Liste erstellt am 2011-05-06

Literatur

Aktuell

Bassett 2011

Danielle S. Bassett, Nicholas F. Wymbs, Mason A. Porter, Peter J. Mucha, Jean M. Carlson & Scott T. Grafton, *Dynamic reconfiguration of human brain networks during learning*. PNAS **108** (2011), 7641–7646.

pnas108-07641-Supplement.pdf

Human learning is a complex phenomenon requiring flexibility to adapt existing brain function and precision in selecting new neurophysiological activities to drive desired behavior. These two attributes—flexibility and selection—must operate over multiple temporal scales as performance of a skill changes from being slow and challenging to being fast and automatic. Such selective adaptability is naturally provided by modular structure, which plays a critical role in evolution, development, and optimal network function. Using functional connectivity measurements of brain activity acquired from initial training through mastery of a simple motor skill, we investigate the role of modularity in human learning by identifying dynamic changes of modular organization spanning multiple temporal scales. Our results indicate that flexibility, which we measure by the allegiance of nodes to modules, in one experimental session predicts the relative amount of learning in a future session. We also develop a general statistical framework for the identification of modular architectures in evolving systems, which is broadly applicable to disciplines where network adaptability is crucial to the understanding of system performance.

complex network | time-dependent network | fMRI | motor learning | community structure

Canton 2011

Sophie E. Canton, Etienne Plésiat, John D. Bozek, Bruce S. Ruded, Piero Decleva & Fernando Martín, *Direct observation of Young's double-slit interferences in vibrationally resolved photoionization of diatomic molecules*. PNAS **108** (2011), 7302–7306.

Vibrationally resolved valence-shell photoionization spectra of H2, N2 and CO have been measured in the photon energy range 20–300 eV using third-generation synchrotron radiation. Young's double-slit interferences lead to oscillations in the corresponding vibrational ratios, showing that the molecules behave as two-center electron-wave emitters and that the associated interferences leave their trace in the angle-integrated photoionization cross section. In contrast to previous work, the oscillations are directly observable in the experiment, thereby removing any possible ambiguity related to the introduction of external parameters or fitting functions. A straightforward extension of an original idea proposed by Cohen and Fano [Cohen HD, Fano U (1966) Phys Rev 150:30] confirms this interpretation and shows that it is also valid for diatomic heteronuclear molecules. Results of accurate theoretical calculations are in excellent agreement with the experimental findings.

photoelectron spectroscopy | molecular spectroscopy | molecular ionization | density functional theory | quantum chemistry

Erickson 2011

Kirk I. Erickson et al., *Exercise training increases size of hippocampus and improves memory*. PNAS **108** (2011), 3017–3022.

pnas108-03017-Supplement.pdf, pnas108-03017-Comment.pdf, pnas108-03017-Reply.pdf

Kirk I. Erickson, Michelle W. Voss, Ruchika Shaurya Prakash, Chandramallika Basak, Amanda Szabo, Laura Chaddock, Jennifer S. Kim, Susie Heo, Heloisa Alves, Siobhan M. White, Thomas R. Wojcicki, Emily Mailey, Victoria J. Vieira, Stephen A. Martin, Brandt D. Pence, Jeffrey A. Woods, Edward McAuley and Arthur F. Kramer
The hippocampus shrinks in late adulthood, leading to impaired memory and increased risk for dementia. Hippocampal and medial temporal lobe volumes are larger in higher-fit adults, and physical activity training increases hippocampal perfusion, but the extent to which aerobic exercise training can modify hippocampal volume in late adulthood remains unknown. Here we show, in a randomized controlled trial with 120 older adults, that aerobic exercise training increases the size of the anterior hippocampus, leading to improvements in spatial memory. Exercise training increased hippocampal volume by 2 %, effectively reversing age-related loss in volume by 1 to 2 y. We also demonstrate that increased hippocampal volume is associated with greater serum levels of BDNF, a mediator of neurogenesis in the dentate gyrus. Hippocampal volume declined in the control group, but higher preintervention fitness partially attenuated the decline, suggesting that fitness protects against volume loss. Caudate nucleus and thalamus volumes were unaffected by the intervention. These theoretically important findings indicate that aerobic exercise training is effective at reversing hippocampal volume loss in late adulthood, which is accompanied by improved memory function.
aging | brain | cognition | plasticity | MRI

Field 2011

Julie S. Field, Thegn N. Ladefoged & Patrick V. Kirch, *Household expansion linked to agricultural intensification during emergence of Hawaiian archaic states*. PNAS **108** (2011), 7327–7332.
pnas108-07327-Supplement.pdf
The Leeward Kohala Field System (LKFS) covering 60 km2 on Hawai'i Island is one of the world's best-studied archaeological examples of preindustrial agricultural intensication. Archaeological correlates for households over a 400-y period of intensication of the LKFS (A.D. 1400–1800) indicate that household age, number, and distribution closely match the expansion of agricultural features at both macro- and microscales. We excavated and dated residential complexes within portions of five traditional Hawaiian land units (ahupua'a), two in the central core of the field system and three in the southern margins. Forty-eight radiocarbon dates from 43 residential features indicate an overall pattern of exponential increase in the numbers of households over time. Spatial distribution of these dates suggests that the core of the LKFS may have reached a population saturation point earlier than in the southern margins. Bayesian statistical analysis of radiocarbon dates from residential features in the core region, combined with spatial analysis of agricultural and residential construction sequences, demonstrates that the progressive subdivision of territories into smaller socioeconomic units was matched by addition of new residences, probably through a process of household fissioning. These results provide insights into the economic processes underlying the sociopolitical transformation from chiefdom to archaic state in precontact Hawai'i.
household archaeology | radiocarbon dating | relative chronology | sociopolitical evolution | paleodemography

Hänggi 2011

Jürgen Hänggi, Diana Wotruba & Lutz Jäncke, *Globally Altered Structural Brain Network Topology in Grapheme-Color Synesthesia*. Journal of Neuroscience **31** (2011), 5816–5828.
JNeurosci31-05816-Supplement.pdf
Synesthesia is a perceptual phenomenon in which stimuli in one particular modality elicit a sensation within the same or another sensory modality (e.g., specific graphemes

evoke the perception of particular colors). Grapheme-color synesthesia (GCS) has been proposed to arise from abnormal local cross-activation between grapheme and color areas because of their hyperconnectivity. Recently published studies did not confirm such a hyperconnectivity, although morphometric alterations were found in occipitotemporal, parietal, and frontal regions of synesthetes. We used magnetic resonance imaging surface-based morphometry and graph-theoretical network analyses to investigate the topology of structural brain networks in 24 synesthetes and 24 nonsynesthetes. Connectivity matrices were derived from region-wise cortical thickness correlations of 2366 different cortical parcellations across the whole cortex and from 154 more common brain divisions as well. Compared with nonsynesthetes, synesthetes revealed a globally altered structural network topology as reflected by reduced small-worldness, increased clustering, increased degree, and decreased betweenness centrality. Connectivity of the fusiform gyrus (FuG) and intraparietal sulcus (IPS) was changed as well. Hierarchical modularity analysis revealed increased intramodular and intermodular connectivity of the IPS in GCS. However, connectivity differences in the FuG and IPS showed a low specificity because of global changes. We provide first evidence that GCS is rooted in a reduced small-world network organization that is driven by increased clustering suggesting global hyperconnectivity within the synesthetes' brain. Connectivity alterations were widespread and not restricted to the FuG and IPS. Therefore, synesthetic experience might be only one phenotypic manifestation of the globally altered network architecture in GCS.

Kooijman 2011

J. D. G. Kooijman, J. P. Meijaard, Jim M. Papadopoulos, Andy Ruina & A. L. Schwab, *A Bicycle Can Be Self-Stable Without Gyroscopic or Caster Effects*. science **332** (2011), 339–342.

s332-0339-Supplement.pdf, s332-0339-Supplement.htm, s332-0339-Supplement1.mp4, s332-0339-Supplement2.mp4, s332-0339-Supplement3.mp4, s332-0339-Supplement4.mp4

A riderless bicycle can automatically steer itself so as to recover from falls. The common view is that this self-steering is caused by gyroscopic precession of the front wheel, or by the wheel contact trailing like a caster behind the steer axis. We show that neither effect is necessary for self-stability. Using linearized stability calculations as a guide, we built a bicycle with extra counter-rotating wheels (canceling the wheel spin angular momentum) and with its front-wheel ground-contact forward of the steer axis (making the trailing distance negative). When laterally disturbed from rolling straight, this bicycle automatically recovers to upright travel. Our results show that various design variables, like the front mass location and the steer axis tilt, contribute to stability in complex interacting ways.

Reardon 2011

Sara Reardon, *Fukushima Radiation Creates Unique Test of Marine Life's Hardiness*. science **332** (2011), 292.

Even so, research from weapons testing and the Chernobyl accident found that large fish that accumulate cesium-137 excrete it over time. Compared with other toxins that humans put into the marine environment, researchers conclude, the danger to Japan's fish from the radiation spill is very low.

Stolarz-Skrzypek 2011

Katarzyna Stolarz-Skrzypek et al., *Fatal and Nonfatal Outcomes, Incidence of Hypertension, and Blood Pressure Changes in Relation to Urinary Sodium Excretion*. Journal of the American Medical Association **305** (2011), 1777–1785.

JAMedA305-1777-Supplement.pdf

Katarzyna Stolarz-Skrzypek, Tatiana Kuznetsova, Lutgarde Thijs, Valérie Tikhonoff, Jitka Seidlerová, Tom Richart, Yu Jin, Agnieszka Olszanecka, Sofia Malyutina, Edoardo Casiglia, Jan Filipovský, Kalina Kawecka-Jaszcz, Yuri Nikitin & Jan A. Staessen for the European Project on Genes in Hypertension (EPOGH) Investigators

Context: Extrapolations from observational studies and short-term intervention trials suggest that population-wide moderation of salt intake might reduce cardiovascular events.
Objective: To assess whether 24-hour urinary sodium excretion predicts blood pressure (BP) and health outcomes.
Design, Setting, and Participants: Prospective population study, involving 3681 participants without cardiovascular disease (CVD) who are members of families that were randomly enrolled in the Flemish Study on Genes, Environment, and Health Outcomes (1985-2004) or in the European Project on Genes in Hypertension (1999-2001). Of 3681 participants without CVD, 2096 were normotensive at baseline and 1499 had BP and sodium excretion measured at baseline and last follow-up (2005-2008).
Main Outcome Measures: Incidence of mortality and morbidity and association between changes in BP and sodium excretion. Multivariable-adjusted hazard ratios (HRs) express the risk in tertiles of sodium excretion relative to average risk in the whole study population.
Results: Among 3681 participants followed up for a median 7.9 years, CVD deaths decreased across increasing tertiles of 24-hour sodium excretion, from 50 deaths in the low (mean, 107 mmol), 24 in the medium (mean, 168 mmol), and 10 in the high excretion group (mean, 260 mmol; P<.001), resulting in respective death rates of 4.1 % (95 % confidence interval [CI], 3.5 %-4.7 %), 1.9 % (95 % CI, 1.5 %-2.3 %), and 0.8 % (95 % CI, 0.5 %-1.1 %). In multivariable-adjusted analyses, this inverse association retained significance (P=.02): the HR in the low tertile was 1.56 (95 % CI, 1.02-2.36; P=.04). Baseline sodium excretion predicted neither total mortality (P=.10) nor fatal combined with nonfatal CVD events (P=.55). Among 2096 participants followed up for 6.5 years, the risk of hypertension did not increase across increasing tertiles (P=.93). Incident hypertension was 187 (27.0 %; HR, 1.00; 95 % CI, 0.87-1.16) in the low, 190 (26.6 %; HR, 1.02; 95 % CI, 0.89-1.16) in the medium, and 175 (25.4 %; HR , 0.98; 95 % CI, 0.86-1.12) in the high sodium excretion group. In 1499 participants followed up for 6.1 years, systolic blood pressure increased by 0.37 mm Hg per year (P<.001), whereas sodium excretion did not change (-0.45 mmol per year, P=.15). However, in multivariable-adjusted analyses, a 100-mmol increase in sodium excretion was associated with 1.71 mm Hg increase in systolic blood pressure (P.<001) but no change in diastolic BP.
Conclusions: In this population-based cohort, systolic blood pressure, but not diastolic pressure, changes over time aligned with change in sodium excretion, but this association did not translate into a higher risk of hypertension or CVD complications. Lower sodium excretion was associated with higher CVD mortality.

Vo 2011

Anh-Thu E. Vo, Michael S. Bank, James P. Shine & Scott V. Edwards, *Temporal increase in organic mercury in an endangered pelagic seabird assessed by century-old museum specimens*. PNAS **108** (2011), 7466–7471.

pnas108-07466-Supplement1.pdf, pnas108-07466-Supplement2.xls

Methylmercury cycling in the Pacific Ocean has garnered significant attention in recent years, especially with regard to rising mercury emissions from Asia. Uncertainty exists concerning whether increases in anthropogenic emissions over time may have caused increased mercury bioaccumulation in the biota. To address this, we measured total mercury and, for a subset of samples, methylmercury (the bioaccumulated form of mercury) in museum feathers from an endangered seabird, the black-footed albatross (Phoebastria nigripes), spanning a 120-y period. We analyzed stable isotopes of nitrogen (d15N) and carbon (d13C) to control for temporal changes in trophic structure and diet. In post-1940

and -1990 feathers, we detected significantly higher mean methylmercury concentrations and higher proportions of samples exhibiting above deleterious threshold levels (≈40,000 ng • g-1) of methylmercury relative to prior time points, suggesting that mercury toxicity may undermine reproductive effort in the species.We also found higher levels of (presumably curator-mediated) inorganic mercury in older specimens of albatross as well as two nonpelagic species lacking historical exposure to bioavailable mercury, patterns suggesting that studies on bioaccumulation should measure methylmercury rather than total mercury when using museum collections. d15N contributed substantially to models explaining the observed methylmercury variation. After simultaneously controlling for significant trends in d13C over time and d15N with methylmercury exposure, year remained a significant independent covariate with feather methylmercury levels among the albatrosses. These data show that remote seabird colonies in the Pacific basin exhibit temporal changes in methylmercury levels consistent with historical global and recent regional increases in anthropogenic emissions.
Asian emissions | ecotoxicology | fisheries | global change | mercury contamination

YANG 2011

Lei Yang et al., *Evolutionary dynamics of bacteria in a human host environment*. PNAS **108** (2011), 7481–7486.
pnas108-07481-Supplement.pdf, pnas108-07481-Supplement1.doc, pnas108-07481-Supplement2.doc, pnas108-07481-Supplement3.doc, pnas108-07481-Supplement4.doc, pnas108-07481-Supplement5.doc
Lei Yang, Lars Jelsbak, Rasmus Lykke Marvig, Søren Damkiær, Christopher T. Workman, Martin Holm Rau, Susse Kirkelund Hansen, Anders Folkesson, Helle Krogh Johansen, Oana Ciofu, Niels Høiby, Morten O. A. Sommer and Søren Molin
Laboratory evolution experiments have led to important findings relating organism adaptation and genomic evolution. However, continuous monitoring of long-term evolution has been lacking for natural systems, limiting our understanding of these processes in situ. Here we characterize the evolutionary dynamics of a lineage of a clinically important opportunistic bacterial pathogen, Pseudomonas aeruginosa, as it adapts to the airways of several individual cystic fibrosis patients over 200,000 bacterial generations, and provide estimates of mutation rates of bacteria in a natural environment. In contrast to predictions based on in vitro evolution experiments, we document limited diversification of the evolving lineage despite a highly structured and complex host environment. Notably, the lineage went through an initial period of rapid adaptation caused by a small number of mutations with pleiotropic effects, followed by a period of genetic drift with limited phenotypic change and a genomic signature of negative selection, suggesting that the evolving lineage has reached a major adaptive peak in the fitness landscape. This contrasts with previous findings of continued positive selection from long-term in vitro evolution experiments. The evolved phenotype of the infecting bacteria further suggests that the opportunistic pathogen has transitioned to become a primary pathogen for cystic fibrosis patients.
microbial evolution | natural population | chronic infection | genome sequences | transcriptomics

Anthropologie

ATKINSON 2011

Quentin D. Atkinson, *Phonemic Diversity Supports a Serial Founder Effect Model of Language Expansion from Africa*. science **332** (2011), 346–349.
s332-0346-Supplement.pdf
Human genetic and phenotypic diversity declines with distance from Africa, as predicted by a serial founder effect in which successive population bottlenecks during range expansion

progressively reduce diversity, underpinning support for an African origin of modern humans. Recent work suggests that a similar founder effect may operate on human culture and language. Here I show that the number of phonemes used in a global sample of 504 languages is also clinal and fits a serial founder-effect model of expansion from an inferred origin in Africa. This result, which is not explained by more recent demographic history, local language diversity, or statistical non-independence within language families, points to parallel mechanisms shaping genetic and linguistic diversity and supports an African origin of modern human languages.

Caldararo 2011

Niccolo Caldararo, *On the Use of Contemporary "Hunters and Gatherers" as Models for Prehistoric Patterns of Wealth Distribution*. Current Anthropology **52** (2011), 265.

The authors' main mistake is to assume that today's surviving peoples who practice various adaptive strategies associated with traditional societies are representatives of the social organization and cultures described as particular to those strategies in the past. Such an idea of the "frozen-intime" primitive was more characteristic of nineteenth-century historians and missionaries and is not accepted by most of today's anthropologists. Implicit in the study is the idea that institutions, represented by inheritance patterns, define today's wealth inequality among the people of their sample. The authors appear to believe that there have been no outside influences in marriage and kinship and that ideas of property are indigenous, functional, and intact.

Comment 2011

Linda Vigilant & Kevin E. Langergraber, *Inconclusive evidence for patrilocality in Neandertals*. PNAS **108** (2011), E87.

Reply 2011

Carles Lalueza-Fox, Antonio Rosas, Marco de la Rasilla, M. Thomas P. Gilbert & Eske Willerslev, *Reply to Vigilant and Langergraber: Patrilocality in Neandertals is still the most plausible explanation*. PNAS **108** (2011), E88.

Kultur

Bar-Oz 2011

Guy Bar-Oz, Melinda Zeder & Frank Hole, *Role of mass-kill hunting strategies in the extirpation of Persian gazelle (Gazella subgutturosa) in the northern Levant*. PNAS **108** (2011), 7345–7350.

pnas108-07345-Supplement.pdf

Continuous and intensive exploitation of wildlife resources by early agricultural societies had major ecological consequences in the ancient Near East. In particular, hunting strategies of postNeolithic societies involving the mass killing of wild ungulates contributed to the eventual extirpation of a number of wild species. A remarkable deposit of bones of Persian gazelle (Gazella subgutarosa) from fourth millennium BCE levels at Tell Kuran in northeastern Syria provides insight into the unsustainable hunting practices that disrupted gazelle migratory patterns and helped set the course for the virtual extinction of this species and possibly other steppe species in the Levant. The social context of mass kills conducted during periods when people relied primarily on domestic livestock for animal resources sets them apart from the more targeted and sustainable practices of earlier periods, when wild animals were the major or sole source of animal protein.

Cameron 2011

Catherine M. Cameron, *Captives and Culture Change, Implications for Archaeology*. Current Anthropology **52** (2011), 169–209.

Captives were found in societies of all social levels throughout much of history and prehistory. They were frequently women, and they could be potent agents of culture change. In some societies they entered a highly stigmatized slave class, while in others they might be fully incorporated into the society of their captors. Regardless of their social position, captives played an important role in the transmission of cultural practices and ultimately in culture change, but few studies have explored the role of captives in culture change, especially in nonstate societies. I begin that process, using ethnohistoric, historic, ethnographic, archaeological, and other data. I document the prevalence and antiquity of captive-taking around the world, its gender selectivity, and the rights of social personhood that captives were accorded in captor societies and assess factors that affected captives' ability to effect culture change. The focus is especially on craft activities, because captive influence is likely to be most evident to archaeologists in the production of craft goods.

Otterbein 2011

Keith F. Otterbein, *Warfare and Its Relationship to the Origins of Agriculture*. Current Anthropology **52** (2011), 267–268.

Stated positively, plant domestication and the origins of agriculture arose only in regions where raiding and warfare did not occur over long periods.

To argue that warfare arose gradually in the Neolithic of the Near East is to make an egregious error. Yes, warfare did increase over time, but it increased only in some regions, such as Anatolia and the Levant. Other regions remained free of warfare. Agriculture flourished in the latter regions. Thus, agricultural intensification went hand-in-hand with peace. Recognition of this pattern has an important implication for the origin of the state. Primary states did not arise in those areas where warfare occurred. Primary states arose where warfare was absent and peace prevailed.

In-depth study of three other primary states supports the conclusion drawn above from the Near East. Warfare must be absent from a region for a long period for domestication of plants to occur, and it also must be absent for a primary state to arise.

Religion

Hodder 2011

Ian Hodder & Lynn Meskell, *A "Curious and Sometimes a Trifle Macabre Artistry", Some Aspects of Symbolism in Neolithic Turkey*. Current Anthropology **52** (2011), 235–263.

Comparison of two Turkish Neolithic sites with rich symbolism, Çatalhöyük and Göbekli, suggests widespread and long-lasting themes in the early settled communities of the region. Three major symbolic themes are identified. The first concerns an overall concern with the penis, human and animal, that allows us to speak of a phallocentrism in contrast to the widely held assumption that the early agriculturalists in the Middle East emphasized the female form, fertility, and fecundity. The second theme concerns wild and dangerous animals, even in sites with domesticated plants and animals, and particularly the hard and pointed parts of wild animals, such as talons, claws, horns, and tusks. We interpret this evidence in relation to providing food for large-scale consumption and the passing down of objects that memorialize such events within specific houses. The third theme is that piercing and manipulating the flesh were associated with obtaining and passing down human and animal skulls. The removal of human heads was also associated with symbolism involving raptors. Overall, we see a set of themes, including maleness, wild and dangerous

animals, headlessness, and birds, all linked by history making and the manipulation of the body.