

## **The Emotional Brain Hypothesis: Emotional, Social, and Religious Vetting in the Evolution of Rational Decision Making and Scientific Modeling**

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Abstract: While sociability has been recognized as a foundation of human evolution and is now well integrated into models of human origins, emotionality has received less attention. It is proposed that emotionally-informed decision making developed to the benefit of members of the genus Homo, as an integral part of the evolution of sentience on the hominin line. Emotionality is especially important in the higher expressions of sentience – science, religion, and art – but also in vetting all rational and scientific thought. The authors propose that future researchers in archaeology, evolutionary psychology, and evolutionary biology incorporate analysis of both emotionality and sociability into their protocols. A brief scenario of early hominin interaction in the search for food is presented, along with a discussion of the emotions involved. In the future, rational decision making that is vetted by both social and emotional intelligence, as well as religious and ethical precepts, will help to provide solutions to world problems. Emotionality remains critically important for members of the genus Homo as an aspect of their attainment of sentience.

Key Words: sentience, hominin, emotion, sociability, adaptation, evolution, archaeology, Matrix Thinking, ethics, global challenges

### **New Understanding of Emotionality in the Evolution of Sentient Hominins**

In responding to ESSSAT's 2014 call for papers, "Do Emotions Shape the World?" we take this opportunity to address a central theme in our work on human sentience on the hominin evolutionary line, and on the origins of scientific, religious, and artistic thought. We propose that human sentience, our awareness and particularly self-awareness, is far from a purely rational, cognitive, or intellectual capacity. Our list of the "components of sentience" have cognitive, perceptual, and emotional features, and our "Advanced Domains of Thought" – science, religion, art (and perhaps sport and cuisine) – have creative, cognitive, and emotional features that underpin them all. We propose that the emotionality of sentience cannot be extricated from it, and therefore, emotional evaluation by members of the genus Homo (including *Homo sapiens*, his forebears, and near cousins) is an integral part of sentience. Only among members of the genus Homo do creatures routinely contemplate and analyze their own existence. We have called the attainment of sentience, "crossing the latest line" because only with sentience does Big History become "reflexive" and able to look back on itself (Corbally & Rappaport 2013).

Emotionality on the hominin line of evolution has been acted upon by natural selection. As mammals became more complex, they became more emotional, in part because of lengthening periods of intense child-rearing, especially among humans and anthropoid apes, but also, we propose, because emotions enabled humans to make better decisions for the social group.

We submitted science, religion, and art to “tests” designed to confirm adaptations that arise in response to natural selection (Fiddick & Barrett 2001). After exploring interdisciplinary literatures from the cognitive science of religion to archaeology, and from evolutionary biology to genetics, we conclude that sentience and its highest capacities could be none other than *bona fide* biological adaptations because of their pervasiveness, tenacity, flexibility, internal complexity and coherence, ubiquity in all human cultures, and ancient origins in the deepening archaeological record that now goes back to the Middle Stone Age in Africa, perhaps 200,000 years or farther.

Emotion is an integral topic of study in diverse fields of the sciences and humanities, including: stones-and-bones archaeology (Tarlow 2012) and cognitive archaeology (De Beaune *et al* 2009); evolutionary psychology (Cosmides, Barrett & Tooby 2010) and cognitive psychology (Platek, Shackelford & Keenan 2006); evolutionary biology and the metamorphosis of “proper [original] functions” to “actual [today’s] functions” (Fiddick & Barrett 2001); population genetics (Cochran & Harpending 2010; Pickrell 2012) and the analysis of mtDNA from human ancestors and near relatives (Mayer *et al* 2014); the ethnological study of present-day hunter-gatherers (Barnard 1992); the cognitive science of religion (Van Slyke 2011); and literature, where many concepts in the sciences are first imagined.

Archaeologists and evolutionary biologists peg what most call “modern thinking” to the origins of the genus *Homo*. Early humans who left behind complex tools, paint production, self-decoration (strings of beads), evidence of long distance trade, knowledge of a pharmacopeia, and external storage devices (purposefully incised red ochre) are often called “behaviorally modern” (e.g. D’Errico 2003) or “culturally modern” (Wadley 2001). We propose that the attainment of sentience is equivalent to behavioral modernity. Early humans were becoming increasingly complex emotionally and more pre-disposed to artistic, scientific, and religious thought, compared to those who came before them.

We suggest reclaiming the term “sentience” for the hominin line. Many writers use “sentience” as synonymous with “rational” or “intelligent.” This meaning has even wormed its way into modern advertising, in which “Sentient Jet” service is said to be “powered by rational thinking” (WSJ Magazine, Feb 2014, 46). Others see “sentient” as synonymous with “symbolic,” although the latest evolutionary psychologists and semioticians find human beings to be far more than symbolic thinkers – as do we. In line with this conclusion, we have worked to develop the

concept of “Matrix Thinking,” which, we believe, is at the heart of creativity for scientific, religious, and artistic thought, and views human sentience as symbolic, as well as socially and emotionally based.

We propose that human sentience is an evolved, complex adaptive capacity that is cognitive, but – at least in the version of sentience that evolved on planet Earth – based on specific perceptual and emotional features, too. Our evolutionary development makes it almost impossible for humans to make decisions that are strictly “rational and scientific.” The species has a biology with very specific abilities to perceive certain phenomena in the natural world, and very specific tendencies to make sense of information in certain ways (like the counter-intuitive belief in God, or the tendency for teleological thinking). Human decision making always takes place within a social matrix, even when a person is alone. Emotional features underlie many of the components of sentience, making it virtually impossible for humans to engage in decision making and scientific modeling without the use of emotional systems, which are embedded in our neural networks, hormonal systems, our skin and sweat glands, facial musculature, and other biological systems. Emotional and social vetting lie at the heart of human decision making, and research testing this hypothesis will be helpful.

We propose that modern humans routinely vet so-called “rational decisions” in a framework not only of social relationships and emotionality, but also in an ethical framework, often as embodied in religion. Humans are not simply symbolic thinkers, but rational thinkers with social, emotional, and ideological systems. We do not make decisions alone...ever. We usually do not make even the most “rational” decision without intuitively asking ourselves, “Does it feel right?”

Emotionality is a basic building block in our understanding of sentience and it comes into play especially in religious experience and artistic expression, but also in planning and strategizing. From the perspective of natural selection, the decisions that humans make are – eventually and ultimately – for the benefit of the group. Hominins did not evolve as individuals, but as very smart, very emotional beings who were, and remain, utterly dependent on their social group. Evaluation of rational decision making took place constantly within a social and emotional context of individuals who encouraged, supported, challenged, and argued with each other in order to arrive at good decisions.

Sentience, including rational thought, is now conceived solidly within a social matrix for early man, and a better understanding of emotionality is emerging because of new archaeological and genetic evidence of early humans. Recent interest in emotionality builds upon a solid foundation of work on sociability by evolutionary biologists and psychologists. Nowhere have humans evidenced sociability *without* emotion (however covertly expressed), unless pathological. Emotion is embedded in human social life. The Social Brain Hypothesis (Stringer 2012; Dunbar 1998), the concepts of “deep social mind” and “socio-cognitive niche” (Whiten & Erdel 2012),

and “cultural ratcheting” as a source of learning and creativity in social groups (Dean *et al* 2012) have been widely reviewed and integrated into models of human origins.

We propose that the emotionality which is ubiquitous in all of modern man’s activities was also an integral part of early man’s survival toolkit on the African savannah. Emotion was, and is, fundamental to the successful adaptations of the species in the genus *Homo*, just like sociability. One could call this the “Emotional Brain Hypothesis,” analogous to Dunbar’s “Social Brain Hypothesis.”

However, when we examine Dean *et al*’s 2012 report on a creative experiment comparing the efforts of human children with chimpanzees and capuchin monkeys (both recorded as having the rudiments of “behavioral traditions”) in solving the same puzzle box task, we see little discussion of emotion. There is much on social interaction, social skills, bargaining, mutual encouragement, but little on the emotion contained in all of these social maneuverings. The words “emotion” and “feeling” are found zero (0) times in the four-page article, while “social” and its various forms (prosocial, prosociality, non-social) are found a total of 43 times. We wonder about emotion when we read the following results on “cultural ratcheting” in Dean *et al*, where social interaction paves the way for problem-solving (2012).

A total of 23 unambiguous instances of teaching by direct instruction...were observed... of which all involved task-relevant communication (e.g., “push that button there”)... A strong positive relationship was observed between the amount of instruction received and the stage reached by a child... the proportion of manipulations that children performed at the same time that another individual was in proximity was significantly greater than in either chimpanzees or capuchins, indicating greater tolerance of others, cooperation, and shared motivation among children (Dean *et al* 2012, p. 1115).

Anyone who has watched children play knows that this kind of group problem-solving is never emotionless.

Closer inspection of the children’s behavior supports the conclusion that a package of social cognitive capabilities, encompassing teaching (largely through verbal instruction) as well as matching (e.g., imitation) and prosociality (altruism), was critical for performance at the highest level (Dean *et al* 2012 p. 1117).

The authors rightly conclude that sociability provides a scaffold upon which to erect solutions to a puzzle box task, but they do not address the role of emotion in finding solutions with others. We know intuitively that emotion is there because without it, social problem-solving by human children would not seem normal. It would look and feel odd. Results from Dean *et al* show clearly that problem-solving proceeds best for human children when they appear to interact on all levels: social, intellectual, and emotional. Social learning is the advantage that human children

have over chimpanzees and monkeys in the experiment. Yet, we propose that it is not only social interaction that creates the effect of “cultural ratcheting” as the common learning mode of *Homo sapiens* and his predecessors, but the attendant emotion, as well.

To date, emotionality has received less attention than sociability in archaeology and studies of human evolution. There have been some surveys of “emotion and archaeology” (Panksepp & Biven 2012) and “the history of emotions” (Rosenwein 2010), but emotion has not yet achieved the central importance of sociability in evolutionary science. The newly emerging literature on the “archeology of emotion” (Tarlow 2012) is addressing methods for understanding emotion in the archaeological record. We propose that evolutionary psychologists and biologists incorporate analysis of emotion into their protocols, in addition to social interaction.

### **The Social, Emotional, and Ethical Context of Effective Decision Making**

Let us take a look at a brief scenario of early hominin interaction in the search for food, and the emotions involved.

The Human Sentience Project is developing Astronomy Skits for secondary school science students, and the skits are based on the expertise of the two Co-Founders, an anthropologist and an astronomer. They are five-minute dramatic productions for two characters. The goal of this educational program is to interest young people in science and math careers. An example of decision making that is emotionally-, socially-, and intellectually-based, comes from a skit developed for our forthcoming book – *Astronomy Skits Guide Book for Science Educators and Educational Policy Makers* by Margaret Boone Rappaport, PhD, and Christopher J. Corbally, SJ, PhD. The skit entitled, “Early Man and Middle Stone Age Maps” takes place near Blombos Cave, on the southern coast of Africa. A man and a woman who lived approximately 75,000 years ago sit warming themselves at a campfire in the evening. The man is Seer, the local medicine man. The woman is Em, and she is the daughter of the aging head man. Seer comments on the cold of the evening, and Em agrees, reminding him that last evening was cold, too.

Em encourages Seer to leave the group and seek out “the Others” (another band of early man). The weather has become too cold, their food is in short supply, and too many babies are dying. He hesitates, reminding her that her father has known other cold spells. She again encourages him to leave and, handing him a piece of intricately incised red ochre, tells him it marks the way to the Others – a kind of map. She promises to wait for him, but insists that he must leave for the sake of them all. He must find them a warmer place to live.

This was the first *dramatic* skit written for the Astronomy Skits book. The others are rather humorous. This one is serious because it concerns changing climate, the search for food, and selection pressure on a human population. During the Late Pleistocene, Africa was subject to

changing climate and sometimes early human populations had to move. The skit involves one such instance.

The emotion involved in the dramatization is important. There is fear, anxiety, hope, love, and understanding between the man and the woman. None of these emotions is found hidden in the ground, but we do have incised ochre pieces whose meaning we do not understand. What were they used for? What rituals were involved in their use and the use of self-adornments? What emotions came into play? We can only imagine. However, humans are good at imagining, especially about beings that were so closely related to modern man.

What we know is this. Out of the extraordinary biological diversity found in the many sub-types of early man, who faced the challenges of adversity in Africa and Eurasia, only our human species survived into the modern era (Stringer 2012). What role emotionality played in our survival, we are only now beginning to ask. Emotion is an important part of both religion and art, and both the anxiety and excitement that attend scientific discovery and analysis.

In the evolution of sentience, we find adaptive excellence in both body and mind. Emotionality responded to natural selection and evolved as an integral part of that excellence. The lines of men and women who survived the African savannah and went on to conquer the remainder of Earth's land masses, skies, and Moon – those hominins who are our forebears and neighbors – must have found at least some succor in science and technology, surely, but also in religious and artistic thought, and in the emotion they so often embody and symbolize. Emotion sustains us, propels us, stops us, and gives us hope for the future. Without it, we are perhaps sometimes more clearly thinking, but we would be, at the same time, lost.

This is an important insight about humanity. We make decisions in a context of society and with a foundation of emotions about, and scientific knowledge of our environment.

### **Effective Educational Formats for Coping with Global Challenges**

In The Human Sentience Project, we teach about a capacity called Matrix Thinking, which involves the dynamic juxtaposition of different paradigms to create new cultural knowledge. Emotion will always play a role in that process because comparisons, contrasts, and analogies involve emotion, both in their evaluation and in their projection from one part of our thinking to another. The Human Sentience Project is preparing another book for young adults. It is a “Dialogue between Priest and Anthropologist on Evolution,” where we include a discussion of the importance of emotion in vetting all types of cultural knowledge. Science, religion, and art, and the emotions interwoven in their full expression, help young adults control the uncontrollable, predict the unpredictable, and know the unknowable – as they did for ancient

hominins. When young adults make decisions, they should know that emotionality is not necessarily a hindrance to clear thinking, but that it can be a special advantage. If a decision does not “feel right,” then a different evaluation and decision may be necessary.

Humanity’s future will depend on reason and science, but also on the innate, emotional good sense of members of human social groups, and a moral sense of right and wrong that is so often codified in theology and expressed in human spirituality. We propose that full use of rational decision making must be vetted by both social and emotional intelligence, as well as religious precepts. These will all help humans in the future to be better citizens; to gain control of a mushrooming quantity of data; and to make ethical decisions about advances in technical fields such as genetics, nanotechnology, and resources management.

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