

## References

### Aktuell

GRUBER 2014

Matthias J. Gruber, Bernard D. Gelman & Charan Ranganath, *States of Curiosity Modulate Hippocampus-Dependent Learning via the Dopaminergic Circuit*. *Neuron* (2014), preprint, 1–11. DOI:10.1016/j.neuron.2014.08.060.

People find it easier to learn about topics that interest them, but little is known about the mechanisms by which intrinsic motivational states affect learning. We used functional magnetic resonance imaging to investigate how curiosity (intrinsic motivation to learn) influences memory. In both immediate and one-day-delayed memory tests, participants showed improved memory for information that they were curious about and for incidental material learned during states of high curiosity. Functional magnetic resonance imaging results revealed that activity in the midbrain and the nucleus accumbens was enhanced during states of high curiosity. Importantly, individual variability in curiosity-driven memory benefits for incidental material was supported by anticipatory activity in the midbrain and hippocampus and by functional connectivity between these regions. These findings suggest a link between the mechanisms supporting extrinsic reward motivation and intrinsic curiosity and highlight the importance of stimulating curiosity to create more effective learning experiences.

LALAND 2014

Kevin Laland, Gregory A. Wray, et al., *Does evolutionary theory need a rethink?* *nature* **514** (2014), 161–164.

Kevin Laland, Tobias Uller, Marc Feldman, Kim Sterelny, Gerd B. Müller, Armin Moczek, Eva Jablonka, John Odling-Smee, Gregory A. Wray, Hopi E. Hoekstra, Douglas J. Futuyma, Richard E. Lenski, Trudy F. C. Mackay, Dolph Schluter & Joan E. Strassmann.

Researchers are divided over what processes should be considered fundamental.

Point: Yes, urgently

Without an extended evolutionary framework, the theory neglects key processes, say Kevin Laland and colleagues.

Counterpoint: No, all is well

Theory accommodates evidence through relentless synthesis, say Gregory A. Wray, Hopi E. Hoekstra and colleagues.

O’SULLIVAN 2009

Kieran O’Sullivan, Elaine Murray & David Sainsbury, *The effect of warm-up, static stretching and dynamic stretching on hamstring flexibility in previously injured subjects*. *BMC Musculoskeletal Disorders* **10** (2009), 37.

Background: Warm-up and stretching are suggested to increase hamstring flexibility and reduce the risk of injury. This study examined the short-term effects of warm-up, static stretching and dynamic stretching on hamstring flexibility in individuals with previous hamstring injury and uninjured controls.

**Methods:** A randomised crossover study design, over 2 separate days. Hamstring flexibility was assessed using passive knee extension range of motion (PKE ROM). 18 previously injured individuals and 18 uninjured controls participated. On both days, four measurements of PKE ROM were recorded: (1) at baseline; (2) after warm-up; (3) after stretch (static or dynamic) and (4) after a 15-minute rest. Participants carried out both static and dynamic stretches, but on different days. Data were analysed using Anova.

**Results:** Across both groups, there was a significant main effect for time ( $p < 0.001$ ). PKE ROM significantly increased with warm-up ( $p < 0.001$ ). From warm-up, PKE ROM further increased with static stretching ( $p = 0.04$ ) but significantly decreased after dynamic stretching ( $p = 0.013$ ). The increased flexibility after warm-up and static stretching reduced significantly ( $p < 0.001$ ) after 15 minutes of rest, but remained significantly greater than at baseline ( $p < 0.001$ ). Between groups, there was no main effect for group ( $p = 0.462$ ), with no difference in mean PKE ROM values at any individual stage of the protocol ( $p > 0.05$ ). Using ANCOVA to adjust for the non-significant ( $p = 0.141$ ) baseline difference between groups, the previously injured group demonstrated a greater response to warm-up and static stretching, however this was not statistically significant ( $p = 0.05$ ).

**Conclusion:** Warm-up significantly increased hamstring flexibility. Static stretching also increased hamstring flexibility, whereas dynamic did not, in agreement with previous findings on uninjured controls. The effect of warm-up and static stretching on flexibility was greater in those with reduced flexibility post-injury, but this did not reach statistical significance. Further prospective research is required to validate the hypothesis that increased flexibility improves outcomes.

## PERELES 2010

Daniel Pereles, Alan Roth & Darby J.S. Thompson, *A Large, Randomized, Prospective Study of the Impact of a Pre-Run Stretch on the Risk of Injury in Teenage and Older Runners*. [USA Track & Field 2010, 1–5](#). unpublished.

Over a three-month period there was no statistically significant difference in injury risk between the pre-run stretching and non-stretching groups. Stretching neither prevented nor induced injury when compared to not stretching before running. Important risk factors for injury during the 3 month study were: BMI (the heavier the subject, the more likely the risk of injury), age (increasing age increases injury risk), average miles per week (increasing miles increases injury risk), and history of chronic injury or injury within 4 months of initiating the study. The risk of all injury types (any, diagnosed, long/short term, knee, hip, foot/ankle, back or other) was the same for men and women. For the increased injury risk for age and for mileage, the difference existed only for those who had professional diagnosis.

Subjects who typically stretched as part of their pre-run routine, but were randomized to the no-stretching group were far more likely to have an injury diagnosed by a medical professional. Although, all subjects switching routines were more likely to experience an injury than those who did not switch, the group that stopped stretching had by far the higher number of reported injuries, implying that an immediate shift in a regimen may be more important than the regimen itself.

As an entirely volunteer study with no oversight for compliance, volunteers randomized to a group they did not want (ie: someone who normally stretches randomized to the non-stretch group) could decline participation and potentially re-enroll to obtain a more preferred assignment. Because there was no in-person

oversight as in a typical clinical trial, all dropouts are excluded from analysis – giving the best opportunity to measure an effect, and none was detected.

#### WANG 2014

Xiaoting Wang et al., *Interleukin-22 alleviates metabolic disorders and restores mucosal immunity in diabetes*. [nature](#) **514** (2014), 237–241.

Xiaoting Wang, Naruhisa Ota, Paolo Manzanillo, Lance Kates, Jose Zavala-Solorio, Celine Eidenschenk, Juan Zhang, Justin Lesch, Wyne P. Lee, Jed Ross, Lauri Diehl, Nicholas van Bruggen, Ganesh Kolumam2 & Wenjun Ouyang

The connection between an altered gut microbiota and metabolic disorders such as obesity, diabetes, and cardiovascular disease is well established<sup>1,2</sup>. Defects in preserving the integrity of the mucosal barriers can result in systemic endotoxaemia that contributes to chronic low-grade inflammation, which further promotes the development of metabolic syndrome<sup>3–5</sup>. Interleukin (IL)-22 exerts essential roles in eliciting antimicrobial immunity and maintaining mucosal barrier integrity within the intestine<sup>6,7</sup>. Here we investigate the connection between IL-22 and metabolic disorders. We find that the induction of IL-22 from innate lymphoid cells and CD41 T cells is impaired in obese mice under various immune challenges, especially in the colon during infection with *Citrobacter rodentium*. While innate lymphoid cell populations are largely intact in obese mice, the upregulation of IL-23, a cytokine upstream of IL-22, is compromised during the infection. Consequently, these mice are susceptible to *C. rodentium* infection, and both exogenous IL-22 and IL-23 are able to restore the mucosal host defence. Importantly, we further unveil unexpected functions of IL-22 in regulating metabolism. Mice deficient in IL-22 receptor and fed with high-fat diet are prone to developing metabolic disorders. Strikingly, administration of exogenous IL-22 in genetically obese leptin-receptor-deficient (*db/db*) mice and mice fed with high-fat diet reverses many of the metabolic symptoms, including hyperglycaemia and insulin resistance. IL-22 shows diverse metabolic benefits, as it improves insulin sensitivity, preserves gut mucosal barrier and endocrine functions, decreases endotoxaemia and chronic inflammation, and regulates lipid metabolism in liver and adipose tissues. In summary, we identify the IL-22 pathway as a novel target for therapeutic intervention in metabolic diseases.

#### WOOD 2014

Andrew R. Wood et al., *Defining the role of common variation in the genomic and biological architecture of adult human height*. [NatGen](#) (2014), preprint, 1–17. DOI:10.1038/ng.3097.

Using genome-wide data from 253,288 individuals, we identified 697 variants at genome-wide significance that together explained one-fifth of the heritability for adult height. By testing different numbers of variants in independent studies, we show that the most strongly associated  $\approx 2,000$ ,  $\approx 3,700$  and  $\approx 9,500$  SNPs explained  $\approx 21\%$ ,  $\approx 24\%$  and  $\approx 29\%$  of phenotypic variance. Furthermore, all common variants together captured 60% of heritability. The 697 variants clustered in 423 loci were enriched for genes, pathways and tissue types known to be involved in growth and together implicated genes and pathways not highlighted in earlier efforts, such as signaling by fibroblast growth factors, WNT/ $\beta$ -catenin and chondroitin sulfate-related genes. We identified several genes and pathways not previously connected with human skeletal growth, including mTOR, osteoglycin and binding of hyaluronic acid. Our results indicate a genetic architecture for human height that is characterized by a very large but finite number (thousands) of causal variants.

## Anthropologie

RIEUX 2014

Adrien Rieux et al., *Improved Calibration of the Human Mitochondrial Clock Using Ancient Genomes*. [Molecular Biology and Evolution](#) **31** (2014), 2780–2792.

MolBiolEvol31-2780-Supplement1.docx, MolBiolEvol31-2780-Supplement2.doc, MolBiolEvol31-2780-Supplement3.docx, MolBiolEvol31-2780-Supplement4.xlsx, MolBiolEvol31-2780-Supplement5.txt

Adrien Rieux, Anders Eriksson, Mingkun Li, Benjamin Sobkowiak, Lucy A. Weinert, Vera Warmuth, Andres Ruiz-Linares, Andrea Manica & François Balloux

Reliable estimates of the rate at which DNA accumulates mutations (the substitution rate) are crucial for our understanding of the evolution and past demography of virtually any species. In humans, there are considerable uncertainties around these rates, with substantial variation among recent published estimates. Substitution rates have traditionally been estimated by associating dated events to the root (e.g., the divergence between humans and chimpanzees) or to internal nodes in a phylogenetic tree (e.g., first entry into the Americas). The recent availability of ancient mitochondrial DNA sequences allows for a more direct calibration by assigning the age of the sequenced samples to the tips within the human phylogenetic tree. But studies also vary greatly in the methodology employed and in the sequence panels analyzed, making it difficult to tease apart the causes for the differences between previous estimates. To clarify this issue, we compiled a comprehensive data set of 350 ancient and modern human complete mitochondrial DNA genomes, among which 146 were generated for the purpose of this study and estimated substitution rates using calibrations based both on dated nodes and tips. Our results demonstrate that, for the same data set, estimates based on individual dated tips are far more consistent with each other than those based on nodes and should thus be considered as more reliable.

**Keywords:** Bayesian phylogenetic inference, mitochondrial substitution rates, divergence times, human, calibration strategy, ancient genomes, molecular clock.

## Biologie

BELLISLE 2007

F. Bellisle & A. Drewnowski, *Intense sweeteners, energy intake and the control of body weight*. [European Journal of Clinical Nutrition](#) **61** (2007), 691–700.

Replacing sugar with low-calorie sweeteners is a common strategy for facilitating weight control. By providing sweet taste without calories, intense sweeteners help lower energy density of beverages and some foods. Reduced dietary energy density should result in lower energy intakes – but are the energy reduction goals, in fact, achieved? The uncoupling of sweetness and energy, afforded by intense sweeteners, has been the focus of numerous studies over the past two decades. There are recurring arguments that intense sweeteners increase appetite for sweet foods, promote overeating, and may even lead to weight gain. Does reducing energy density of sweet beverages and foods have a measurable impact on appetite and energy intakes, as examined both in short-term studies and over a longer period? Can reductions in dietary energy density achieved with intense sweeteners really affect body weight control? This paper reviews evidence from laboratory, clinical and epidemiological studies in the context of current research on energy density, satiety and the control of food intake.

Keywords: intense sweeteners; energy density; hunger; satiety; satiation; weight control

#### BODINHAM 2010

Caroline L. Bodinham, Gary S. Frost & M. Denise Robertson, *Acute ingestion of resistant starch reduces food intake in healthy adults*. [British Journal of Nutrition](#) **103** (2010), 917–922.

Resistant starch (RS), a non-viscous dietary fibre, may have postprandial effects on appetite regulation and metabolism, although the exact effects and mechanisms are unknown. An acute randomised, single-blind crossover study, aimed to determine the effects of consumption of 48 g RS on appetite compared to energy and available carbohydrate-matched placebo. Twenty young healthy adult males consumed either 48 g RS or the placebo divided equally between two mixed meals on two separate occasions. Effects on appetite were assessed, using an ad libitum test meal and 24-h diet diaries for energy intake, and using visual analogue scales for subjective measures. Changes to postprandial glucose, insulin and C-peptide were also assessed. There was a significantly lower energy intake following the RS supplement compared to the placebo supplement at both the ad libitum test meal (5241 (SEM 313) v. 5606 (SEM 345) kJ,  $P=0.033$ ) and over the 24 h (12 603 (SEM 519) v. 13 949 (SEM 755) kJ,  $P=0.044$ ). However, there was no associated effect on subjective appetite measures. Postprandial plasma glucose concentrations were not significantly different between supplements, but there was a significantly lower postprandial insulin response following the RS supplement ( $P=0.029$ ). The corresponding C-peptide concentrations were not significantly different, although the ratio of C-peptide to insulin was higher following the RS supplement compared to placebo ( $P=0.059$ ). These results suggest that consumption of 48 g RS, over a 24-h period, may be useful in the management of the metabolic syndrome and appetite. Further studies are required to determine the exact mechanisms.

Fibre: Appetite: Postprandial insulin

#### FEEHLEY 2014

Taylor Feehley & Cathryn R. Nagler, *The weighty costs of non-caloric sweeteners*. [nature](#) **514** (2014), 176–177.

Analyses in mice and humans indicate that non-caloric artificial sweeteners may promote obesity-associated metabolic changes by changing the function of the bacteria that colonize the gut.

What is the relevance of these results for human disease? Suez et al. studied around 400 people, and found that bacterial populations in the guts of those who consumed NAS were significantly different from those who did not. Moreover, NAS consumption correlated with disease markers linked to obesity, such as elevated fasting blood-glucose levels and impaired glucose tolerance. The authors placed seven volunteers who did not normally consume NAS on a seven-day regimen of controlled high NAS intake. After only four days, half the individuals had elevated bloodglucose levels and altered bacterialcommunity composition, mirroring the results seen in the mice. Transfer of faeces from NAS-fed human donors induced elevated blood-glucose levels in germ-free mouse recipients that had never consumed NAS. Taken together, Suez and colleagues' data indicate that NAS consumption may contribute to, rather than alleviate, obesityrelated metabolic conditions, by altering the composition and function of bacterial populations in the gut.

## JOHNSTON 2010

K. L. Johnston, E. L. Thomas, J. D. Bell, G. S. Frost & M. D. Robertson, *Resistant starch improves insulin sensitivity in metabolic syndrome*. *Diabetic Medicine* **27** (2010), 391–397.

**Aims** Diets rich in non-viscous fibre are linked to a reduced risk of both diabetes and cardiovascular disease; however, the mechanism of action remains unclear. This study was undertaken to assess whether chronic consumption of this type of fibre in individuals with the metabolic syndrome would improve insulin sensitivity via changes in ectopic fat storage.

**Methods** The study was a single-blind, randomized, parallel nutritional intervention where 20 insulin resistant subjects consumed either the fibre supplement (resistant starch) (40 g day) or placebo supplement (0 g day) for 12 weeks. Insulin sensitivity was measured by euglycaemic-hyperinsulinaemic clamp and ectopic fat storage measured by whole-body magnetic resonance spectroscopy.

**Results** Resistant starch consumption did not significantly affect body weight, fat storage in muscle, liver or visceral depots. There was also no change with resistant starch feeding on vascular function or markers of inflammation. However, in subjects randomized to consume the resistant starch, insulin sensitivity improved compared with the placebo group ( $P = 0.023$ ). Insulin sensitivity correlated significantly with changes in waist circumference and fat storage in tibialis muscle and to a lesser extent to visceral-to-subcutaneous abdominal adipose tissue ratio.

**Conclusion** Consumption of resistant starch improves insulin sensitivity in subjects with the metabolic syndrome. Unlike in animal models, diabetes prevention does not appear to be directly related to changes in body adiposity, blood lipids or inflammatory markers. Further research to elucidate the mechanisms behind this change in insulin sensitivity in human subjects is required.

**Keywords** fibre, lipid, magnetic resonance spectroscopy, obesity, pulse wave velocity

## KIRCHHOFF 2007

Thomas Kirchhoff, *Systemauffassungen und biologische Theorien, Zur Herkunft von Individualitätskonzeptionen und ihrer Bedeutung für die Theorie ökologischer Einheiten*. Beiträge zur Kulturgeschichte der Natur 16 (Freising 2007). Dissertation, TU München.

## MALAISSÉ 1998

Willy J. Malaisse, Anne Vanonderbergen, Karim Louchami, Hassan Jijakli & Francine Malaisse-Lagae, *Effects of Artificial Sweeteners on Insulin Release and Cationic Fluxes in Rat Pancreatic Islets*. *Cellular Signalling* **10** (1998), 727–733.

b-l-Glucose pentaacetate, but not a-d-galactose pentaacetate, was recently reported to taste bitter and to stimulate insulin release. This finding led, in the present study, to the investigation of the effects of both bitter and non-bitter artificial sweeteners on insulin release and cationic fluxes in isolated rat pancreatic islets. Sodium saccharin (1.0–10.0 mM), sodium cyclamate (5.0–10.0 mM), stevioside (1.0 mM) and acesulfame-K (1.0–15.0 mM), all of which display a bitter taste, augmented insulin release from islets incubated in the presence of 7.0 mM d-glucose. In contrast, aspartame (1.0–10.0 mM), which is devoid of bitter taste, failed to affect insulin secretion. A positive secretory response to acesulfame-K was still observed when the extracellular K<sup>+</sup> concentration was adjusted to the same value as that in control media. No major changes in <sup>86</sup>Rb and <sup>45</sup>Ca outflow from pre-labelled perfused islets could be attributed to the saccharin, cyclamic or acesulfame anions.

It is proposed that the insulinotropic action of some artificial sweeteners and, possibly, that of selected hexose pentaacetate esters may require G-protein-coupled receptors similar to those operative in the recognition of bitter compounds by taste buds.

Keywords: Artificial sweeteners, Pancreatic islets, Insulin release

## SUEZ 2014

Jotham Suez et al., *Artificial sweeteners induce glucose intolerance by altering the gut microbiota*. *nature* **514** (2014), 181–186.

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Jotham Suez, Tal Korem, David Zeevi, Gili Zilberman-Schapira, Christoph A. Thaiss, Ori Maza, David Israeli, Niv Zmora, Shlomit Gilad, Adina Weinberger, Yael Kuperman, Alon Harmelin, Ilana Kolodkin-Gal, Hagit Shapiro, Zamir Halpern, Eran Segal & Eran Elinav

Non-caloric artificial sweeteners (NAS) are among the most widely used food additives worldwide, regularly consumed by lean and obese individuals alike. NAS consumption is considered safe and beneficial owing to their low caloric content, yet supporting scientific data remain sparse and controversial. Here we demonstrate that consumption of commonly used NAS formulations drives the development of glucose intolerance through induction of compositional and functional alterations to the intestinal microbiota. These NAS-mediated deleterious metabolic effects are abrogated by antibiotic treatment, and are fully transferrable to germ-free mice upon faecal transplantation of microbiota configurations from NAS-consuming mice, or of microbiota anaerobically incubated in the presence of NAS. We identify NAS-altered microbial metabolic pathways that are linked to host susceptibility to metabolic disease, and demonstrate similar NAS-induced dysbiosis and glucose intolerance in healthy human subjects. Collectively, our results link NAS consumption, dysbiosis and metabolic abnormalities, thereby calling for a reassessment of massive NAS usage.

## SWITHERS 2008

Susan E. Swithers & Terry L. Davidson, *A Role for Sweet Taste, Calorie Predictive Relations in Energy Regulation by Rats*. *Behavioral Neuroscience* **122** (2008), 161–173.

Animals may use sweet taste to predict the caloric contents of food. Eating sweet noncaloric substances may degrade this predictive relationship, leading to positive energy balance through increased food intake and/or diminished energy expenditure. These experiments were designed to test the hypothesis that experiences that reduce the validity of sweet taste as a predictor of the caloric or nutritive consequences of eating may contribute to deficits in the regulation of energy by reducing the ability of sweet-tasting foods that contain calories to evoke physiological responses that underlie tight regulation. Adult male Sprague–Dawley rats were given differential experience with a sweet taste that either predicted increased caloric content (glucose) or did not predict increased calories (saccharin). We found that reducing the correlation between sweet taste and the caloric content of foods using artificial sweeteners in rats resulted in increased caloric intake, increased body weight, and increased adiposity, as well as diminished caloric compensation and blunted thermic responses to sweet-tasting diets. These results suggest that consumption of products containing artificial sweeteners may lead to increased body weight and obesity by interfering with fundamental homeostatic, physiological processes.

Keywords: learning, energy balance, cephalic-phase responses, thermic effect of food

## Datierung

STEHLI 1989

Petar Stehli, *Zur relativen und absoluten Chronologie der Bandkeramik in Mitteleuropa*. In: JAN RULF (Hrsg.), *Bylany Seminar 1987, Collected Papers*. (unveröffentlicht, Prag 1989), 69–78.

WARDLE 2014

Kenneth Wardle, Thomas Higham & Bernd Kromer, *Dating the End of the Greek Bronze Age, A Robust Radiocarbon-Based Chronology from Assiros Toumba*. [PLoS ONE 9 \(2014\), e106672](#). DOI:10.1371/journal.pone.0106672.

[pone09-e106672-Supplement.pdf](#)

Over 60 recent analyses of animal bones, plant remains, and building timbers from Assiros in northern Greece form an unique series from the 14th to the 10th century BC. With the exception of Thera, the number of 14C determinations from other Late Bronze Age sites in Greece has been small and their contribution to chronologies minimal. The absolute dates determined for Assiros through Bayesian modelling are both consistent and unexpected, since they are systematically earlier than the conventional chronologies of southern Greece by between 70 and 100 years. They have not been skewed by reference to assumed historical dates used as priors. They support high rather than low Iron Age chronologies from Spain to Israel where the merits of each are fiercely debated but remain unresolved.

## Grabung

BOELICKE 1988

Ulrich Boelicke, Detlef von Brandt, Jens Lüning, Petar Stehli & Andreas Zimmermann, *Struktur und Entwicklung des Siedlungsplatzes*. In: U. BOELICKE, D. V. BRANDT, J. LÜNING, P. STEHLI & A. ZIMMERMANN (Hrsg.), *Der bandkeramische Siedlungsplatz Langweiler 8, Gemeinde Aldenhoven, Kreis Düren, Beiträge zur neolithischen Besiedlung der Aldenhovener Platte III 2*. Rheinische Ausgrabungen 28 (Bonn 1988), 891–931.

## Grundlagen

ARPONEN 2014

V. P. J. Arponen & Artur Ribeiro, *Understanding Rituals, A Critique of Representationalism*. [Norwegian Archaeological Review \(2014\), preprint, 1–19](#). DOI:10.1080/00293652.2014.938107.

The explanations of ritual practices observed in archaeological contexts often proceed on the representationalist basis that the human mind contains the social constituted ideas or representations that underpin the practice of rituals. Such a view remains widespread and, despite the often proclaimed rejection in contemporary theory of the Cartesian mind-body and other dualisms, it perpetuates the Enlightenment representationalist heritage according to which mental contents represent social reality and, as such, drive ritual practices and human action



more generally. This article illustrates the meaning and value of rejecting such a representationalist view of human (ritual) action in favour of what we call an institutional view. In such a view, a ritual can be conceived as a form of recurring activity involving temporally and geographically dispersed actors active in differing roles and hence also with differing interests and levels of knowledge of the ritual and the associated belief system.

Keywords: Ritual; religion; institutions; beliefs; mental representations

#### BARTON 2008

C. Michael Barton, *General Fitness, Transmission, and Human Behavioral Systems*. In: M. J. O'BRIEN (Hrsg.), *Cultural Transmission and Archaeology, Issues and Case Studies*. (Washington 2008), 112–119.

#### BIRD 2006

Douglas W. Bird & James E. O'Connell, *Behavioral Ecology and Archaeology*. *Journal of Archaeological Research* 14 (2006), 143–188.

Behavioral ecology is the study of adaptive behavior in relation to social and environmental circumstances. Analysts working from this perspective hold that the reproductive strategies and decision-making capacities of all living organisms – including humans – are shaped by natural selection. Archaeologists have been using this proposition in the study of past human behavior for more than 30 years. Significant insights on variation in prehistoric human subsistence, life history, social organization, and their respective fossil and archaeological consequences have been among the more important results.

Keywords: Evolutionary ecology | Optimal foraging | Hominin life history | Costly signaling | Hereditary inequality

#### EGGERT 2014

Manfred K. H. Eggert, *Das Rituelle als erkenntnistheoretisches Problem der Archologie*. In: KIENLIN (Hrsg.), *Fremdheit*. (im Druck 2014), 1–25.

Es gehört zum Wesen des Rituellen, dass es dem Nichteingeweihten fremd ist. Als emische Dimension ist es immer kulturell – wenngleich in durchaus unterschiedlichem Maße – enkodiert. Erkenntnis und Verstehen resultiert aus der Analyse der Schnittstelle des Universums des Handelnden und des Universums des Beobachters (Abb. 4). Diese Schnittstelle schließt sowohl den materiellen Niederschlag ritueller Praxis als auch die darauf beruhende archäologische Deutung ein. Die Deutung geht notwendigerweise von etischen Voraussetzungen aus. Sie vermag einseitiges Ritualverhalten bei günstiger Befundlage durchaus zu erkennen – dies wird dann oft auch den Rückschluss auf Religion zulassen. Weitergehende Erkenntnisse wie etwa die Frage nach Art und Struktur dieser Religion, nach ihrer Bedeutung und Wirksamkeit, nach den zentralen handelnden Personen und nach den mit ihr verbundenen Vorstellungen über Diesseits und Jenseits sind kaum zu erwarten.

#### HANSEN 2003

Svend Hansen, *Archäologie zwischen Himmel und Hölle, Bausteine für eine theoretisch reflektierte Religionsarchäologie*. In: M. HEINZ, M. K. H. EGGERT, U. VEIT (Hrsg.), *Zwischen Erklären und Verstehen? Beiträge zu den erkenntnistheoretischen Grundlagen archäologischer Interpretation*. Tübinger Archäologische Taschenbücher 2 (Münster 2003), 113–148.

Die hier zur Diskussion gestellten Ausführungen sind kein systematisches “Programm” einer Religionsarchäologie. Vielmehr handelt es sich um eine Bestandsaufnahme der in der prähistorischen Archäologie relevanten religionswissenschaftlichen Ansätze. Ferner soll an einigen Beispielen die wechselseitige Rezeption religionswissenschaftlicher und archäologischer “Tatsachen” dargestellt werden. Schließlich wird versucht, anhand einer exemplarisch gehaltenen Darlegung Umrisse einer Religionsarchäologie zu skizzieren. Da die Gegenstände der Religionsarchäologie nicht bereits als solche vorliegen, sondern die archäologischen Quellen erst unter religionsarchäologischen Aspekten befragt werden müssen, die Artefakte also einer eigenen Ordnung bedürfen, müssen die religionsarchäologisch relevanten Quellen erst erschlossen werden. Diese Erschließung kann nicht entlang der Alltagserfahrung der Wissenschaftler, sondern nur durch die theoretische Reflexion religionswissenschaftlicher Ansätze gelingen.

#### RAPPAPORT 1999

Roy A. Rappaport, *Ritual and Religion in the Making of Humanity, 2. The Ritual Form*. Cambridge Studies in Social and Cultural Anthropology (Cambridge 1999), 23–68.

#### ZIMMERMANN 1998

W. Haio Zimmermann, *Pfosten, Ständer und Schwelle und der Übergang vom Pfosten- zum Ständerbau, 5. Lebensdauer von Pfosten- und Ständerbauten. Probleme der Küstenforschung im südlichen Nordseegebiet* 25 (1998), 50–64.

Wir konnten oben anhand einiger „Lebensalter“ von Pfostenbauten aufzeigen, daß diese von weniger als 10 bis über 100 Jahre, mit dem Schwerpunkt zwischen 10 und 50 Jahren, stehen können. Der in den letzten Jahrzehnten in der Archäologie oft wiederholte Topos, ein Pfostenhaus würde 25-30 Jahre überdauern, ist also nicht auf archäologische Quellen zurückzuführen und so auch nicht haltbar. Vermutlich beruht er teilweise wohl auf den Vorstellungen von der Gleichsetzung von Menschen- und Haus-„Leben“.

#### ZIMMERMANN 2012

Andreas Zimmermann, *Das Hofplatzmodell – Entwicklung, Probleme, Perspektiven*. In: REGINA SMOLNIK (Hrsg.), *Siedlungsstruktur und Kulturwandel in der Bandkeramik, Internationale Tagung „Neue Fragen zur Bandkeramik oder alles beim Alten?!“ Leipzig, 23. bis 24. September 2010*. Arbeits- und Forschungsberichte zur sächsischen Bodendenkmalpflege Beiheft 25 (Berlin 2012), 11–19.

1. Hier wird der Begriff “Hofplatzmodell” im Sinne des Referenztextes zu Langweiler 8 (Boelcke u.a. 1988) verstanden. Es handelt sich um eine Kombination von Methoden, mit der man sich ein Bild davon machen kann, welche Häuser in einer bandkeramischen Siedlung gleichzeitig standen und wie sie aufeinanderfolgten. Das Hofplatzmodell ist für das Rheinland entwickelt worden. Gegenwärtig wird die räumliche Reichweite und die Ausgestaltung der Module diskutiert.

2. Das Hofplatzmodell im hier verwendeten methodologischen Sinne beinhaltet keine Typologie der sich aus der zeitlich-räumlichen Struktur eines spezifischen Wohnortes ergebenden Siedlungsform etwa in Begriffen wie “lockere Streusiedlung”, “Dorf” oder “weilerartige Gruppierungen innerhalb einer größeren Streusiedlung” oder, wie sie Eva Lenneis in ihrem Beitrag in diesem Band skizziert, in dem sie die Entwicklung von “Strukturmodellen” annimmt. Gegenwärtig ist bereits deutlich,

dass es in dieser Hinsicht nicht nur großräumige, sondern auch kleinräumige Unterschiede gibt. Im Rheinland z.B. lassen sich sehr unterschiedliche Siedlungsformen gleichzeitig nebeneinander beobachten, die mit der Geschichte des Besiedlungsprozesses innerhalb der Region zusammenhängen.

3. In gewissen Grenzen ist eine externe Kontrolle der erarbeiteten Siedlungsstruktur über die daraus resultierende Bevölkerungsdichte möglich (A. Zimmermann u.a. 2009).

## Isotope

CHAKRABORTY 2014

Subrata Chakraborty, B. H. Muskatel, Teresa L. Jackson, Musahid Ahmed, R. D. Levine & Mark H. Thiemens, *Massive isotopic effect in vacuum UV photodissociation of N<sub>2</sub> and implications for meteorite data*. [PNAS 111 \(2014\), 14704–14709](#).

Nitrogen isotopic distributions in the solar system extend across an enormous range, from -400‰, in the solar wind and Jovian atmosphere, to about 5,000‰ in organic matter in carbonaceous chondrites. Distributions such as these require complex processing of nitrogen reservoirs and extraordinary isotope effects. While theoretical models invoke ion-neutral exchange reactions outside the protoplanetary disk and photochemical self-shielding on the disk surface to explain the variations, there are no experiments to substantiate these models. Experimental results of N<sub>2</sub> photolysis at vacuum UV wavelengths in the presence of hydrogen are presented here, which show a wide range of enriched d15N values from 648‰ to 13,412‰ in product NH<sub>3</sub>, depending upon photodissociation wavelength. The measured enrichment range in photodissociation of N<sub>2</sub>, plausibly explains the range of d15N in extraterrestrial materials. This study suggests the importance of photochemical processing of the nitrogen reservoirs within the solar nebula.

nitrogen isotopes | organic molecules | perturbation

## Jungpaläolithikum

AUBERT 2014

M. Aubert et al., *Pleistocene cave art from Sulawesi, Indonesia*. [nature 514 \(2014\), 223–227](#).

n514-0223-Supplement1.xlsx, n514-0223-Supplement2.xlsx

M. Aubert, A. Brumm, M. Ramli, T. Sutikna, E. W. Saptomo, B. Hakim, M. J. Morwood, G. D. van den Bergh, L. Kinsley & A. Dosseto

Archaeologists have long been puzzled by the appearance in Europe ≈40–35 thousand years (kyr) ago of a rich corpus of sophisticated artworks, including parietal art (that is, paintings, drawings and engravings on immobile rock surfaces)<sup>1,2</sup> and portable art (for example, carved figurines)<sup>3,4</sup>, and the absence or scarcity of equivalent, well-dated evidence elsewhere, especially along early human migration routes in South Asia and the Far East, including Wallacea and Australia<sup>5–8</sup>, where modern humans (*Homo sapiens*) were established by 50 kyr ago<sup>9,10</sup>. Here, using uranium-series dating of coralloid speleothems directly associated with 12 human hand stencils and two figurative animal depictions from seven cave sites in the Maros karsts of Sulawesi, we show that rock art traditions on this Indonesian island are at least compatible in age with the oldest European art<sup>11</sup>. The earliest dated image from Maros, with a minimum age of 39.9 kyr, is now the oldest known hand stencil in the world. In addition, a painting of a babirusa ('pig-deer') made at

least 35.4 kyr ago is among the earliest dated figurative depictions worldwide, if not the earliest one. Among the implications, it can now be demonstrated that humans were producing rock art by 40 kyr ago at opposite ends of the Pleistocene Eurasian world.

#### ROEBROEKS 2014

Wil Roebroeks, *Art on the move*. *nature* **514** (2014), 170–171.

Studies of stencils and paintings from prehistoric caves in Indonesia date the art to at least 39,900 years ago — around the same age as the earliest cave art previously known, 13,000 kilometres away in western Europe.

Whether rock art was an integral part of the cultural repertoire of colonizing modern humans, from western Europe to southeast Asia and beyond, or whether such practices developed independently in various regions, is unknown. What is clear is that no figurative art is known from before the time of the initial expansion of *Homo sapiens* into Asia and across Europe — neither from earlier *H. sapiens* in Africa nor from their contemporaries in western Eurasia, the Neanderthals, who became extinct during the period of modern human expansion out of Africa. The dating technique applied by Aubert et al. requires only minute amounts of calcite, and hence holds great potential for dating rock art worldwide, to shed light on when this art first appeared as well as on how it developed through time and space.

## Klima

#### GOODWIN 2014

Ian D. Goodwin, Stuart A. Browning & Atholl J. Anderson, *Climate windows for Polynesian voyaging to New Zealand and Easter Island*. *PNAS* **111** (2014), 14716–14721.

Debate about initial human migration across the immense area of East Polynesia has focused upon seafaring technology, both of navigation and canoe capabilities, while temporal variation in sailing conditions, notably through climate change, has received less attention. One model of Polynesian voyaging observes that as tradewind easterlies are currently dominant in the central Pacific, prehistoric colonization canoes voyaging eastward to and through central East Polynesia (CEP: Society, Tuamotu, Marquesas, Gambier, Southern Cook, and Austral Islands) and to Easter Island probably had a windward capacity. Similar arguments have been applied to voyaging from CEP to New Zealand against prevailing westerlies. An alternative view is that migration required reliable off-wind sailing routes. We investigate the marine climate and potential voyaging routes during the Medieval Climate Anomaly (MCA), A.D. 800–1300, when the initial colonization of CEP and New Zealand occurred. Paleoclimate data assimilation is used to reconstruct Pacific sea level pressure and wind field patterns at bidecadal resolution during the MCA. We argue here that changing wind field patterns associated with the MCA provided conditions in which voyaging to and from the most isolated East Polynesian islands, New Zealand, and Easter Island was readily possible by off-wind sailing. The intensification and poleward expansion of the Pacific subtropical anticyclone culminating in A.D. 1140–1260 opened an anomalous climate window for off-wind sailing routes to New Zealand from the Southern Austral Islands, the Southern Cook Islands, and Tonga/Fiji Islands.

proxy climate | Modoki La Nina

## Kultur

HENRICH 2001

Joseph Henrich, Robert Boyd, Samuel Bowles, Colin Camerer, Ernst Fehr, Herbert Gintis & Richard McElreath, *In Search of Homo Economicus, Behavioral Experiments in 15 Small-Scale Societies*. [American Economic Review](#) **91** (2001), ii, 73–78.

While our results do not imply that economists should abandon the rational-actor framework, they do suggest two major revisions. First, the canonical model of the self-interested material payoff-maximizing actor is systematically violated. In all societies studied, UG offers are strictly positive and often substantially in excess of the expected income-maximizing offer, as are contributions in the public-goods game, while rejections of positive offers in some societies occur at a considerable rate. Second, preferences over economic choices are not exogenous as the canonical model would have it, but rather are shaped by the economic and social interactions of everyday life. This result implies that judgments in welfare economics that assume exogenous preferences are questionable, as are predictions of the effects of changing economic policies and institutions that fail to take account of behavioral change. Finally, the connection between experimental behavior and the structure of everyday economic life should provide an important clue in revising the canonical model of individual choice behavior.

WINTERHALDER 2012

Bruce Winterhalder & Cedric Puleston, *Population Ecology and Prehistory II, The Exchequer's Guide to Revenue in the Agrarian State*. [unknown](#) (2012), preprint, 1–56.

We adopt an imagined exchequer, functionary responsible in an early state for securing resources from its agrarian subjects, and develop a feature-rich demographic and environmental model to explore the population ecology of agricultural production in the context of Malthusian constraints and economic exploitation. Our objective is better understanding of the manner in which political extraction of agricultural resources would have facilitated the rise, persistence and decline, or occasionally the collapse, of early chiefdoms and states. We identify a peak of surplus production prior to density dependent constraints. Using elasticities, we characterize its timing and magnitude as a function of agricultural area, environmental yield, and the work effort and consumption needs of the producing population. We then characterize the taxation potential of a population at its Malthusian equilibrium in the same terms. We consider two philosophies of taxation: a fixed tax in which the total tribute is constant, regardless of environmental or population fluctuations, and a per capita tax, which varies with population size. For a fixed total level of taxation the exchequer has two options: a small population taxed at a high rate, unstable to small perturbations, or a larger population taxed at a lower rate, which is stable. In a small and growing population it is more effective to tax goods, however, as the population begins to approach its density dependent equilibrium it is more effective to tax labor. Taxation interacts with stochastic yield variation to exacerbate the magnitude of periodic famines, with per capita taxation having a more severe effect than a fixed tax. Because survival of the producing population is at stake in a risky environment, we characterize the likely persistence of early agrarian states in terms of their half-life as a function of level of taxation and degree of yield variation. We discuss implications for the evolution, success and decline of centralized political institutions and we argue that fiscal mismanagement should be among the hypotheses for the early state failure.

## Metallzeiten

KOCH 2013

Leonie Carola Koch, *Kleine Mädchen in großen gesellschaftlichen Rollen? Überlegungen zu besonderen Kindergräbern der Früheisenzeit in Mittelitalien*. In: STEFANIE WEFERS ET AL. (Hrsg.), *Bilder – Räume – Rollen, Gemeinsame Sitzung der AG Eisenzeit und der AG Geschlechterforschung, 7. Deutscher Archäologenkongress, Bremen 2011*. Beiträge zur Ur- und Frühgeschichte Mitteleuropas 72 ([Langenweißbach 2013](#)), 143–157.

Hrsg: Stefanie Wefers, Jana Esther Fries, Janine Fries-Knoblach, Christiana Later, Ulrike Rambuscheck, Peter Trebsche & Julian Wiethold

Given our standard view of prehistoric communities' 'rich' burials of little girls and children in general seem to require an explanation. Typically, such 'rich' graves of children are seen as a sign of hereditary social status and a stable hierarchical division of the community. Graves in Early Iron Age Italy are often furnished with numerous other object classes apart from only pottery or fibulas. Some outstanding burials of girls from three Iron Age necropolises in Etruria (Tarquinia, Veio) and Latium (Osteria dell'Osa) are described and used to suggest alternative interpretations. It is also discussed how the taking into account of mourning and other individual emotions may influence the interpretation of the grave good combinations of little children and how such emotions may be identified in the archaeological record.

„Reiche“ Gräber kleiner Mädchen und von Kindern generell scheinen in unserer Sichtweise urgeschichtlicher Gesellschaften erklärungsbedürftig. Meist werden herausragende Kinderbestattungen sozialhistorisch als ein Zeichen für erblichen hohen Status, somit als Anzeiger stabiler gesellschaftlicher Hierarchien interpretiert. Die Beigabenausstattungen der Gräber der frühen italischen Eisenzeit weisen neben Keramik oder Fibeln viele weitere Objektklassen auf. Beispiele exzeptionell ausgestatteter Mädchengräber dreier Fundorte in Etrurien (Tarquinia und Veji) sowie Latium (Osteria dell'Osa) werden genutzt, um alternative Deutungsvorschläge aufzuzeigen. Weiter wird diskutiert, inwieweit die Berücksichtigung von Trauer und anderen individuellen Emotionen als Beweggründe für Grabausstattungen die Interpretation der Zusammensetzung von Grabbeigaben beeinflussen kann.

Keywords: Italy, Etruria, Latium, funeral archaeology, social archaeology, children

Schlagwörter: Italien, Etrurien, Latium, Gräberarchäologie, Sozialarchäologie, Kinder

## Mittelpaläolithikum

KOT 2014

Małgorzata Anna Kot, *The earliest Palaeolithic bifacial leafpoints in Central and Southern Europe, Techno-functional approach*. [Quaternary International](#) **326** (2014), 381–397.

Bifacially worked leafpoints are often treated as a kind of “index fossil” for MP/UP transitional industries in Central Europe. In some cases, their presence determines if a given inventory is assigned to a leafpoint industry. For the last 50 years, research has established the oldest leafpoints in Central and Southern

Europe. As a result, a few dozen sites can be recently ascribed as leafpoint assemblages older than transitional Szeletian or Jerzmanowician assemblages. This article was designed as a point in the ongoing debate on the legitimacy of treating leafpoints as the main culture indicator of such assemblages. It challenges the notion that the tools called “leafpoints” in the whole of Central and Southern Europe illustrate a similar tool concept, in terms of their technology. In total, 17 collections of leafpoints from 8 countries were analysed by a scar pattern analysis in order to reconstruct the chaîne opératoire. The results show that the analysed artefacts are not coherent from the perspective of the technology, and one can distinguish at least few different techno-functional concepts of tools. On the basis of the analyses, the manuscript presents a technological definition of the leafpoint as a tool which has two symmetrical edges converging at the tip; both edges were treated in the same way in the course of knapping; the tool is symmetrical and was made to be such.

#### RICHTER 2014

Jürgen Richter, *L'impact environnemental sur la formation des assemblages lithiques unifaciaux et bifaciaux “micoquiens” ou “MMO” d'Europe centrale*. In: JACQUES JAUBERT, NATHALIE FOURMENT & PASCAL DEPAEPE (Hrsg.), *Transitions, ruptures et continuité en Préhistoire, 2. Paléolithique et Mésolithique, XXVIIe Congrès Préhistorique de France, Bordeaux – Les Eyzies 31 mai-5 juin 2010*. (Paris 2014), 195–205.

Research of the last two decades has considerably changed our notion of the cultural units connected with the late Middle Palaeolithic of Europe. The revision of lithic assemblages from Middle Palaeolithic sites in Germany resulted in a new understanding of the relationship between techno-typological entities of artefact assemblages, on the one hand, and the utilization of prehistoric natural landscape, on the other hand.

Keywords: Neanderthals, MTA, Micoquian, MMO, Middle Palaeolithic, landscape, demography, chronology, OIS 3

## Neolithikum

#### CLASSEN 2009

Erich Claßen, *Settlement history, land use and social networks of early Neolithic communities in western Germany*. In: DANIELA HOFMANN & PENNY BICKLE (Hrsg.), *Creating Communities, New Advances in Central European Neolithic Research*. (Oxford 2009), 95–110.

In summary, it can be stated that during the earlier phases of the LBK, the observed relations have a causal connection with the settlement history of the distinct settlement groups. Settlements founded earlier are obviously better embedded than later settlements. Therefore, kinship relations are seen as being responsible for similarities in pottery decoration. In the later phase, new actors became important as producers and distributors of lint raw material. Furthermore, at this point in time boundaries between exactly these settlements can be observed with reference to pottery decoration.

This change is interpreted as a breakdown in long lasting kinship ties. Frirdich (1994) has referred to this as the “emancipation of the younger generation”. Settlements in neighbouring regions separated from one another, which is also implied

by the construction of enclosures at the end of the LBK. This – as well as the reduction of long distance contacts in the later phase – supports strongly the opinion that social units were much smaller in the last generations of the LBK.

The structures which were responsible for the very stable social system of the older and middle LBK begin to change as early as a century prior to the end of the LBK in the Rhineland. Therefore – in my opinion – the disappearance of the typical LBK features in the Rhineland is very much the result of processes related to social change.

## Ozeanien

JOHNS 2014

Dilys A. Johns, Geoffrey J. Irwin & Yun K. Sung, *An early sophisticated East Polynesian voyaging canoe discovered on New Zealand's coast*. [PNAS 111 \(2014\), 14728–14733](#).

The colonization of the islands of East Polynesia was a remarkable episode in the history of human migration and seafaring. We report on an ocean-sailing canoe dating from close to that time. A large section of a complex composite canoe was discovered recently at Anaweka on the New Zealand coast. The canoe dates to approximately A.D. 1400 and was contemporary with continuing interisland voyaging. It was built in New Zealand as an early adaptation to a new environment, and a sea turtle carved on its hull makes symbolic connections with wider Polynesian culture and art. We describe the find and identify and radiocarbon date the construction materials. We present a reconstruction of the whole canoe and compare it to another early canoe previously discovered in the Society Islands.

maritime archaeology | conservation | waterlogged wood | Maori

## Religion

BLOCH 2008

Maurice Bloch, *Why religion is nothing special but is central*. [Phil. Trans. Royal Society B 363 \(2008\), 2055–2061](#).

It is proposed that explaining religion in evolutionary terms is a misleading enterprise because religion is an indissoluble part of a unique aspect of human social organization. Theoretical and empirical research should focus on what differentiates human sociality from that of other primates, i.e. the fact that members of society often act towards each other in terms of essentialized roles and groups. These have a phenomenological existence that is not based on everyday empirical monitoring but on imagined statuses and communities, such as clans or nations. The neurological basis for this type of social, which includes religion, will therefore depend on the development of imagination. It is suggested that such a development of imagination occurred at about the time of the Upper Palaeolithic ‘revolution’.

Keywords: religion; sociality; imagination; evolution

BLOCH 2010

Maurice Bloch, *Is there religion at Çatalhöyük . . . or are there just houses?* In: IAN HODDER (Hrsg.), *Religion in the Emergence of Civilization, Çatalhöyük as a case study*. (Cambridge 2010), 146–162.

The Templeton initiative that led to the publication of this book was about religion at Çatalhöyük, yet this chapter has not mentioned the word once. This



is no accident. The reason is that I am confident that there was no religion in Çatalhöyük, any more than there was among the Zafimaniry before Christianity arrived there. Looking for religion is therefore a misleading wild goose chase. The English word “religion” inevitably refers to what English speakers have known, and no amount of redefinition or manipulation of the term can escape the associations that a particular history has created. It is clear that calling the phenomena usually indicated by the words Hinduism and Buddhism “religions” has similarly simply led to misunderstandings (Fuller 1992). The kind of phenomena that the English word “religion,” and the associated word “belief,” can be made to evoke have, at most, a history of five thousand years. This is thousands of years after the establishment of Çatalhöyük. I have tried in an earlier publication to suggest the processes that might have led to the creation of religion, and these inevitably made use of preexisting cultural and cognitive phenomena (Bloch 2008). These elements that were so used were and could have been used for a host of other developments. These preexisting elements have to do with the nature of the human social. Some of them are found in a specific form in house-based societies, and this is why I have talked of houses, roles, corporate groups and the transcendental rather than about religion.

#### HODDER 2010

IAN HODDER (Hrsg.), *Religion in the Emergence of Civilization, Çatalhöyük as a case study*. (Cambridge 2010), 146–162.

This book presents an interdisciplinary study of the role of spirituality and religious ritual in the emergence of complex societies. With contributions by an eminent group of natural scientists, archaeologists, anthropologists, philosophers and theologians, this volume examines Çatalhöyük as a case study. A nine-thousand-year-old town in central Turkey, Çatalhöyük was first excavated in the 1960s and has since become integral to understanding the symbolic and ritual worlds of the early farmers and village dwellers in the Middle East. It is thus an ideal location for exploring theories about the role of religion in early settled life. This book provides a unique overview of current debates concerning religion and its historical variations. By exploring such themes as the integration of the spiritual and the material, the role of belief in religion, the cognitive bases for religion and religion’s social roles, this book situates the results from Çatalhöyük within a broader understanding of the Neolithic in the Middle East.

#### RENFREW 2008

Colin Renfrew, *Neuroscience, evolution and the sapient paradox, The factuality of value and of the sacred*. *Phil. Trans. Royal Society B* **363** (2008), 2041–2047.

The human genome, and hence the human brain at birth, may not have changed greatly over the past 60 000 years. Yet many of the major behavioural changes that we associate with most human societies are very much more recent, some appearing with the sedentary revolution of some 10 000 years ago. Among these are activities implying the emergence of powerful concepts of value and of the sacred. What then are the neuronal mechanisms that may underlie these consistent, significant (and emergent) patterns of behaviour?

**Keywords:** evolution of mind; speciation and tectonic phases; sedentary revolution; value; the sacred

SPIRO 1966

Melford E. Spiro, *Religion: Problems of Definition and Explanation*.  
In: MICHAEL BANTON (Hrsg.), *Anthropological Approaches to the  
Study of Religion*. A.S.A. Monographs 3 (London 1968), 85–126.