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"Tiger got to hunt, bird got to fly;
Man got to sit and wonder 'why, why, why?'
Tiger got to sleep, bird got to land;
Man got to tell himself he understand."
- *Cat's Cradle* by Kurt Vonnegut

Cognitive Developments within Homo

The Genus *Homo* is characterized by the trait of self-awareness; a distinction that separates it from its fellow animals because of the development sometime within the evolving *Homo* lineage of the capacity of individuals to reflect on their own mortality and to contemplate the existence of spiritual deities. These two derived cognitive traits are observable across the world in every present and past human culture and may extend back into our Genus lineage. It is important to understand the functional adaptation of these two cerebral capabilities in the context of what we already know about the biological adaptations of modern *Homo sapiens*. Modern humans have the capacity to reach transcendental states of consciousness that seem to whisk us away from the everyday world to a spiritual dimension that is not governed by the laws of physical matter. How and why did we develop this faculty?

As one will witness in the following discussion, after decades of proposed theories about the evolution of a spiritual capacity within *Homo*, there is still no consensus among palaeoanthropologists. This paper will seek to briefly outline the current theories, which will be followed by a critique of the single-function paradigm that is holding back scientists from deciphering the anomaly of spirituality. I will argue that there certainly is a socially cohesive role for religion (as the communal form of individual spirituality) that provided a competitive advantage, but that this explanation is not complete. The foundation of all human spirituality was the initial "discovery" of altered states of consciousness within our own minds that first aided in solving those existential dilemmas that are such a fundamental aspect of the human condition.

The Beginnings of Spiritual Thought

The human condition is plagued by an unpleasantness stemming from the dual existential predicament where we (i) desperately long for the impossibility of a tangible meaning of life and are (ii) cognizant of our inevitable death. No other living animal has to worry about this and, when our ancestors were first confronted with this anxiety, there must have been an excruciating need for answers to their newfound metaphysical questions. The source of this uniquely human consideration is supposedly our relatively large brain, which brought along spatial comprehensions undocumented in earlier *Homo* species. Apparently, our improved spatial capabilities come from the use of our very nimble hands in the manufacture of stone tools (Wynn 1989). In the constant effort to produce stone tools for the procurement and processing of food, toolmakers would gradually learn the physical laws involved in flint-knapping and with practice and teaching, they were able to produce more efficient results.

Generations of combined learning led to two major breakthroughs in *Homo* spatial competence that resulted in early *Homo* (referring to all tool-making species preceding Neanderthals and archaic *Homo sapiens*): developing predetermined notions of a general expected shape of a stone tool before the first flake is whacked off, and the ability to consider a whole (core) in relation to its parts (flakes). These two breakthroughs allowed late *Homo* (for the purposes of this paper referring to Neanderthals, archaic and modern *Homo sapiens*) to strategize the shape of their stone tool beforehand, instead of merely whacking a core randomly until a cutting surface appeared (Wynn 1989: 63-64). Yet it seems that these spatial breakthroughs forced our ancestors to stumble upon a new world of abstractions that brought along existential baggage that had previously been of no concern to earlier members of the lineage. The split between late *Homo* and all other conscious organisms is a spatial one, and it is from this premise that one proceeds to understand human spiritual capacity. In a way, advances in the spatial competence of *Homo* compelled the newly adapted species to think about itself and its surroundings in the same manner that they were conceptualizing the stone tool. These new cognitive capabilities now demanded that our species reflect upon itself in

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relation to external reality and to curiously ponder this relationship. This new line of thinking led to abstractions, where symbolic culture arose for the first time by connecting objects or perceptions of the here-and-now with conceptual notions, such as ideological systems and future or past events:

> We have the highest level of reactivity-meaning that animals on this planet have been able to achieve: what we call symbolic behavior. Man himself coins a designation for an object, and then responds to that arbitrary designation. The word "house," for example, has no intrinsic qualities within itself that would connect it with an object—we could just as well use the words "casa," or "maison," or "dom." So, unlike Pavlov's dog, man creates the relationship between stimuli. And unlike the chimp reaching with a firm pole for a banana, the airy symbol "house" has nothing intrinsic in it that would connect it with the object it stands for (Becker 1971: 6-7).

The key to human spiritual capacity is found in the unique abilities of symbolic conceptualization and communication. Humans must explain the world in which they exist through associations so that everything from physical objects to entire systems of metaphysics must be given a particular symbolic structure, according to which they are understood by people who share a common culture. Sosis and Alcorta exemplify this theory by looking at rituals of marriage, which "link the abstraction of future behaviors regarding sexual fidelity to the community and are sanctified through emotional associations" (Sosis & Alcorta 2003: 272).

Recent findings about the possibility for a genetic coding of spirituality have found that there is an apparent association between those who have a C on their VMAT2 gene and have high scores on a self-transcendence scale. Those who have an A on VMAT2, however, score lower on the scale. Dean Hamer and his team were able to show that "somehow, this single-base change was affecting every facet of self-transcendence, from loving nature to loving God, from feeling at one with the universe to being willing to sacrifice for its improvement" (Hamer 2004: 73). Nevertheless, we are still not at the functional root of the evolutionary problems of religion and spirituality, for which there are a plethora of theoretical propositions. The following discussion will assess possible explanations for the functional adaptation of a spiritual capacity in humans, for which there are two main approaches: one approach argues that spirituality arose as a functional social mechanism, while the other contends that it was the derivative of a highly sophisticated brain with a multifaceted consciousness, and that spiritual concepts developed through experimentation with altered states of consciousness (ASC).

The Place of *Homo sapiens* within *Homo*

It is interesting to note the cognitive similarities between *Homo sapiens* and their closest *Homo* relative, the Neanderthals. In an evaluation of the Neanderthal mind, Thomas Wynn and Frederick Coolidge (2004) claim that the archaeological record indicates that Neanderthals disappeared soon after the arrival of modern *Homo sapiens* in Europe around 50,000 years ago. They proceed to argue that the split between modern humans and Neanderthals must be cognitive since:

> Because working memory has been empirically shown to be strongly related to both general intelligence and native, fluid intelligence, this mutation might have subsequently had a profound positive effect on the general reasoning abilities of modern humans. We have labeled this effect "enhanced working memory" (EWM)...Even if it yielded only a slight selective advantage, such a mutation could have spread rapidly in African populations, enabling the dramatic spread of anatomically and behaviorally modern humans after 50Ka (Wynn & Coolidge 2004: 469).

The subtle split proposed by Wynn and Coolidge is that Neanderthals possessed an inferior working memory, that it is the evolution of *enhanced working memory* in humans that allowed them to entertain more advanced cognitive notions (including spiritual concepts), and that this provided moderns a competitive edge over the Neanderthals.

The archaeological evidence appears to suggest that Neanderthals could not ponder metaphysical concepts and spirituality in the way that moderns could. It is assumed that Neanderthals were the first species of *Homo* to

bury their dead and this could be taken as a sign of a spiritual capacity, but it is also likely that they were burying corpses merely to dispose of the smell (Klein 1999: 469). The question, "Was there a Neanderthal religion?" is answered in the negative because arguments for shared ideologies (e.g. the "Cave Bear cult"), ritual cannibalism, and sacramental burials have all been shown to be unfounded (Rowley-Conwy 1993: 70). Red and black ochre have been found alongside Neanderthal burials, but it is believed that these are residuals of clothing decoration rather than a sign of ritual (Klein 1999: 441). Wynn and Coolidge compare the meagerness of Neanderthal burials to the extremely ornate *Homo sapiens* burials in Sungir, Russia (32,000 B.P.) and Qafzeh, Israel (90,000-110,000 B.P.), both of which include carefully selected beads and ornaments found in association with the bodies (Wynn & Coolidge 2004: 480). Such contrast in grave goods suggests that the human adaptation of EWM was sufficient to provide *Homo sapiens* with a competitive advantage as they moved into Europe. This advantage would have made them more adaptively fit and this is obvious when one considers that the human species flourished while Neanderthals went extinct.

An important point has been largely ignored in discussions about the evolution of religion (as the social institution of spirituality) in that current religious groups have shown that violence often results between groups that do not share common religious views. The 20th Century alone saw its share of religiously driven battles, so why should we think of the original religious groups as any different? "When group membership and religious affiliation become intertwined, group conflict easily escalates into genocidal "holy wars" (Kurland 1999: 84). It is not too far fetched a notion to argue that perhaps the humans who were moving into the Neanderthal territory in Europe brought with them deeply ingrained religious convictions. In this sense, the perverted depiction of Christopher Stringer's *Out of Africa* model as "the dispersal of 'killer Africans,' who wiped out other human populations in a Pleistocene holocaust" (Stringer 1994: 150) may be a rational hypothesis after all. Palaeoanthropologists must begin to entertain the possibility that ancient humans probably expressed tendencies for violent xenophobia just like present day humans, and that their first encounter with Neanderthals almost certainly would not have been friendly and tolerant. The EWM that humans developed would have given them new cognitive abilities, which allowed them to overcome whatever environment or organism they came across and also provoked a religious fervor that further encouraged an aggressive nature.

Current Theories

The issue of the evolution of human spirituality is very difficult to discuss within a scientific framework. Indeed:

> [w]ithin an evolutionary perspective, one would primarily explain the emergence of religions along lines similar to the explanations one would advance for social contributions to the inclusive fitness of the individuals or communities in which they arose. Alternatively, one could claim that religions arose as a side-effect with the emergence of some other trait. Perhaps with the rise of consciousness questions about the origin and meaning of the world and of one's individual existence could arise, and as long as other explanations were not available, explanations in terms of spirits and personal powers in and beyond the world were attractive (Drees 1998: 323).

The difficult theoretical connection of biological evolution and religious spirituality was declared to be in "general stagnation" by Clifford Geertz (Geertz 1966: 1), but has since become the focus of critical examination by scholars, (such as Ernest Becker) who hope to justify human spirituality within the confines of evolutionary theory. This has been no easy task, yet it is important for the scientific community to account for spirituality because it presents such a pesky abnormality where rituals and religiously driven labour seem evolutionarily uneconomical. Hayden points out that "behaviour which demands significant amounts of time and energy but confers no adaptive advantage on a species, not only has no reason to persist, but should be actively selected against due to episodic competition over resources" (Hayden 1987: 82). Following this logic, any time and energy spent on religious matters must provide spiritual beings with a competitive advantage over their neighbours. This is a common assumption about the nature of adaptations, but as Stephen J. Gould points out repeatedly, we often forget that adaptations that increase fitness come in two

different forms. Gould proposes the term *exaptation* as a way of accounting for the other half of the meaning of the concept of adaptation that appears to be misunderstood by many scholars:

> A feature is an adaptation only if it was built by natural selection for the function it now performs. [Exaptation] defines adaptation in a static, or immediate way as any feature that enhances current fitness, regardless of its historic origin. (As a further confusion, adaptation refers both to a process and a state of being. We are only discussing state of being here—that is, features contributing to fitness (Gould 1982: 5).

In this way, exaptations are side-effects of adaptation (as described in the Drees quote above) that can now be discussed apart from the more common restriction of adaptations as simply those features that have a direct functional correlate over a long period of historical time.

The first set of hypotheses involves those that argue for religious rituals and spiritual activities as instruments that induce social cohesion and solidarity. This can be witnessed in modern religious groups, which helps to suggest that rituals may have played a similar role in the past. There are broader ecological approaches that seek to rationalize religious ritual in terms of mammalian communicative routines, such as mating rituals and inborn signaling between signaler and receiver (Sosis & Alcorta 2003: 265). This is a likely candidate for the distant origins of religious ritual, but fails to clarify the question of how transcendental human religiosity, in its plethora of forms, evolved from involuntary mammalian behaviour. With the advent of the genus *Homo*, there was the increase in spatial competence discussed earlier, which acted to distance the higher hominids from the rest of the mammals. Considering this advance, Social Solidarity theories arose, arguing that ritual ceremonies, conducted for religious purposes, acted to unify the group under a shared belief system and to urge cohesion amongst the individuals in the group (Sosis & Alcorta 2003: 265). This has been a very popular view because it is more *Homo*-centered than the broad ecological approaches and it describes the complexity of human communication better than analogies regarding less complex mammals. Human communication is not a simple practice; rather, the issues conveyed between humans are often complex and indistinct. It has been suggested that most human social communication is the result of early religious rituals, which allowed signals of *yes-no*, or more ambiguous *more-less*, to be given and received between clans. An example of this principle is provided by the Maring peoples of New Guinea, who indicate their intent to lend military support to another clan by dancing in that clan's ritual festivals (Rappaport 1971: 26). In this way, Social Solidarity theorists argue that participation in rituals allows for group selection based on the success of the communication bonds between groups who could then reciprocate in aiding each other during droughts or conflicts with other groups.

There is also the *Ritual as Deception* theory, which claims that religious rituals arose as a power struggle between individuals within the group. Denouncing the group selection assumptions, these theorists assert that natural selection "should not favour organisms that signal their honest intentions if greater gains can be achieved through deception" (Sosis & Alcorta 2003: 266). The group can be exploited by crafty individuals who promote and manipulate religious ceremonies for their own gain. Therefore, social cohesion is achieved by individuals who convince the group that it is in their best interest to participate in their deceptive rituals built around a set of shared religious beliefs.

On the other hand, Costly Signaling theorists argue against deception by individuals because religious systems originated as devices of social cohesion by creating signals of dedication that were costly to fake. In order to be accepted as part of a social group with shared religious ideology, one had to participate willingly in rituals that would otherwise deter non-believers from going to great lengths of deception in order to swindle their peers. In this way, "trust is enhanced among group members, which enables them to minimize costly monitoring mechanisms that are otherwise necessary to overcome the free-rider problems that typically plague collective pursuits" (Sosis & Alcorta 2003: 267). These three theories of the evolution of religion are promising in that they are able to link what seems to be the inefficiency of religious rituals with possible benefits of ritual as providing competitive advantage against groups that are not held together by shared religious ideology. Others have argued, however, that social cohesion is

only a byproduct of adapted spiritual capabilities that were merely side effects of cognitive adaptations unrelated to social benefits.

Theories aimed at explaining spirituality and religious beliefs as the byproduct of previous adaptations are more focused on the evolution of the human mind. Of course the mind is intimately connected to the physical brain structure, but there is also attention being paid to the more elusive adaptive features of human consciousness. To a certain degree, the origin of these sets of hypotheses can be attributed to the early 20th century psychological explanations of the evolution of religion that are now snubbed by many archaeologists. Those opposed to this cognitive view of the evolution of spiritual abilities argue that there is no evolutionary purpose for metaphysical anxieties to exist because there is no competitive advantage for anxieties to have adapted in the first place (Hayden 1987: 83). This is a narrow-minded approach to the process of evolution since there is the possibility that beneficial traits evolve as adaptations to certain environmental conditions, while at the same time the new trait can bring along adaptational baggage. A perfect example of this is the increase in cognitive abilities in late *Homo*, which conferred upon these hominids a competitive advantage in problem solving and tool technology while at the same time forcing them to entertain metaphysical concepts that had previously been psychologically unattainable. The first of these cognitive approaches is Ritual Healing theory, which focuses on the uniqueness of human religious systems (including ritual, arts and language) as the only animal behaviour that associates physical responses in the automatic nervous system with abstract notions. The theory holds that shamanism was the original form of religious practice and that its focus on healing and ASC are indicative of the earliest religious priorities (Sosis & Alcorta 2003:270-271). A current study of the function of the human pineal gland is one case of the new research on the relationship between ASC and health, which has produced some surprising results. Researchers have found that those who frequently experience sexual pleasure and spiritual transcendence have pineal glands that release chemicals into the body that suppress cancer growth and increase overall health. On the other hand, people who are spiritually anxious and sexually repressed are found to have greater tumor growth and overall immunosuppression (Lissoni *et al.* 2001). This fits well into James McClenon's (1997) model of the evolution of religion through the use of ritual as a healing sacrament to induce therapeutic altered states of consciousness. He argues that those who naturally fell into ASC stayed healthier and passed on their genotypes to following generations, while those that did not have the genetic basis for religiosity were more susceptible to disease (McClenon 1997). These ideas are interesting, as they imply that the more spiritual a person is, the better their chances of survival.

Researchers who ascribe to the social-cohesion school of thought have trouble accepting that spirituality may not have an evolutionary function by itself, but the argument for religion as an evolutionary byproduct is very convincing nonetheless. Kirkpatrick (1999) outlines the grounds upon which it can be hypothesized that spirituality was not an adaptation in itself, but was instead the offshoot of adaptations that arose for other purposes. First, it has been the tendency of past scholars to assume that spiritual feelings must have a direct adaptive rationale. Second, past studies have been too focused on trying in vain to find a universal characteristic of all religions when, in reality, the tremendous diversity that exists between religions suggests that there is not one lone adaptive function. Third, religious behaviour is an evolutionary byproduct much like other behaviors such as playing sports, driving cars or doing mathematics, none of which has an apparent functional evolutionary correlate (Kirkpatrick 1999: 926). It is clear that the mystery of the evolution of the human spiritual capacity must be reframed in order to account for these discrepancies, and it appears that the only path to enlightenment on the issue is through the exploration of altered states of consciousness. ASC may offer a window into how our ancestors experimented with their own minds in an effort to attain communal spiritual ecstasy.

The "Stoned Ape" Hypothesis

Perhaps the most intriguing avenue of new research into the competitive advantage provided by a communal spirituality (religion) is offered by Terence McKenna's *Stoned Ape* hypothesis. McKenna maintains that entheogens, "plants or chemical substances which awaken or generate mystical experiences" (Forte 1997: 1), are the so-called "missing link" that scholars have been searching for (McKenna 1992: 32). Through observing some of the most ancient iconographic depictions of religious

ritual relative to the known effects of psilocybin mushrooms and grasses containing Dimethyltryptamine (DMT), McKenna (1992) proposes that the first religious members of the genus *Homo* were African tribes who began to experiment with entheogenic mushrooms and grasses that they found growing in the emerging grassland habitat. At first glance, this theory seems to be describing a Lamarckian view of evolution. McKenna defends his theory, however, by citing that the use of mushrooms was the first "discovery" of otherworldly realms within our newly developed *Homo sapiens* consciousness (Wynn would say Enhanced Working Memory), and that this led to the first groups exploiting the competitive advantage of religious ritual:

> The presence of psilocybin in the hominid diet changed the parameters of the process of natural selection by changing the behavioral patterns upon which that selection was operating. Experimentation with many types of foods was causing a general increase in the numbers of random mutations being offered up to the process of natural selection, while the augmentation of visual acuity, language use, and ritual activity through the use of psilocybin represented new behaviors...Hence psilocybin inclusion in the diet shifted the parameters of human behaviour in favour of patterns of activity that promoted increased language; acquisition of language led to more vocabulary and an expanded memory capacity. The psilocybin-using individuals evolved epigenetic rules or cultural forms that enabled them to survive and reproduce better than other individuals. Eventually the more successful epigenetically based styles of behaviour spread through the populations along with the genes that reinforce them. In this fashion the population would evolve genetically and culturally (McKenna 1992: 27-28).

This explanation fits nicely with the finding of Dean Hamer's (2004) "God Gene" in that the new social framework created by the use of these entheogens would have created a selective process where those who lacked the proper genetic code for heightened spirituality were selected against.

McKenna clearly ascribes to the *Out of Africa* theory of evolution rather than the *Multiregional* hypothesis because he assumes that religion originated in Africa along with the first *Homo sapiens* (McKenna 1992: 34). Nevertheless, his line of reasoning is very persuasive as he points to the cave paintings of the Tassili-n-Ajjer Plateau of Algeria. This region boasts a series of cave paintings (12,000 B.C.) that portray figures of shamans holding mushrooms, garbed in mushroom shaped swellings and "surrounded by the geometric structures of their hallucinations" (McKenna 1992: 70). It is clear that the culture living in Tassili-n-Ajjer was ingesting these mushrooms and translating their experiences as important encounters with the divine. It is very hard for contemporary minds to accept this notion of drug-use because these substances are relegated to an objectionable status within modern Western society. However, modern biases are no reason to ignore suggestible evidence and perhaps if palaeoanthropologists begin to understand the effects of these substances, there can be improved understanding of how the first spiritual concepts were formed. McKenna's "Stoned Ape" hypothesis is simply one example of thinking outside the box in an attempt to uncover hidden secrets about the evolution of human religious behaviour and belief. It may be absolutely wrong, but this theory's pursuit of a solution is an attempt to further the discipline by questioning past approaches and offering up fresh ideas to be tested against the archaeological record.

Conclusions

It is evident that there is little consensus concerning the explanation for the evolution of a spiritual capacity in *Homo sapiens*. Yet the two competing viewpoints are mutually helpful because there is probably some truth in both the social cohesion theories and the cognitive approaches. In the end, an explanation for the evolutionary function of religion and spirituality will most likely include the essence of both paradigms given that ritual behaviour and communal ideologies seem to offer both social unity *and* metaphysical wellness. The evolutionary justification of spirituality may not correspond to the functions of other derived traits of *Homo sapiens*, but this should not deter researchers from pursuing other possibilities. The sciences have continually been forced to rethink long-established doctrines because of their limitations and our current analysis may

warrant a need for another paradigm shift. This is especially true when we consider how the connection between spiritual transcendence and the cognitive system has been overlooked by those seeking a direct functional link where one may not even exist. We must begin to think of spirituality as we think of playing hockey or riding a bike, in that these activities are not adaptations in themselves, but rather, they are exaptations; side-effects of functional adaptations that just so happen to give us the ability to accomplish unrelated feats. Our ability to play sports or control vehicles is the result of our experimental nature, which urges us to explore our natural abilities to find out what we are capable of. Theories like the "stoned ape" hypothesis highlight this fact by arguing that our ancestors probably applied their experimental disposition to their internal worlds as well, by exploring altered states of consciousness and the extreme limits of their minds. Future research should delve into this possibility in an attempt to better comprehend the likely conduct of the original spiritual beings.

Bibliography

Becker, Ernest. 1971. *The Birth and Death of Meaning*. New York: Free Press.

Drees, Willem. 1998. "Evolutionary Naturalism and Religion." In *Evolutionary and Molecular Biology: Scientific Perspectives on Divine Action*. Robert Russell, William Stoeger and Francisco Ayala (editors). Pp. 303-328. Vatican City: Vatican Observatory Publications and Berkeley, CA: Center for Theology and Natural Sciences.

Forte, Robert. 2000. "Introduction." In *Entheogens and the Future of Religion*. Robert Forte (editor). Pp. 1-5. San Francisco: Council on Spiritual Practices.

Geertz, Clifford. 1966. "Religion as a Cultural System." In *Anthropological Approaches to the Study of Religion*. Michael Banton (editor). Pp. 1-46. New York: Tavistock Publications.

Gould, Stephen. 1982. Exaptation—A Missing Term in the Science of Form. *Paleobiology*. 8: 4-15.

Hamer, Dean. 2004. *The God Gene: How Faith is Hardwired into Our Genes*. New York: Doubleday.

Hayden, Brian. 1987. Alliances and Ritual Ecstasy: Human Responses to Resource Stress. *Journal for the Scientific Study of Religion*. 26: 81-91.

Kirkpatrick, Lee. 1999. Toward an Evolutionary Psychology of religion and Personality. *Journal of Personality*. 67: 921-952.

Klein, Richard. 1999. *The Human Career: Human Biological and Cultural Origins*. Chicago: University of Chicago Press.

Kurland, Jeffrey. 1999. Towards an Evolution of Mind: Implications for the Faithful? *Zygon*. 34: 67-92.

Lissoni, Paolo et al. 2001. A Review of Cancer-Psychospiritual Status Interactions. *Neuroendrocrinology Letters*. 22: 175-180.

McClenon, James. 1997. Shamanic Healing, Human Evolution, and the Origin of Religion. *Journal for the Scientific Study of Religion*. 36: 345-354.

McKenna, Terence. 1992. *Food of the Gods: A Radical History of Plants, Drugs, and Human Evolution*. New York: Bantam Books.

Rappaport, Roy. 1971. The Sacred in Human Evolution. *Annual Review of Ecology and Systematics*. 2: 23-44.

Rowley-Conwy, Peter. 1993."Was There a Neanderthal Religion?" In *The First Humans: Human Origins and History to 10,000 BC*. Göran Burenhult (editor). San Francisco: Harper Collins.

Sosis, Richard and Alcorta, Candace. 2003. "Signaling, Solidarity, and the Sacred: The Evolution of Religious Behavior." *Evolutionary Anthropology*. 12: 264-274.

Stringer, Christopher. 1994. "Out of Africa – A Personal History." In *Origins of Anatomically Modern Humans*. M.H. Nitecki and D.V. Nitecki (editors). Pp. 149-172. New York: Plenum Press.

Vonnegut, Kurt. 1963. *Cat's Cradle*. New York: Dell Publishing.

Wynn, Thomas. 1989. *The Evolution of Spatial Competence*. Chicago: University of Illinois Press.

Wynn, Thomas and Coolidge, Frederick. 2004. The Expert Neandertal Mind. *Journal of Human Evolution*. 46: 467-487.