Sino-German Symposium  
February 26 - March 2, 2012

Environment and culture of early humans in China and beyond

organized by
Volker Mosbrugger (Senckenberg Frankfurt) & Cheng-Sen Li (Botanical Institute CAS, Beijing)

Program and Abstracts
Location

Hörsaal B
Hauptgebäude der Universität
Mertonstrasse 17-23
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http://www.sophienhotelfrankfurt.de
Program

Tuesday, 28.02.2012

Symposium

**Early humans in China and beyond**

09:00 - 09:30  Mosbrugger, Volker  Welcome and introduction: Environment and culture of early humans in China and beyond

09:30 - 10:00  Li, Cheng-Sen  The climatic change around Tibet-Qinghai Plateau and its impact on the development of humanity

10:00 - 10:30  Richter, Jürgen  Corridors of Modern Human dispersal

10:30 - 11:00  coffee break

11:00 - 11:30  Gao, Xing  Pleistocene human evolution in China: Paleolithic archaeological evidence

11:30 - 12:00  Conard, Nicholas  The evolution of modernity: A look at the European and Chinese records.

12:00 - 12:30  Havarti, Katharina  The fossil record evidence for modern human dispersal into Asia

12:30 - 14:00  lunch

14:00 - 14:30  Krause, Johannes  Learning about human population history in Eurasia from archaic and modern human genomes

14:30 - 15:00  Qu, Tongli  Archaofaunal remains and Palaeolithic bone artifacts of the Chinese record

**Dimensions of Expansions**

15:00 - 15:30  Haidle, Miriam  Dimensions of expansion: cultural capacity

15:30 - 16:00  coffee break

16:00 - 16:30  Hertler, Christine  Range expansions derived from faunal communities – the ecology of hominin expansions

16:30 - 17:00  Bruch, Angela  Dimensions of expansion: Climate and vegetation as parameters of early human ecospace

17:00 - 17:30  Kandel, Andrew  Cultural development and environmental changes: case study South Africa

17:30 - 18:00  Märker, Michael  Introduction to the ROAD database

18:00 - 18:30  Li, Xiao  The ancient city ruins around the Tarim Basin in the extreme arid area, Xinjiang, China
**Wednesday, 29.02.2012**  
**Symposium**  

**Plio/Pleistocene environments in China and beyond**

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**Cultural development and environmental changes**

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<td>Liu, Yan-Ju</td>
<td>The role of Tea-Horse Road in the economic and cultural exchanges, civilization spread at highland of SW China.</td>
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17:00 - 17:30  Feng, Guang-Ping  The Introduction of farming technique in Han Dynasty and Its profound Influence to the environment of Hainan Island

17:30 - 18:00  Wang, Yong  The relationship between the survival of Panda and the living enviroments of minorities in Sichuan, China

Thursday, 01.03.2012  Symposium

Cultural development and environmental changes - extreme environments

09:00 - 09:30  Bubenzer, Olaf  Geoarchaeological investigations along the Silk Road near Turfan (Xinjiang, China)

09:30 - 10:00  Zhang, Yong-Bing  The Environmental Archaeology and the Ancient Cultural Sites in Turpan Basin, Xinjiang, China

10:00 - 10:30  Guo, Wu  The nomadic progress and environmental changes in the central area of Eurasia

10:30 - 11:00  coffee break

11:00 - 11:30  Hecht, Stephan  The potential of sediment tomography techniques (2D, 3D) for the reconstruction of human impacts along the Silk Road near Turfan (Xinjiang, China)

11:30 - 12:00  Li, Chun-Chang  The Original, Development and Function of Karez in In the extremely dry environment in Turpan Basin, Xinjiang, China

12:00 - 12:30  Li, Xiao-Qiang  The early agriculture and its impact in Northwestern China

12:30 - 14:00  lunch

14:00 - 16:00  Mosbrugger, Volker  Discussion, Synthesis and Outlook & Li, Cheng-Sen

16:00 - 16:30  coffee break

16:30  End of Symposium
The Nature of the Earliest Hominin Cultures

Anne Delagnes
CNRS – PACEA/université Bordeaux 1, Talence, FRANCE

The first hominin cultures emerge between 2.6 and 2.3 Ma in several areas dispersed along the northern extension of the East African Rift System, over a distance of about 1000 km, from the Afar triangle in the north to the Turkana basin in the south. No more than four site complexes yield archaeological sites that are correlated with this time period: Gona, Hadar, Omo (Ethiopia) and Lokalalei (Kenya) site complexes. They form the earliest indisputable evidence of hominin culture. They all occur within geological and fossil-bearing formations that cover a much longer time range and start respectively from 4.5 Ma (Nachukui formation: Lokalalei site complex), 3.6 Ma (Shungura Formation: Omo site complex), 3.4 Ma (Hadar Formation: Hadar site complex) and 2.94 Ma (Budisima Formation: Gona site complex) (Woldegabriel et al. 2000). A number of hominin taxa: robust or gracile australopithecines, as well as Early Homo, could be the authors of this first hominin culture. The only plausible evidence of direct association between hominin fossils and archaeological occurrences comes from the Hadar Formation, where a maxilla of an early Homo (AL 666) has been found in close spatial and stratigraphic correlation with stone tools in a horizon dated to circa 2.33 Ma (Kimbel et al. 1996).

One of the key questions that emerge from these cultural remains is whether they reflect the first stage of stone tool production or whether they relate to an already advanced stage of tool-making. They also raise the questions of a rapid versus gradual development of hominin cultural capacity and of a monocentric versus polycentric emergence. At 2.6 Ma, the oldest stone tool assemblages, found at Gona (OGS 6a and OGS 7) (Semaw 2000; Semaw et al. 1997), do not reflect a novice lithic production. All the basic physical and gestural principles of hard rock fragmentation are acquired at this stage. The same holds true for most of the sites comprised between 2.6 and 2.3 Ma, with some discrepancies from one site to another. These discrepancies certainly reflect unequal technical skills, but more acute technological and chronological data are still required to assess whether they may correspond to distinct stages of apprenticeship.
Considering the intensive surveys that are carried out in these formations from several decades, it is unlikely that the absence of archaeological evidence prior to 2.6 Ma may be a result of an archaeological bias. Moreover, even if the technological patterns that characterize the first stone tools were the result of elementary, unpatterned or unskilled behaviors, it should be possible to distinguish them from natural implements, as has been done for the low-elaborated Lokalalei 1 assemblage. The petrographic composition of the assemblages compared with the composition of the natural outcrops accessible during site occupation, seems a relevant criteria, in addition to technological criteria, for recognizing a hominid-made assemblage. With few exceptions (eg. Hadar A.L. 894) (Goldman-Neuman and Hovers 2009), raw material selectivity is indeed a pattern that characterizes the earliest known lithic series.

At a macro-regional scale, sites are distributed in two core areas some one thousand kilometers apart: the Afar Rift (Gona, Hadar) and the Omo Basin (Lokalalei, Omo). The scarce available data concerning early hominin mobility patterns suggest that they exploited small subsistence territories. If we accept such assumption, connections between the two core areas seem very unlikely, whereas displacements of groups between Gona and Hadar sites on one hand, Lokalalei and Omo sites on the other hand, look more plausible. The picture that emerges from such paleogeographic settings would support the assumption of at least two homes of emergence for the earliest hominin cultures.

At a micro-regional scale, Lokalalei site complex gives relevant indications on the cognitive abilities involved during the first stages of toolmaking and their variation in time. The oldest occurrence, found at Lokalalei 1, documents low elaborated flaking sequences (Kibunjia 1994) which contrast significantly with the organized flaking process evidenced at the younger Lokalalei 2c site (Delagnes and Roche 2005). The differences are mainly visible in terms of nodule selectivity, planning depth, blow precision, frequency of flaking accidents, productivity and regularity of gestures. They clearly indicate an important cognitive difference between the two groups of knappers. Moreover, the technical skills documented at Lokalalei 2c imply a social transmission that rests on the replication of gestural sequences and not merely on single gestures.

Despite some marked cognitive differences, stone tool production prior to 2 Ma is characterized by a set of constant technical features which rest on the prevalence of flaking sequences intended for the obtention of small sharp-edged flakes which look perfectly adapted for cutting soft tissues. Pounding, shaped, and retouched implements are very rare, which points for a still limited array of functional needs. Raw material procurement prioritizes in most instances fine-grained lavas (eg. Gona, Lokalalei) (Harmand 2009; Stout et al. 2005), supporting the assumption of implements intended primarily for cutting tasks. These technical features are still present in the Oldowan assemblages dated after 2 Ma, in association with a diversity of end-products that did not exist before. Such shifts raise a number of issues related to the homogeneity of the Oldowan, the driven factors (eg. environmental or. biological) and the nature of the changes (eg. cultural, functional, cognitive) that occur during the
earliest stages of stone tool production, between 2.6 and 1.8 Ma.


Scarce but Significant: The Limestone Component of the Acheulian Site of Gesher Benot Ya’aqov, Israel

Nira Alperson-Afil* and Naama Goren-Inbar**

Institute of Archaeology, Hebrew University of Jerusalem, Mt. Scopus, 91905, Jerusalem, Israel

A variety of scientific fields are involved in the attempt to explore hominin cultural complexity, including evolutionary biology, brain research, animal behavior, and ethnography. And yet, the only direct evidence for the behavior and technological skills of our ancestors is available through the archaeological record. Analyses of their material culture remains can contribute substance and illustrate cultural complexity. Lithic chaînes opératoires are expressed in the search, selection, and procurement of raw materials, followed by the production, modification, use, and discard of the artifacts. The different stages of the reduction sequence attest to various cognitive abilities as well as cultural complexity in human Paleolithic history. These involve foresight and planning, technological skills, fitting typo-technological images to particular materials, problem solving and flexibility, all associated with a vast knowledge of the environmental resources and the ways by which they can be exploited and fit into the work plan.

Located in the African Great Rift, the site of Gesher Benot Ya’aqov (GBY) is bedded in the Benot Ya’akov Formation. Excavations have revealed that this formation was deposited by the paleo-Lake Hula during the Early-Middle Pleistocene. The depositional sequence includes extensive lake and lake-margin environments in which evidence of human activities is provided by a series of 14 archaeological horizons rich in paleontological, paleobotanical, and archaeological assemblages, assigned to MIS 18.

Since the beginning of excavations at Gesher Benot Ya’aqov, the remains of its Acheulian material culture have been continuously studied. The analyses have demonstrated affinities with the African tradition and revealed various technological and behavioral traits of the ancient hominins. Recently, an in-depth investigation of the GBY limestone component has been carried out, resulting in illumination of the role of this component in Levantine Acheulian assemblages. Our study reveals that the limestone component, procured from fluvial deposits in the vicinity of the site, was transported to
the lake margin and was exploited throughout the occupational sequence. Limestone nodules were brought to the site for a particular function that necessitated a specific size range and morphology. While size selection is easily recognized through metrical analyses, function is more elusive and is studied through techno-morpho-typological classification.

The limestone component at GBY includes a small sample of flakes and flake tools in addition to three categories of cores/core tools: percussors, chopping tools, and cores. Analyses of the three main categories of cores/core-tools illustrate that they exhibit a gradual reduction in several morpho-technological attributes, suggesting that the GBY limestone artifacts originate primarily in a single reduction process.

The limestone reduction sequence begins with targeting the most suitable nodules for use as percussors. The operation of these percussors sometimes caused breakage of the artifacts and hence accidentally produced flakes typical of working accidents. When percussors were broken, a sharp working edge was often formed, and a second morphotype, chopping tools, was created. A third morphotype represents different types of cores. We view these three morphotypes as inter-related consecutive options. The analyses show that once a morphotype was inadequate for use it was transformed into another one, a reduction sequence characterized by the reduction of dimensions from one type to the other. The primary motive of the GBY hominins in obtaining limestone nodules was their use as percussors. Thus, the other limestone artifacts can be considered byproducts.

The fact that these byproducts appear in the reduction sequence in a formal, consistent manner is evidence of contingency. The ability to transform one type into another while diverging from the original plan implies cultural complexity as well as flexibility. As with other aspects of the lithic assemblages of GBY, the limestone component exhibits consistent homogeneity along the time trajectory for thousands of years. This conservatism of the transmission of knowledge about specific raw materials, their reduction sequences, and the flexible variations within them is typical of a “complex” culture.
Is increasing technological, behavioural and cognitive flexibility an effect of cumulative culture?

Stone Age hunting weapons as proxy for the evolution of human flexibility

Marlize Lombard

Department of Anthropology and Development Studies, University of Johannesburg

In this paper I ask a series of questions relating to technological, behavioural and cognitive flexibility and how these concepts relate to the idea of cumulative culture as represented in the Stone Age archaeological record. It is an exploratory paper, mainly based on my long-term interest in the evolution of hunting technology, and recent collaborative work with Miriam Haidle on the potential cognitive implications of the production and use of bow-and-arrow technology during the Middle Stone Age in southern Africa. I introduce three basic types of hunting technologies for which we have archaeological evidence from > 300 ka to ~ 60 ka.

The only traces of early human culture are reflected in archaeological remains that most often represent technology. By studying and hypothesising about technologies in different ways we may be able to gain some insight into the more abstract notions of behavioural and cognitive flexibility. For example, drawing from a range of methods we can consider:

a) With what tools were made – assess levels of flexibility during the collection and preparation of materials.

b) How tools were made – assess levels of flexibility during tool production.

c) Why tools were made (function) – assess levels of flexibility regarding the application of technology.
For example, when we explore what the Schöningen spears were made of, and how they were produced, we find a surprisingly intricate answer. Miriam Haidle’s work shows us that what seems like a simple, single-substance object made by *Homo heidelbergensis* more than 300 ka ago requires the collection and preparation of several other materials before production can begin. If we accept that sharp-edged stone tools were used to remove bark and smooth and sharpen the wood, and that heat was used to shape and/or harden the spears, then the spears already represent a decoupling of satisfaction and basic need (where small operational units, each with its own intermediate aims, can be put together in a modular, flexible way in different operational sequences), a cognitive and cultural trait seemingly unique to *Homo*.

Such objects need not only be used as hand-delivered hunting weapons, they would function equally well as digging sticks, armatures for defence, walking sticks and stakes that can be driven into the ground for various purposes. Thus, the notion of modifying a wooden stick, into a long, straight, strong, sharpened object (such as a spear from Schöningen), can exponentially increase the range of behaviours with which an individual interacts with her/his conditions and situations. As a result, individuals equipped with wooden spears are much more prepared for, and flexible within, their environments than without – whether these environments are physical, economical or social.

The addition of several independent elements forming a single, composite tool with enhanced properties, such as a stone-tipped spear or knife, represents the concept of modular combination or the further cognitive element of ‘composition’. We will probably never know how, or how many times, the idea of a hafted tool was ‘invented’ over the past 300 ka, but it is an innovation that radically changed the world of hominin technology. Composition offers increased flexibility in different contexts, a range of solutions can be applied to a single problem, or diverse needs can be met with one solution. Fitness options regarding hunting, meet processing, foraging and defence are increased exponentially for individuals equipped with stone-tipped spears and knives, as opposed to those with simple wooden spears and a handful of loose stone flakes. Evidence for stone-tipped spears (or other composite/hafted implements) in the archaeological record, therefore, represents a powerful increase in technological, behavioural and cognitive flexibility compared to that of simple wooden spears and/or hand-held stone tools. Notwithstanding its complexity, it is a cognitive trait shared by *Homo sapiens* with several other *Homo* species, including *Homo neanderthalensis* and *Homo heidelbergensis* in Eurasia, and archaic modern *Homo* in Africa.

The invention of the bow and arrow used to be closely linked to the late Upper Palaeolithic in Europe, and thought to be a recent invention in Eurasia and the Americas. Recent evidence, however,
indicates that this technology was in use during the Middle Stone Age in sub-Saharan Africa by ~ 64 ka. Whereas more steps may be involved in bow-and-arrow production than in stone-tipped spear production, broken down into its individual operational units, the production of a bow or an arrow is probably no more complex than the production of any other composite tool. On the other hand, as soon a bow-and-arrow is used together, as complementary tool set, it represents the cognitive concept of technological symbiosis—i.e., the ability to conceptualize a set of independent, yet inter-dependent tools. With technological symbiosis, the advantages of modularization increase exponentially into what can be referred to as advanced modularization. Consequently, flexibility regarding decision-making and taking action is amplified. It allows a range of cognitive and behavioral complexity and flexibility that is basic to human behavior today.

Do these hunting technologies reflect cumulative culture? In our briefing document, cumulative culture is defined as changes that are built upon one another and accumulate over time. The suggested outcome is that the same problems need not be solved repeatedly. Rather, already available solutions or options can be adapted or further developed. The process is compared to a ratchet—a wheel or bar with teeth along the edge and metal piece that fits between the teeth, allowing movement in one direction only.

At first glance, the answer to the question posed above has to be ‘yes’. Using the three weapon systems introduced here, and their rough chronological appearance in the Stone Age archaeological record, we can construct the following hypothetical ratchet:

1. Ability to use and alter objects – basic technology;
2. Ability to change objects with other objects before use – modularization;
3. Ability to combine objects into single units – composition;
4. Ability to produce and use complementary tool sets – technological symbiosis/advanced modularization.

Yet, considering our archaeological and historical records in more detail, I’m not convinced that a ratchet or the ratchet effect is the most appropriate illustration of what is reflected in the cultural remains associated with humans. As illustrated above, the analogy can be used as a course-grained reconstruction of long-term technological/cultural evolution, but it fails to explain or help understand episodes of simplification often encountered in our archaeological and historical records. A ratchet, allowing movement in a single direction only, is perhaps too inflexible and too close to previous unilinear perceptions of cultural evolution to explain the irregular cultural record associated with human behaviour. The archaeological and historical records do not always show a continuous
accretion of innovations as expected when cumulative culture is compared with a ratchet. Rather, when we afford it a closer look, it seems as though complex technologies may have been invented, discarded and re-invented or re-introduced over time and space – most probably as a result of a variety of environmental, demographic and social factors. Whereas the ratchet effect may be used effectively to illustrate the latent capacity for certain types of behaviours, I wonder if a model of humans negotiating a rugged fitness landscape (historical context, demography and environment), supplied with mountaineering gear (technology/culture), is perhaps not more appropriate to illustrate the evolution of human cognitive and behavioural flexibility.
The Evolution of Play and Its Role in the Extension of Cultural Competence

April Nowell

Department of Anthropology, University of Victoria, Victoria, BC, Canada.

One of the questions that arises out of this workshop is whether changes in life history correspond to changes in cultural capacity. In other words, as our hominin ancestors transitioned from one life history strategy to another can we document concomitant shifts in the extension of cultural capacity? This is not a simple question. Life history, often referred to as reproductive turnover or the ‘speed of life’, is “the allocation of an organism’s energy for growth, maintenance and reproduction. . . it is fundamentally a life strategy adopted by an organism to maximize fitness in a world of limited energy (Dean and Smith 2009:119).” As such life history is not just one ‘thing’; it is the sum total of life history-related variables such as gestation length, age at weaning, age at first and last reproduction and longevity that can tell us about the rate and timing of important life history events. Life-history strategies are fluid and where we recognize breaks is somewhat arbitrary. The same can be said for cultural capacity. Thus, the short answer to this question could be both yes or no depending on which variable or suite of variables is studied; how much change is ‘enough change’ to be considered something different and whether we ask this question at the level of the individual or the population.

Workshop organizers have argued that the extension of cultural capacity can be thought of in terms of the amount, form and processes of the transmission of information. In this paper I will look at the evidence for the evolution and extension of the uniquely hominin life history stages of childhood and adolescence and I will consider the relationship between these stages, the evolution of play, the transmission of information through peer to peer interaction, and the extension of cultural capacity. I will conclude by outlining the implications of these relationships for our understanding and interpretation of the archaeological record.
Cumulative culture - cognitive and social prerequisites and possible material outcomes

Claudio Tennie, David Braun and Shannon P. McPherron

Max Planck Institute for Evolutionary Anthropology, Dept. of Developmental and Comparative Psychology, Leipzig.

Recently the expansion of the investigation of tool use and behavioral patterns in chimpanzees and other non-human animals has changed our view of our closest living relatives. Rather than culture separating us from the apes, it appears as if culture may be a unifying dimension of the higher primate lineage. However, despite the apparent similarities between human cultures and similar-looking patterns of behavior in chimpanzees and other ape species, there do appear to be differences that make human culture unique. Specifically, the nature of human cultural change is associated with a ratcheting effect usually referred to as cumulative cultural evolution and may be a unique feature of the hominin lineage. Tomasello has suggested that one important underlying learning mechanism of cumulative culture is imitation. While it is currently debated whether learning through imitation is present in the non-human primates, Tennie has offered an alternative learning model for chimpanzees called the zone of latent solutions (ZLS). The ZLS model is based on the premise that all documented chimpanzee behaviors can be learned by a naïve individual without access to or knowledge of prior learned behaviors and that behaviors spread within a group through social learning via low-fidelity copying. The question we ask here is whether the ZLS model can explain the behaviors documented in the earliest archaeological record without recourse to cumulative culture. If so, the question then becomes when did cumulative culture first appear. First, we argue that the Oldowan, with its simple core and flake technology, very likely falls within the ZLS model. Second we consider whether the Acheulian, characterized by the handaxe, might also fall within this model. We conclude with some considerations of how we might better refine our archaeological tests to better understand the origins of cumulative culture in the hominin lineage.
The Relationship between Technological, Cognitive and Cultural Complexity

Lyn Wadley

School of Geography, Archaeology and Environmental Studies and The Institute for Human Evolution, University of the Witwatersrand

The definition of human culture is difficult to separate from that of animal culture, except that a number of cultural attributes can be simultaneously attributed to humans and not to animals. This is not an issue that arises when trying to define what is meant by culture in the modern world or even in the world that was occupied by people who were physically like us at 100,000 years ago. As archaeologists, we cannot access culture or cognition directly; we can only interpret the level of cultural or cognitive complexity from circumstantial evidence. We also do not excavate technology; we infer a level of technology from artefacts and the contexts from which they were recovered. Interpreting technological, cognitive and cultural complexity requires carefully constructed bridging theory between archaeologically-recovered data and interpretations about behaviour and human capacity. Some technological strategies that we infer from the Middle Stone Age record in Africa seem to have the potential to inform us about the cognitive abilities achieved by people in the past. Amongst these is trapping and snaring. The humble and technically simple snare implies complex executive functions of the brain enabling people to hold in mind a strategy and action that is out-of-sight. A great many new social circumstances are enabled through the invention of the snare. Thus complex technology is not a prerequisite for cognitive or cultural complexity, though it may also inform us of these states. The creation of compound adhesives in the Middle Stone Age is one way in which multi-faceted technology requiring multi-tasking and even abstract thought can provide a clue to complex cognition possessed by artisans in the past.
The Critical Pre-hominin Foundations of Hominin Cultural Evolution

Andrew Whiten

Centre for Social Learning and Cognitive Evolution, University of St Andrews

The expansion of cultural capacity and material achievement that occurred in the course of hominin evolution, the central focus in this symposium, is principally documented within the stone age, which occupied the latter half of the period since the common ancestor of humans and chimpanzees lived (Whiten et al. 2011). Here I focus on reconstructing the evolution of the essential cultural foundations that made the hominin cultural expansion possible. This analysis logically takes the common human-chimpanzee ancestor as its principal focus, but can be extended much further back in time, as well as forwards to the beginnings of the stone age, insofar as there is little to document significant change from great ape levels of culture until then.

Taking the chimpanzee of today as a model of our common ancestor would invite several potential pitfalls (Whiten et al. 2010). Instead I analyse the cultural commonalities between ourselves and chimpanzees (and where possible, other apes) to draw inferences about the likely nature and scope of culture in our common ancestor. In recent papers I have suggested that where the goal is to compare cultural phenomena between humans, chimpanzees and other species, it is helpful to assign such phenomena to one of three major categories, each further subdivided into several subcategories (Whiten 2005, 2011).

The first category concerns the distribution of traditions in space and/or time. Here, commonalities between chimpanzees and humans suggest a common ancestry marked by the existence of regionally different, socially transmitted cultures each defined by multiple traditions spanning a variety of types of behaviour, including food processing techniques and tool repertoires, as well as social and sexual customs. Compared to hominins’ later evolving cultural richness these would have been limited to only a handful of traditions and shown little sign of cumulative cultural change, if any.
The second category concerns the behavioural and material contents of culture. Of major interest from the perspective of the present symposium, chimpanzees share with ourselves a substantial suite of material traditions that incorporate large numbers of tool types and uses, including a range of percussive techniques that suggest important ancestral foundations for the innovations and cultural achievements of the stone age (Whiten, Schick and Toth 2009). I shall describe key features of this cultural content in more detail.

The third category concerns the psychological and behavioural processes and mechanisms underlying cultural transmission. Characteristics shared between chimpanzees and humans suggest a common ancestor would have possessed a suite of different social learning processes ranging from imitation to emulation (emulation is learning from the results of actions, rather than copying actions themselves). These processes would not have permitted the high fidelity copying characteristic of our own species today, nor would they have involved more than minimal forms of teaching, but from our experiments with apes we can infer that they would have been sufficient to sustain traditions including variations in, for example, percussive technologies. The extent of cultural capacity seen in great apes as a group, may explain their distinctive encephalisation (van Schaik and Burkart 2011).

The scenario outlined above for the cultural nature of our common ancestor corresponds to the level of multiple-tradition ‘culture’ in the broader evolutionary ‘cultural pyramid’ of Whiten and van Schaik (2007: see figure) on which Haidle, Conard and Bolus have elaborated to build their more comprehensive proposal for the evolution of culture. I shall suggest several respects in which both the original model and its more complex ‘descendant’ model, proposed by Haidle et al., might now be best refined.

The explanation for the expansion of cultural capacity and material capacity and material culture that characterised the stone age is suggested to lie in a unique interaction between the Africa Pliocene environmental change experienced by our ancestors, and the cultural potential already in existence, outlined in this paper.


For further publications see [https://risweb.st-andrews.ac.uk/portal](https://risweb.st-andrews.ac.uk/portal)

See also [www.cultureevolves.org](http://www.cultureevolves.org) for links and access to related documents
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