skeletons of two adults, a sub-adult and a child buried beneath the foundations of three roundhouses. Osteological and isotopic evidence has shown that the male adult skeleton is a composite made up of parts of at least three different individuals. To test the hypothesis that the female skeleton was also a composite we examined ancient DNA from four of its components: the skull, mandible, right humerus and right femur. Seven polymerase chain reactions (PCRs) were attempted, these covering positions 15,996–16,420, 16–132 and 232–368 of the mitochondrial DNA hypervariable I and II regions. Three PCRs were successful for each sample and a total of 55 sequences were obtained from the cloned products. After exclusion of possible contaminating sequences, the remaining 34 were compared. It was concluded that the mandible, humerus and femur come from different individuals. Insufficient data were obtained to draw conclusions regarding the origin of the skull. The presence of two composite skeletons at Cladh Hallan indicates that the merging of identities may have been a deliberate act, perhaps designed to amalgamate different ancestries into a single lineage.
Keywords: Ancient DNA | Bronze Age | Claidh Hallan | Mitochondrial DNA | Mummy

Santos 2012

T. A. Santos, N. Fonseca, F. Castro & T. Vacas, *Loading and stability of a late 16th century Portuguese Indiaman*. Journal of Archaeological Science **39** (2012), 2835–2844.

The stability characteristics of 16th century ships are not known with certainty, but safety issues related to floatability, stability and overloading were a cause of concern at the time. The aim of the paper is to advance knowledge in this field by developing a set of loading conditions for a typical Portuguese ship of this epoch, for both the voyage from Lisbon to India and the return voyage. This allows testing the reconstruction of the presumable Nossa Senhora dos Mártires as well as to use this reconstruction to bring a better understanding of safety and loading issues on the Portuguese East India route. Given the uncertainties about the loading conditions, several hypotheses are tested, varying the amount of ballast, the degree of overloading and the distribution of weights on board, and allowing the development of a range of plausible loading arrangements. The stability of the ship is then assessed using modern tools to develop the limit KG curve for compliance with a modern stability criterion applicable to large sailing vessels. The case study ship is a plausible reconstruction based on the analysis of nautical archaeological remains, contemporary documents and the use of modern naval architecture methods.
Keywords: Shipbuilding history | Nautical archaeology | Portuguese Indiamen | 16th century seafaring

Takahashi 2012

Hidehiko Takahashi, Harumasa Takano, Takashi Ideno, Yuki Tamari, Kazuhisa Takemura & Tetsuya Suhara, *Reply to Yang et al.: Gender is not a confounding factor of our result*. PNAS **109** (2012), E1677.

Their sex difference argument does not have any influence on our result from a young Japanese male sample. In our article, we were interested in individual differences in reaction to unfairness observed in the ultimatum game.

YANG 2012

Zhibing Yang, Danmin Miao, Xufeng Liu & Xia Zhu, *Sex may influence the mediating effect of honesty in the relationship between serotonin and reaction to unfairness*. PNAS **109** (2012), E1676.

First, only male subjects were investigated in their study (1). Sex differences in the serotonin system and personalities would potentially confound the results. Although the authors noted that sex could influence the reaction to unfairness, they ignored the sex differences in the serotonin system.

Anthropologie

JARVIS 2012

Joseph P. Jarvis et al., *Patterns of Ancestry, Signatures of Natural Selection, and Genetic Association with Stature in Western African Pygmies*. PLoS Genetics **8** (2012), iv, e1002641. DOI:10.1371/journal.pgen.1002641.

Joseph P. Jarvis, Laura B. Scheinfeldt, Sameer Soi, Charla Lambert, Larsson Omberg, Bart Ferwerda, Alain Froment, Jean-Marie Bodo, William Beggs, Gabriel Hoffman, Jason Mezey & Sarah A. Tishkoff

African Pygmy groups show a distinctive pattern of phenotypic variation, including short stature, which is thought to reflect past adaptation to a tropical environment. Here, we analyze Illumina 1M SNP array data in three Western Pygmy populations from Cameroon and three neighboring Bantu-speaking agricultural populations with whom they have admixed. We infer genome-wide ancestry, scan for signals of positive selection, and perform targeted genetic association with measured height variation. We identify multiple regions throughout the genome that may have played a role in adaptive evolution, many of which contain loci with roles in growth hormone, insulin, and insulin-like growth factor signaling pathways, as well as immunity and neuroendocrine signaling involved in reproduction and metabolism. The most striking results are found on chromosome 3, which harbors a cluster of selection and association signals between approximately 45 and 60 Mb. This region also includes the positional candidate genes DOCK3, which is known to be associated with height variation in Europeans, and CISH, a negative regulator of cytokine signaling known to inhibit growth hormone-stimulated STAT5 signaling. Finally, pathway analysis for genes near the strongest signals of association with height indicates enrichment for loci involved in insulin and insulin-like growth factor signaling.

Author Summary

Africa is thought to be the location of origin of modern humans within the past 200,000 years and the source of our dispersion across the globe within the past 100,000 years. Africa is also a region of extreme environmental, cultural, linguistic, and phenotypic diversity, and human populations living there show the highest levels of genetic diversity in the world. Yet little is known about the genetic basis of the observed phenotypic variation in Africa or how local adaptation and demography have influenced these patterns in the recent past. Here, we analyze a set of admixing Bantu-speaking agricultural and Western Pygmy hunter-gatherer populations that show extreme differences in stature; Pygmies are ≈17 cm shorter on average than their Bantu neighbors and among the shortest populations globally. Our multifaceted approach identified several genomic regions that may have been targets of natural selection and so may harbor variants underlying the unique anatomy and physiology of Western African Pygmies. One region of chromosome three, in particular, harbors strong signals of natural selection, population differentiation, and

association with height. This region also contains a significant association with height in Europeans as well as a candidate gene known to regulate growth hormone signaling.

Bibel

Rasmussen 2012

Kaare Lund Rasmussen et al., *The constituents of the ink from a Qumran inkwell: new prospects for provenancing the ink on the Dead Sea Scrolls.* Journal of Archaeological Science **39** (2012), 2956–2968.

JArchSci39-2956-Supplement.kmz

Kaare Lund Rasmussen, Anna Lluveras Tenorio, Ilaria Bonaduce, Maria Perla Colombini, Leila Birolo, Eugenio Galano, Angela Amoresano, Greg Doudna, Andrew D. Bond, Vincenzo Palleschi, Giulia Lorenzetti, Stefano Legnaioli, Johannes van der Plicht & Jan Gunneweg

A unique sample of ink from an inkwell in the Schøyen Collection allegedly found at Qumran has been subjected to analyses by several analytical techniques: GCeMS, proteomic analysis, PXRD, Raman, (ATR) FT-IR, LIBS, ICP-MS and MS. The results reveal to an unexpected level of detail how the ink was manufactured, which gives insight into the industrial processes and craftsmanship that were practiced at the Qumran settlement during the Second Temple period (100 BCE–CE 70). The identified minerals and other organic and inorganic materials are sufficiently multiple and diverse that it is probable that this specific ink can be recognized if analyses of inks are performed on manuscripts from Qumran and other locations in Israel and the Middle East. The present work exposes a distinct and unique possibility to shed light on early Jewish manuscript controversies, including their provenance.

Keywords: Ink | Qumran | GCeMS | Raman | FT-IR | PXRD | LIBS | ICP-MS | Proteomic analyses | Radiocarbon dating

Datierung

Ruiz 2012

Juan F. Ruiz, Antonio Hernanz, Ruth Ann Armitage, Marvin W. Rowe, Ramon Viñas, José M. Gavira-Vallejo & Albert Rubio, *Calcium oxalate AMS ^{14}C dating and chronology of post-Palaeolithic rock paintings in the Iberian Peninsula. Two dates from Abrigo de los Oculados (Henarejos, Cuenca, Spain).* Journal of Archaeological Science **39** (2012), 2655–2657.

JArchSci39-2655-Supplement.kmz

Since 2005 we have been utilizing accelerator mass spectrometry (AMS) 14C dating in research on calcium oxalate crusts associated with open air rock art of the Iberian Peninsula. In this paper we present two dates linked with three eye-idol pictographs at Abrigo de los Oculados (Henarejos, Cuenca, Spain). Radiocarbon ages for these motifs agree with the expected iconography-based archaeological chronology. Such oxalate dates could provide an independent basis for evaluating chronological theories for post-Palaeolithic sites, designated in the UNESCO World Heritage List as Rock Art of the Mediterranean Basin on the Iberian Peninsula.

Keywords: AMS 14C dating | Calcium oxalate | Schematic art | Levantine art | Eye-idols | Abrigo de los Oculados

Isotope

Drake 2012

Brandon L. Drake, David T. Hanson & James L. Boone, *The use of radiocarbon-derived $\Delta^{13}C$ as a paleoclimate indicator: applications in the Lower Alentejo of Portugal*. Journal of Archaeological Science **39** (2012), 2888–2896.

JArchSci39-2888-Supplement.zip

Values of d13C are frequently reported with radiocarbon dates from organic materials. In C3 plants d13C values have been linked to changes in water use efficiency as a response to arid conditions. By calculating 13C discrimination (D13C) from 13C isotopic composition (d13C), archaeologists can gain potentially valuable inference into past climate conditions. Values of D13C reflect the process of discrimination against heavier 13C isotopes of carbon by comparing the d13C of samples to that of the atmosphere, and can be calculated when records of atmospheric d13CO2 are available. The present study examines a 1300 year history of radiocarbon-derived D13C from the Lower Alentejo of Portugal using charcoal recovered from excavations of a series of medieval habitation sites in the study area. To calculate D13C, the posterior means generated from Bayesian change-point analysis of d13CO2 records were used. Archaeological data were then compared to contemporary ecological studies of D13C of the same taxa against instrumental records of climate. Values of D13C fell within mean ranges for the taxa through a period of population growth between the 7th and 10th centuries AD. During the height of the Medieval Warm Period in the 11th century AD D13C values frequently fell to low levels associated with arid conditions. At this time environmental degradation and erosion were documented. Values of D13C increased for a brief period in the early 12th century AD before the rural Lower Alentejo was largely abandoned for nearly two centuries. Another period of aridity occurred in the 16th and 17th centuries AD. Radiocarbon-derived D13C is a potentially useful paleoclimate proxy for archaeologists provided that results can be paired with observed D13C variation in studies that pair these data with instrumental climate records.

Keywords: Stable carbon isotopes | Portugal | Medieval warm period | Abandonment | 13C discrimination | Carbon discrimination | Water use efficiency | Radiocarbon

Stokes 2011

Helen R. Stokes, Gundula Müldner & Emma Jenkins, *An investigation into the archaeological application of carbon stable isotope analysis used to establish crop water availability: solutions and ways forward*. In: Steven Mithen & Emily Black (Hrsg.), *Water, Life and Civilisation: Climate, Environment and Society in the Jordan Valley*. (Cambridge 2011), 373–380.

Carbon stable isotope analysis of charred cereal remains is a relatively new method employed by archaeological scientists to investigate ancient climate and irrigation regimes. The aim of this study was to assess the effect of environmental variables on carbon isotope discrimination (Δ) in multiple environments to develop the technique and its archaeological application, using crops grown at three experimental stations in Jordan. There are two key results: (1) as expected, there was a strong positive relationship between water availability and Δ; (2) site, not water input, was the most important factor in determining Δ. Future work should concentrate on establishing ways of correcting Δ for the influence of site specific environmental variables and on assessing how well carbon isotope discrimination values are preserved within the archaeological record.

Klima

Berberian 2012

Manuel Berberian, Sādegh Malek Shahmirzādi, Jebra'il Nokandeh & Morteza Djamali, *Archeoseismicity and environmental crises at the Sialk Mounds, Central Iranian Plateau, since the Early Neolithic*. Journal of Archaeological Science **39** (2012), 2845–2858.

During the long-lasting cultural sequences of the Shurābeh and Sialk archeological mounds (6200–550 BC) the inhabitants encountered numerous diversified crises along a narrowfertile passageway at the edge of the Central Iranian Plateau Great Desert. Some of the threats may be attributed to earthquakes, drastic climatic changes, and man-made environmental deterioration, which possibly led to the settlement withdrawing at different stages toward a more suitable location. Our study identified the occurrence of a large-magnitude earthquake around 3800 BC along the Kāshān fault, which is well documented by various lines of circumstantial evidence, including: (i) numerous contemporaneous smashed skeletons and artifacts underneath collapsed walls and ceiling debris in several different areas; (ii) tilted and collapsed walls; (iii) nearly N–S oriented fallen large storage jars; and (iv) nearly vertical deep ground fractures cutting walls and floors of the Sialk III5 South Mound settlement. Archeological data also shows additional stratigraphic discontinuities and damages that may be attributed to earthquakes. However, damage features in limited exposed trenches are less conclusive and require additional careful excavations. Apparent ancient paleo-architectural innovative attempts to enhance the coherency/elasticity of the structures and minimize earthquakedamage to buildings were also noted, suggesting the indigenous earthquake hazard mitigation endeavor. There seems to be a correlation between some site abandonment dates and possible drastic regional draught/cooling events. The natural and anthropogenic impacts addressed in this study constituted major threats to the sensitive archeological settlements at the fringe of the desert and the vicinity of the Kāshān active fault since antiquity.

Keywords: Archeology | Seismicity | Active faulting | Archeoseismicity | Environmental crises | Climate change | Sialk, Iran

Bliege Bird 2012

Rebecca Bliege Bird, Brian F. Codding, Peter G. Kauhanen & Douglas W. Bird, *Aboriginal hunting buffers climate-driven fire-size variability in Australia's spinifex grasslands*. PNAS **109** (2012), 10287–10292.

Across diverse ecosystems, greater climatic variability tends to increase wildfire size, particularly in Australia, where alternating wet-dry cycles increase vegetation growth, only to leave a dry overgrown landscape highly susceptible to fire spread. Aboriginal Australian hunting fires have been hypothesized to buffer such variability, mitigating mortality on small-mammal populations, which have suffered declines and extinctions in the arid zone coincident with Aboriginal depopulation. We test the hypothesis that the relationship between climate and fire size is buffered through the maintenance of an anthropogenic, fine-grained fire regime by comparing the effect of climatic variability on landscapes dominated by Martu Aboriginal hunting fires with those dominated by lightning fires. We show that Aboriginal fires are smaller, more tightly clustered, and remain small even when climate variation causes huge fires in the lightning region. As these effects likely benefit threatened small-mammal species, Aboriginal hunters should be considered trophic facilitators, and policies aimed at reducing the risk of large fires should promote land-management strategies consistent with Aboriginal burning regimes.

climate change | patch mosaic burning | trophic facilitation

Corella 2012

Juan Pablo Corella et al., *The 1.5-ka varved record of Lake Montcortès*

(southern Pyrenees, NE Spain). Quaternary Research (2012) preprint, 1–10. DOI:10.1016/j.yqres.2012.06.002.

Juan Pablo Corella, Achim Brauer, Clara Mangili, Valentí Rull, Teresa Vegas-Vilarrúbia, Mario Morellón and Blas L. Valero-Garcés

The karstic Lake Montcortès sedimentary sequence spanning the last 1548 yr constitutes the first continuous, high-resolution, multi-proxy varved record in northern Spain. Sediments consist of biogenic varves composed of calcite, organic matter and detrital laminae and turbidite layers. Calcite layer thickness and internal sub-layering indicate changes in water temperature and seasonality whereas the frequency of detrital layers reflects rainfall variability. Higher temperatures occurred in Lake Montcortès in AD 555-738, 825-875, 1010-1322 and 1874-present. Lower temperatures and prolonged winter conditions were recorded in AD 1446-1598, 1663-1711 and 1759-1819. Extreme and multiple precipitation events dominated in AD 571-593, 848-922, 987-1086, 1168-1196, 1217-1249, 1444-1457, 1728-1741 and 1840-1875, indicating complex hydrological variability in NE Spain since AD 463. The sedimentary record of Lake Montcortès reveals a short-term relation between rainfall variability and the detrital influx, pronounced during extended periods of reduced anthropogenic influences. In pre-industrial times, during warm climate episodes, population and land use increased in the area. After the onset of the industrialization, the relationship between climate and human activities decoupled and population dynamics and landscape modifications were therefore mostly determined by socio-economic factors.

Keywords: Biogenic varves | Human impact | Climate changes | Medieval Climate Anomaly | Little Ice Age | Pre-Pyrenees

Mathematik

Axelrod 1988

Robert Axelrod & Douglas Dion, *The Further Evolution of Cooperation*. science **242** (1988), 1385–1390.

Axelrod's model of the evolution of cooperation was based on the iterated Prisoner's Dilemma. Empirical work following this approach has helped establish the prevalence of cooperation based on reciprocity. Theoretical work has led to a deeper understanding of the role of other factors in the evolution ofcooperation: the number of players, the range of possible choices, variation in the payoff structure, noise, the shadow of the future, population dynamics, and population structure.

von Neumann 1928

John von Neumann, *Zur Theorie der Gesellschaftsspiele*. Mathematische Annalen **100** (1928), 295–320.

Nowak 1993

Martin Nowak & Karl Sigmund, *A strategy of win-stay, lose-shift that outperforms tit-for-tat in the Prisoner's Dilemma game*. nature **364** (1993), 56–58.

The Prisoner's Dilemma is the leading metaphor for the evolution of cooperative behaviour in populations of selfish agents, especially since the well-known computer tournaments of Axelrod and their application to biological communities. In Axelrod's simulations, the simple strategy tit-for-tat did outstandingly well and subsequently became the major paradigm for reciprocal altruism. Here we present extended evolutionary simulations of heterogeneous ensembles of probabilistic strategies including mutation and selection, and report the unexpected success of another protagonist: Pavlov. This strategy is as simple as tit-for-tat and embodies the fundamental behavioural mechanism

win-stay, lose-shift, which seems to be a widespread rule. Pavlov's success is based on two important advantages over tit-for-tat: it can correct occasional mistakes and exploit unconditional cooperators. This second feature prevents Pavlov populations from being undermined by unconditional cooperators, which in turn invite defectors. Pavlov seems to be more robust than tit-for-tat, suggesting that cooperative behaviour in natural situations may often be based on win-stay, lose-shift.

Nowak 2000

Martin A. Nowak, Karen M. Page & Karl Sigmund, *Fairness Versus Reason in the Ultimatum Game*. science **289** (2000), 1773–1775.

In the Ultimatum Game, two players are offered a chance to win a certain sum of money. All they must do is divide it. The proposer suggests how to split the sum. The responder can accept or reject the deal. If the deal is rejected, neither player gets anything. The rational solution, suggested by game theory, is for the proposer to offer the smallest possible share and for the responder to accept it. If humans play the game, however, the most frequent outcome is a fair share. In this paper, we develop an evolutionary approach to the Ultimatum Game. We show that fairness will evolve if the proposer can obtain some information on what deals the responder has accepted in the past. Hence, the evolution of fairness, similarly to the evolution of cooperation, is linked to reputation.

Nowak 2006

Martin A. Nowak, *Five Rules for the Evolution of Cooperation*. science **314** (2006), 1560–1563.

s314-1560-Supplement.pdf

Cooperation is needed for evolution to construct new levels of organization. Genomes, cells, multicellular organisms, social insects, and human society are all based on cooperation. Cooperation means that selfish replicators forgo some of their reproductive potential to help one another. But natural selection implies competition and therefore opposes cooperation unless a specific mechanism is at work. Here I discuss five mechanisms for the evolution of cooperation: kin selection, direct reciprocity, indirect reciprocity, network reciprocity, and group selection. For each mechanism, a simple rule is derived that specifies whether natural selection can lead to cooperation.

Press 2012

William H. Press & Freeman J. Dyson, *Iterated Prisoner's Dilemma contains strategies that dominate any evolutionary opponent*. PNAS **109** (2012), 10409–10413.

The two-player Iterated Prisoner's Dilemma game is a model for both sentient and evolutionary behaviors, especially including the emergence of cooperation. It is generally assumed that there exists no simple ultimatum strategy whereby one player can enforce a unilateral claim to an unfair share of rewards. Here, we show that such strategies unexpectedly do exist. In particular, a player X who is witting of these strategies can (i) deterministically set her opponent Y's score, independently of his strategy or response, or (ii) enforce an extortionate linear relation between her and his scores. Against such a player, an evolutionary player's best response is to accede to the extortion. Only a player with a theory of mind about his opponent can do better, in which case Iterated Prisoner's Dilemma is an Ultimatum Game.

evolution of cooperation | game theory | tit for tat

Stewart 2012

Alexander J. Stewart & Joshua B. Plotkin, *Extortion and cooperation in the Prisoner's Dilemma*. PNAS **109** (2012), 10134–10135.

Had Press and Dyson kept their results to themselves, they may have enjoyed an advantage in tournaments like those set up by Axelrod (6, 7), in which a variety of fixed strategies compete. To test whether this is true, we reran Axelrod's original tournament, but with the addition of some ZD strategies (Fig. 1). We found ZD strategies that foster cooperation and receive the highest total payoff in the tournament-higher even than Tit-For-Tat's payoff. In addition, we found extortion strategies that win the largest number of the head-to-head competitions in the tournament. Following Press and Dyson, future research on the IPD will surely be framed in terms of ZD strategies. How do such strategies fare in iterated games with finite but undetermined time horizons, or in the presence of noise, or in a spatial context, etc.? Additionally, what does the existence of ZD strategies mean for evolutionary game theory: can such strategies naturally arise by mutation, invade, and remain dominant in evolving populations? What is immediately clear is that, by publishing their results, Press and Dyson have changed the game. Readers of PNAS, some of whom have a theory of mind, will now be tempted to use an extortion strategy when faced with an IPD opponent. Yet even in a game as simple as the Prisoner's Dilemma, even knowing that a long-term memory does not provide an advantage and that ZD strategies exist, a sentient player after Press and Dyson is still faced with a kind of Turing test each time she meets an opponent: she must determine what her opponent knows about the game, what he knows about her, and what he might be able to learn, and only then, in the face of these tentative assumptions, can she apply her own understanding to devise a strategy that best serves her interest.

Metallzeiten

Giosan 2012

Liviu Giosan et al., *Fluvial landscapes of the Harappan civilization*. PNAS **109** (2012), 10138–10139.

pnas109-10138-Fulltext.pdf

Liviu Giosan, Peter D. Clift, Mark G. Macklin, Dorian Q. Fuller, Stefan Constantinescu, Julie A. Durcan, Thomas Stevens, Geoff A. T. Duller, Ali R. Tabrez, Kavita Gangal, Ronojoy Adhikari, Anwar Alizai, Florin Filip, Sam VanLaningham and James P. M. Syvitski

The collapse of the Bronze Age Harappan, one of the earliest urban civilizations, remains an enigma. Urbanism flourished in the western region of the Indo-Gangetic Plain for approximately 600 y, but since approximately 3,900 y ago, the total settled area and settlement sizes declined, many sites were abandoned, and a significant shift in site numbers and density towards the east is recorded. We report morphologic and chronologic evidence indicating that fluvial landscapes in Harappan territory became remarkably stable during the late Holocene as aridification intensified in the region after approximately 5,000 BP. Upstream on the alluvial plain, the large Himalayan rivers in Punjab stopped incising, while downstream, sedimentation slowed on the distinctive mega-fluvial ridge, which the Indus built in Sindh. This fluvial quiescence suggests a gradual decrease in flood intensity that probably stimulated intensive agriculture initially and encouraged urbanization around 4,500 BP. However, further decline in monsoon precipitation led to conditions adverse to both inundation- and rain-based farming. Contrary to earlier assumptions that a large glacier-fed Himalayan river, identified by some with the mythical Sarasvati, watered the Harappan heartland on the interfluve between the Indus and Ganges basins, we show that only monsoonal-fed rivers were active there during the Holocene. As the monsoon weakened, monsoonal rivers gradually dried or became seasonal, affecting habitability along their courses. Hydroclimatic stress increased the vulnerability of agricultural production supporting Harappan urbanism, leading to settlement downsizing, diversification of crops, and a drastic increase in settlements in the moister monsoon regions of the upper Punjab, Haryana, and Uttar Pradesh.

Indus Valley | floods | droughts | climate change | archaeology

Methoden

White 2012

Devin A. White & Sarah B. Barber, *Geospatial modeling of pedestrian transportation networks: a case study from precolumbian Oaxaca, Mexico.* Journal of Archaeological Science **39** (2012), 2684–2696.

Using accumulated cost surfaces and various pathfinding techniques within Geographic Information Systems (GIS) software, archaeologists and other spatial scientists have developed increasingly sophisticated models of human movement. Despite their utility, these approaches can be limited because standard GIS software cannot model movement (1) from many origins to many destinations or (2) without specific origins and destinations. Absent these capabilities, it is particularly difficult to model networks of movement over a given tract of land if you are interested in obtaining a more general sense of movement dynamics, not specific site-to-site patterns. In this paper, we present an innovative way of modeling past movement that generates both natural-looking networks and also indicates the degree of traffic that may have existed on any particular segment of those networks. The "From Everywhere to Everywhere" (FETE) model generates networks based on topography and landcover without requiring that origin and destination points be supplied in advance. We apply the FETE model to a case from the southern Mexican state of Oaxaca, a region that has extensive archaeological and ethnohistoric data sets that serve as a test of the efficacy of our technique. A comparison of the FETE output with known late precolumbian and early colonial movement corridors indicates that the method is effective and should be useful for modeling networks in other areas.

Keywords: Oaxaca | GIS | Movement | Networks | Pathfinding | High performance computing | Least cost path