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Comment on Sterelny and Watkins

Stephen Shennan

This is a very stimulating paper, with which I find myself very much in sympathy. There are many aspects that could be discussed, but I will only focus on one, their theoretical framework.

It has been increasingly clear for quite a long time that understanding transitions to farming ways of life involves much more than the analysis of assemblages of plant and animal remains and whether they show indications of changed morphologies, though these topics still tend to dominate the literature. One of the first to propose the need for a new understanding was Ian Hodder, in his book *The Domestication of Europe* (1990), which proposed that the emergence of a set of concepts based around the symbolic importance of the house was a key driver for the appearance of farming and settled life, in contrast to the standard population pressure arguments of the time. Four years later, Jacques Cauvin's *Naissance des divinités, naissance de l'agriculture* developed a similar theme, arguing that the origins of agriculture should not be seen in environmental and ecological terms, but as resulting from a 'restructuring of the human mentality' involving the emergence of new religious ideas. It was this, in Cauvin's view, that made possible the development of a farming way of life. In the intervening period the discovery of extraordinary sites like Gobekli Tepe, dating to a time when the cultivation of cereals and the control of prey animals was just beginning, has only added force to such arguments.

When these ideas were first put forward they were rightly seen as the antithesis of the original ecological thesis of farming origins, in Hodder's case part of the challenge of post-processual archaeology to processualism. The paper by Watkins and Sterelny now offers a synthesis of these different perspectives which emphasizes the complex feedback relationships between what we categorize as social, cultural and economic practices and processes; population density and nucleation effectively remain prime movers, but in a much more complex set of feedback relationships than previous versions. The key to their synthesis is its framing in terms of niche construction, though,

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as they point out, this is not the first time this has been done (see, e.g., O'Brien & Laland 2012). While its usefulness continues to be debated in the evolutionary literature (e.g. Scott-Phillips *et al.* 2013), niche construction theory is one aspect of a broadening of evolutionary ideas in biology, which has included the development of evolutionary-developmental biology ('evo-devo') and of cultural evolution and the role of inherited behavioural traditions in animals. Parallel with this, evolutionary social science as a field has grown in importance, including again the theory and methods of cultural evolution, but also the application of evolutionary game theory to the understanding of social situations, both specific social dilemmas such as 'tragedies of the commons' and more generally to the conditions affecting the nature, extent and continuation of cooperation in social groups. The social rules that provide the (generally temporary) solutions to social dilemmas in turn have an impact on transmitted social norms, because these will be affected by the pay-offs received in social interactions, so evolutionary game theory and cultural evolution are intimately inter-connected and are both fundamental to the importance or otherwise of cultural group selection.

Watkins and Sterelny have effectively presented an outline evolutionary game theory and cultural-evolution scenario for the social dimensions of the transition to farming, taking as their starting point the consequences of long-term population growth. In doing so, they have brought these under a broad interdisciplinary theoretical and empirical domain which has already developed many useful theoretical and methodological tools for thinking about these kinds of issues, as they recognize.

One area where such tools have already been applied concerns the conditions affecting property rights and how you get from the sharing rights generally prevalent among mobile hunter-gatherers to the private property rights over land, herds and produce that are seen extensively among farmers and herders. This issue was already addressed in 1981 by Douglass North in one of the chapters in his book *Structure and Change in Economic History*, but has recently been explored by Bowles and Choi (2013), cited by the authors, using a simulation model. The core of their argument is that farming could not have developed in the context of generalized sharing rights, because there would have been no incentive to undertake the work required for cultivation. This required a way of ensuring that people had a valid claim to the results of their work. Simulations of their model of the process showed that farming could only take off if private property rights co-evolved with it and that this depended on the resources of farmers being excludable and defensible; conversely, such rights were not viable where subsistence depended on wild resources. Furthermore, the combination of the new subsistence system and the new property rights gave groups that had adopted them an advantage in inter-group competition, with the result that the system was able to spread, by a process of cultural group selection. Bowles and Choi tested the predictions of their simulated model against time-series data on the prevalence of farming.

And this is the point. The danger of a vague niche construction perspective is that it is simply a currently fashionable way of saying, 'It's complicated', there are lots more things than we thought to take into account, and everything is related to everything else in a locally specific way. This is both uninteresting and does not take us anywhere, except to the classic recourse of inductive archaeology, 'We need to collect more data'. Watkins and Sterelny, on the other hand, offer us a wide-ranging theory-based explanatory sketch. Whether they are right or wrong on the specifics, by linking the trajectory of social and economic change over 10,000 years at the end of the last Ice Age to a powerful set of evolutionary ideas, they are hopefully setting the stage for new work addressing some of the theoretically-based predictions—not just storytelling but story testing (Gerbault *et al.* 2014)—and avoiding the dangers of the descent into atheoretical particularism so rightly criticized by Gremillion *et al.* (2014).

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Comment on Sterelny and Watkins

Melinda A. Zeder

Niche-construction theory and Neolithic emergence in the Near East

Explanatory models of Neolithic emergence in the Near East traditionally spotlight domestication and follow-on agricultural emergence as defining characteristics of the Neolithic, with most characterizing these developments as responses to resource depression induced either by adverse climatic conditions (Bar Yosef 2011) or by unchecked demographic expansion accompanying climate amelioration over the course of the Late Pleistocene/Early Holocene (Stutz *et al*. 2009). Changes in social organization, ritual, and symbolic inventories are, if mentioned at all, portrayed as knock-on, tangential and largely ancillary side-effects of the transition from foraging to farming. Trevor Watkins is one of a vocal minority who argue that the Neolithic represents fundamental and revolutionary reorientation in human social organization in which changes in subsistence economies play more of a supporting than catalytic role (Watkins 2010). He has, in particular, advocated that symbolic systems and their material expression play primary shaping roles in Neolithic emergence. And while the mechanics of the shifts in symbolic repertoires and the cognitive changes that drove them remain largely undefined in other similar approaches (Cauvin 2000; Hodder 2001), Watkins' work is anchored in an evolutionary framework that portrays Neolithic emergence as a later phase of the development of cognitive skills that distinguished anatomically modern humans from earlier hominin relatives (Watkins 2005).

In teaming up with Kim Sterelny, a philosopher of science who has written widely about the evolution of human cognition, Watkins is able to tie this view of Neolithic emergence even more closely, and convincingly, to an evolutionary framework as a manifestation of cultural niche construction—the unique human ability to construct bodies of cultural knowledge and transmit them through social learning that is held to be a major driver of human evolution (Sterelny 2007). This new angle brings Watkins' theories into the mainstream of an emerging paradigm, niche construction theory (NCT), which is finding a broad and receptive audience in evolutionary biology, ecology and the social sciences. By embedding this thesis within NCT, Sterelny and Watkins make a compelling case for the catalytic role of symbolic systems and their manifestation in material and expressive culture in Neolithic emergence.

This breakthrough article, however, falls short of realizing the full potential of NCT as a comprehensive explanatory framework for Neolithic emergence in the Near East by 1) retaining Watkins' original emphasis on population growth as the primary driver of these developments; 2) relegating subsistence economy to a relatively minor role in the process; and 3) omitting any mention of the dramatic climate and environmental changes that provided the context for these developments. Both here and in Watkins' earlier contributions, inevitable, unstoppable demographic expansion is a central driver of Near Eastern neolithization. According to this view, population expansion resulted, in a largely unspecified way, in the formation of large permanent communities that provided the context for the development of new forms of cognitive cultural niche construction needed to mitigate the stresses that arose from the aggregation of larger and less closely related groups of people living together on a permanent basis. And yet, many of the developments held here to be central to this process—the explosive increase in the size and density of communities, privatization of access to resources, specialization of economic and social roles—are all much

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