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Building blocks of imagination

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In the human context, the ubiquitous faculty of imagination is taken for granted. Whether we are singularly equipped with this ability or whether it is an evolved faculty also present in other life forms is a question that has been an issue ever since Darwin. A variety of research projects have indicated the presence of mental processes in non-human taxa and the faculty of imagination developed with increasing complexity over time, to its present status in humans. As an evolved faculty, encompassing a variety of non-humans, it serves as a useful tool to ascertain and understand the origins and unique quality of human mental processes, even to the extent of informing certain medical issues and problems in education. Several pointers exist that argue for human imagination as an evolved faculty that is shared within broad spectrum of taxa. Paleoanthropological research has provided insights as to the role of imagination in the early manifestations of religious behaviour in humans, the construction of effective stone tools by anatomically modern humans employing pyro technology, as well as their ability to mentally link ostensibly non-related natural phenomena like tidal fluctuations and the phases of the moon.

Contribution: This review article explores imagination as an evolved faculty in an intersectional and interdisciplinary manner. This evolutionary reflection fits well with the purpose and inclusive nature of this special collection on the building blocks of our past, present and future.

Keywords: animal imagination; anthropomorphism; cognition; evolutionary biology; human ancestors; human imagination; mental awareness; religion.

> Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand. (Einstein 2009:97)

Introduction

Imagination is a ubiquitous faculty mostly taken for granted, yet it constitutes the basis for almost everything that we do. It is exceedingly well developed in humans so that we can, with consummate ease, engage in exercises that are clearly impossible, such as attempts at visualising infinity or square triangles. Philosopher Steven Asma (2017) notes that most people are aware of the important role imagination fulfils in ethical thinking and moral commitments, while the reason for the insouciance exhibited by professional philosophers over the years about this matter, was because '… the professionals are often behind the curve …' (p. 244).

Children, especially, possess powerful imaginations. It constitutes a crucial component in the development of cognition and problem-solving capabilities, enabling us to reason counterfactually. Aaron Blaisdell (2019:193) notes that child psychologists are increasingly cognisant of the fact that in children an important link exists between imagination and understanding reality. In children, it does not merely manifest as a youthful activity but is '… crucial to the development of advanced cognition, problem solving, and social empathy' (2019:193). All types of play, including imaginary, serve to guide the development of the human brain and mould intelligence:

> It motivates us to search for hidden causes, whether it be a doctor trying to diagnose the cause of a patient's symptoms, a scientist's search for hidden causes to explain observations, or a child trying to understand what prevents a simple wooden block from standing on its side. (Blaisdell 2019:193)

Similarly, Ho, Wang and Cheng (2013:68) regard the creative application of a rich imagination as essential to generate scientific inventions. In the adult imagination, this eventually affects artistic expression '... such as writing fiction, painting, sculpting, and music – to philosophy, science, and engineering' (Blaisdell 2019:193).

Consequently, different authors have identified a series of subcategories they believe resort under the concept of imagination. According to Steven Mithen (2001), the origins of the various types of imagination lie at different places in our evolutionary history:

> Imagination in terms of thinking (perhaps unconsciously) about the consequences of different courses of action is likely to be very old indeed, as this is a type of imagination most likely shared by many types of animals. (p. 50)

Mithen (2007:2) refers to the uniquely human ability of integrating different forms of knowledge and thought patterns into new and innovative concepts, as creative imagination. The paleoanthropological record has established that our hominin forebears did employ imagination in the production of tools and hunting forays, although Mithen (2007:3) notes that there is no evidence that they possessed creative imagination, which is also absent in chimpanzees, but defines our ability to engage in science and art.

According to Andrey Vyshedskiy (2019:105) 'Imagination is an umbrella term covering at least six component mechanisms …' He discusses an extensive and detailed neurobiological analysis of the ability of the imagination to generate novel concepts both consciously and during dreaming, and suggests that a better understanding of the different mechanisms of imagination can clarify aspects of hominin evolution as well as contribute positively to certain medical conditions and the education of children suffering from delays in skills development. We refer to aspects of his research, but lack of space prohibits a full exploration of the finer points of his extensive analysis.

It is, however, abundantly clear that imagination constitutes the lynchpin of our ability to reason counterfactually when probing for hidden causes encountered across the cognitive spectrum ranging from art to science. Any attempt to better understand the evolutionary origins and development of this particular faculty we share with other sentient life forms, and which feature so prominently in all of our activities, seems to us an important, worthwhile pursuit, and resonates with the evocative pronouncement of Nassim Taleb (2008:57) '… understanding how to act under conditions of incomplete information is the highest and most urgent human pursuit'.

Imagination in animals

The ubiquitous presence of a complex imagination in humans argues for a long evolutionary history. Thus, in terms of our evolutionary relationships to all life, and especially to the primates, it begs the question whether our imaginative faculty is a unique, *de novo* attribute of *Homo sapiens,* lacking in all other life forms, or did this unique faculty incipiently arose in less complex life forms, as did other attributes such as consciousness and our moral disposition (Van den Heever & Jones 2019, 2020), increasing in complexity over time as the result of increasing brain size and sociality, environmental contingencies, eventually to achieve full bloom in *Homo sapiens*. Consequently, it is of critical importance to assess the level of mental faculties that animals possess and how it relates to the complexity of human imaginative abilities. Blaisdell (2019) points out that:

> An important goal of comparative psychology and cognition research is to understand the origins, evolution, development, and function of behavioral traits and cognitive processes. By investigating the cognitive processes that nonhumans share with humans, we can better understand our own human uniqueness. (p. 194)

According to Blaisdell (2019:194), evidence for full blown imaginative powers in animals is, as yet, relatively meagre, although research on mental imagery, the cognitive process from which imagination is built, has produced positive results. Consequently, mental imagery needs to be circumscribed in terms which allows it to be studied in both humans and non-human animals. This relates to being able to reason imaginatively when confronted with missing information:

> Mental imagery is the ability to maintain an active representation of the sensory/perceptual detail of an event or object in the absence of actual sensory input from the physical event or object. (Blaisdell 2019:194)

The question, therefore, is: can animals visualise and plan in the absence of information? Do they have the ability to fill in gaps where information is lacking? This appears to hold true for instances when fleet-footed prey employs strategies such as challenging the predator by stotting behaviour or weaving and dodging, forcing the pursuing predator to continually update the situation by imagining and predicting possible alternative prey movements in fractions of a second. A real possibility exists that such an approach may be interpreted as conducive to an anthropocentric stance. Frans de Waal (1991, 1999, 2009) has been prominent in explaining the utility of anthropomorphism in specific contexts noting that similar behaviour patterns can be an indication of similarity in mental processes (1991:316). De Waal (1999:274) notes that being animals ourselves, we are at an advantage when comparisons are made between humans and animals. From an evolutionary perspective, the most parsimonious explanation would be that we share multiple cognitive and emotional faculties with anthropoid apes, in which case anthropomorphism should be a non-issue, regarding the anthropoid apes. He is of the further opinion that, even in the case of more distantly related taxa, anthropomorphism should, at least, be taken seriously. Blaisdell (2019:194) points out that searching for, and establishing the presence of cognitive functions, manifestly present in both non-human and human taxa, is a practical method of determining the content and functions of the animal mind.

De Waal (2009:175) concurs, recalling the comment of the Scottish philosopher David Hume in 1739 that a hypothesis attempting to explain mental states common to both humans and other animals, must, of necessity, be applied to both. Darwin (2013) takes precedence because he first noted in 1871 that:

> The *Imagination* is one of the highest prerogatives of man. By this faculty he unites, independently of the will, former images and ideas, and thus creates brilliant and novel results. (p. 37)

Commenting on the fact that vertebrates like cats, dogs and horses experience dream sequences, as indicated by bodily movement and the sounds they emit, he acknowledged the presence of an imaginative faculty in animals. According to De Waal (2009:175), anthropodenial '– the *a priori* rejection of continuity between humans and other animals – has led people to systematically underestimate animals'. In terms of evolutionary theory, we acknowledge that the closer species are related the higher the incidence of shared cognitive responses will be. Taking human attributes as a starting point, researchers have shown that, among other taxa, primates also have the capacity of recognising faces based on the arrangement of the eyes, nose and mouth. This implies the presence of similar neural substrates:

> At the Furuvik Zoo in Gävle, Sweden, a chimpanzee named Santino, started pelting visitors with rocks. It turned out that hours prior to the arrival of visitors, Santino would hide the missiles under logs and strategically placed bundles of hay, prompting investigators to suspect that he was engaging in mental time travel thus imagining his future actions … (Van den Heever & Jones 2020:9)

Brandon Keim (2017:33) notes that Santino was '… living life autobiographically, with a sense of one's own story'. In an elegant and lengthy exposition, Elliott Sober (2012) discusses the philosophical implications of a cladistic approach to anthropomorphism as proposed by De Waal (1991:316): 'The most parsimonious assumption concerning nonhuman primates is that if their behavior resembles human behavior the psychological and mental processes involved are probably similar too'. Sounding a more cautious note on the full congruence of mental states (M) and behaviour (B) in humans and chimpanzees, Sober refrains from regarding it as *strong* evidence that chimpanzees have M as well. He concludes by suggesting that '… the fact that humans have M is *evidence* that chimpanzees do too' (p. 237).

Nathan Emery (2006:23) in his analysis of cognitive ornithology, advocates the combined application of both the anthropocentric approach, as well as the adaptive specialisation approach, especially with respect to the presence of episodic memory and theory of mind. Emery (2006:23–24) notes that corvids and parrots experience many ecological problems similar to those experienced by primates and, as a result, exhibit characteristics which sets them apart from other avian taxa, such as the size of the forebrain and a level of social complexity equal to that of many monkeys and apes, which leads him to conclude '… that some birds possess many of the intellectual capacities of non-human primates. It also appears that corvids … rival the great apes in many psychological domains' (Emery 2006:34). Angeles Salles, Diebold and Moss (2020) have convincingly demonstrated that echolocating bats in pursuit of prey can cope with missing information. 'Our data indicate that bats can use trajectory information at the beginning of the trail to anticipate the future position of the target during the segment of the trajectory when it moved behind the occluder' (Salles et al. 2020:29232). Blaisdell et al. (2006:1021) affirm that 'In the process of studying causal learning and inference in the rat we discovered that, like humans, rats also reason about hidden causes'. Rats are non-linguistic, and these experiments therefore also indicate that language is not a prerequisite for producing mental imagery. Consequently, Blaisdell (2019:212) have stressed the importance of such research in unravelling the complexities of imagination and counterfactual reasoning.

One of Asma's (2017:9) interesting claims is that imagination preceded language. Iain McGilchrist (2019:107) concurs and states that '… in evolutionary terms, thought, including concept formation, clearly predates language'. The reason being that the biological prerequisites for imagination arose, not only in primates, but in most social mammals as well. They acquired the ability to recognise particular individuals and a limbic system able to process affective states such as fear and attachment. As an interesting adjunct, he mentions that carp has the mental wherewithal to differentiate between the blues singer Muddy Waters and the Trout Quintet (McGilchrist 2019:108). Despite these revelations, McGilchrist does not disparage the role of language in human evolution, but rather stresses the point that language enhances imagination:

> The ability to engage in imagination and mental stimulation when information is incomplete serves as the basis of hypothesis generation and testing, a foundation for the scientific method. These investigations may even have an impact on more profound philosophical issues such as intentionality, logics, moral reasoning, and self-knowledge. (Blaisdell 2019:212)

Imagination and neurobiology

Many examples of dream-inspired discoveries exist. Vyshedskiy (2019:89) records several relevant examples such as the discovery by Nobel Laureate Otto Loewi that nerve impulses are chemically transmitted, and Elias Howe, inventor of the first sewing machine, who claimed to have perfected the needle of his sewing machine as the result of a dream. The chemist Friedrich Kekulé allegedly owed his discovery of the ring shape of the benzene molecule to a dream. In this respect, Ho et al. (2013:68) list the Chinese invention of paper (AD 105) and printing technology (AD 550) as examples of imaginative reasoning. To this can be added the invention of computers, the Internet and Einstein's theory of general relativity. Dreams can therefore influence our perceptions and insights in important ways, although this ability is lacking during waking hours. The reason is that while awake, imaginary concepts fall under the jurisdiction of the executive control network at the front of the brain:

> Reasoning, planning, and strategizing is the result of the constructive imagination conducted by the lateral prefrontal cortex (LPFC), which acts like a puppeteer assembling objects stored in memory into novel combinations. (Vyshedskiy 2019:89)

On the other hand, the posterior cortex, at the back of the brain, controls dreaming during rapid eye movement (REM) sleep, when the LPFC is inactive. New, imaginative combinations drawn from the memory banks can then lead to novel insights. Memories of dreams are usually fleeting but waking up during a dream and writing the insight down

brings long-term memory into play, which can lead to significant discoveries. Vyshedskiy (2019:89) notes that although both these versions of how the imagination functions can produce the same mental image, they rely on different neurological mechanisms. He identifies an image from the posterior cortex as generated by a bottom-up mechanism, known as REM sleep dreaming, as opposed to a top-down, purposeful mechanism called the Prefrontal Synthesis (PFS), which operates during waking hours and exhibits the ability to create new mental images by merging different objects from memory. Thus, 'PFS is essential for many cognitive functions, including the understanding of flexible syntax' (Vyshedskiy 2019:91). It is generally understood that while modern humans can avail themselves of the total spectrum of mechanisms of the imagination, the entire package is not available to all animals:

> In sum, there is no good scientific reason to give evolutionary approaches short shrift, or to deride Darwin's speculations about continuity between humans and other animals, including a 'sense of humor' – even the playful panting sounds of apes have recently been shown to be analogous to human laughter. Anyone who has watched primates, elephants or ravens at play realizes that here, too, Darwin may well have the last laugh. (De Waal 2009:175)

Imagination and prehistory

The archaeological record indicates that PFS was acquired in piecemeal fashion by humans. Vyshedskiy (2019:96) regards the evolution of imagination as closely related to the attainment of PFS, and he considers that the first solid evidence of human PFS only appeared between 65 000 and 40 000 years ago. Among the listed caveats associated with PFS include innovation as expressed through the quality of manufactured tools (Vyshedskiy 2019:96). Mithen (2001:38–39) notes, as general comment, that the conception and manufacture of tools are seated in the imagination and that 'Imaginative power may also have been a necessary prerequisite for the cultural transmission of technical knowledge'.

A case in point for an earlier acquisition of PFS may involve a small, coastal population of anatomically modern humans at Pelican Point, South Africa. They existed during Marine Isotope Stage 6 (MIS6), a glacial period that lasted from 195 000 to 123 000 years ago, during which sea levels were lower, and the Pelican Point environment functioned as a refugium for a small population of anatomically modern humans (Marean et al. 2010:234). The occupants of Pinnacle Point manufactured small, hafted bladelets out of silcrete, a rock type unsuitable for weaponry in its natural state, but if heat treated, produces sharp, highly functional shards. Alastair Key, Pargeter and Schmidt (2021:463) note that the increased edge sharpness of these tools would have been a strong incentive to employ pyro technology. The use of pyro technology entails a complex series of steps, from insulating silcrete rocks in a sand pit, slowly building the fire to approximately 350 °C, maintaining the temperature for several hours, prior to a period of slow cooling. Kyle Brown et al. (2009), referring to the use of pyro technology to manufacture weaponry at Pelican Point, point out that 'Heat treatment demands a sophisticated knowledge of fire, an elevated cognitive ability, and appears roughly at the same time as widespread evidence for symbolic behaviour' (p. 859). Although some reservation has been aired as to the full acceptance of these conclusions, it is also tempting to speculate that in establishing and maintaining such technological innovations, from generation to generation, would have required linguistic abilities of some complexity.

At Pelican Point, the ocean was a readily available resource of highly nutritious food that could be exploited with relative ease. However, the most profitable returns were only to be had during low spring tides, when the gravitational pull of the aligned sun and moon was at its maximum. An analysis of shell remains at Pelican Point shows that a substantial number could only have been collected during these spring tide cycles. Because sea levels were considerably lower during MIS6, 164 000 years ago, the Pelican Point cave system was located much further inland, and, in order to harvest shellfish at the most propitious time, knowledge of the tidal cycle was essential. The indications are that the inhabitants of Pelican Point possessed the cognitive wherewithal to recognise the relationship between tidal cycles and the phases of the moon, and mentally devised a form of lunar calendar to guide their periodic excursions to the shoreline. Curtis Marean (2012:53) has suggested that the discoveries in Cave 13B at Pinnacle Point (PP13B) support the perception that anatomical modernity long preceded cognitive modernity '… evidence of behavioural sophistication abounds even in the oldest levels at PP13B'. In the light of the above, we would like to suggest that the cognitive lifestyle of the inhabitants of Pelican Point may indicate the emergence of PFS. If so, it would suggest a much earlier acquisition of this mental faculty than is usually recognised.

Imagination and religion

Historically, religions have depended almost exclusively on imaginative constructs to explain the existence of, literally, thousands of deities and the contending reasons why any particular deity should be exclusively worshipped. This has ultimately developed into a set of religious assumptions known as dogma, especially within Western religions. Of late, however, a number of theologians have started to explore historically forbidden avenues to include themes questioning mainstream religious practices (Grigg 2008; Van Huysteen 2006; Wildman 2017; Wuketits 1990). In this regard, the internationally well-known and acclaimed theologian Wentzel van Huysteen has been a leading proponent in his research as James I. McCord professor of Theology and Science at Princeton Theological Seminary, as attested by his numerous influential publications on the subject:

> When my students ask me, 'what do you think of evolution', the answer is always straightforward and simple: evolution is the way in which God works. I believe evolution is the amazing and unavoidable tool that God uses to create our world, and everything in it. This clearly means that also us humans, as 'created in the image if (sic) God', have arrived on this planet through a long

> complex evolutionary history. Hominid history thus reveals for us the gradual emergence of *Homo sapiens,* and therefore the *image of God*, through natural history. (Van Huysteen 2020:n.p.)

In his long-running theological project on the compatibility of science and religion, with special reference to hominin evolution, the historical emergence of incipient religiosity, and human uniqueness, Van Huysteen has eloquently, and in depth, explored his concept of the human condition, based on his main thesis that the emergence of human uniqueness should be addressed, and will definitely be illuminated, from the cognitive stance that science and religion are equal, cross-fertilising partners in any attempt to resolve the origin of religiosity and humanity's relation to God. Whether this interesting approach, coupled with a wide range of proposals (see Van Huysteen 2006 for a detailed exposition), will ultimately stand the test of time, will in all likelihood be influenced by the escalating volume of recovered hominid material and cultural artefacts of paleoanthropological import, together with increasing utilisation of sophisticated technological applications.

In spite of Van Huysteen's comprehensive, wide-ranging, and eloquent exposition of his cosmic soteriology, certain points and concepts remain as subjects of interest from an evolutionary point of view. Firstly, what does an unqualified acceptance of the natural process of evolution really entail for the concept of the *imago Dei*, and secondly can a truly evolutionary approach be transversally integrated with an *a priori*, non-debatable stance, proposing the existence of a deity such as the Christian God, who is claimed to be active in the real world? Thirdly, is a postfoundational theology (see Van Huysteen 1997) capable of successfully integrating the concept of the *imago Dei* with the complex spectrum of human sexuality, and lastly, is this radical reinterpretation of Christianity fated to remain an academic discourse of interest only, or ultimately function as a form of public theology, anticipated to successfully gain mainstream acceptance in the minds of the pastor on the pulpit and the believer in the pew?

Therefore, any responsible attempt to reciprocally merge science and theology needs to initially acknowledge, fully understand, and accept the evolutionary implications of human origins. It would then seem that the inviolate, *a priori* insistence on the existence of a deity would obviate this project, because for many scholars in the evolutionary origins of humankind no omnipotent deity is required or acknowledged. In contrast, a paleoanthropological perspective on the origin of belief systems suggests that imaginative constructs originally arose in response to natural phenomena and triggered behavioural practices that were later consolidated into belief systems. Bipedal, proto humans inhabiting the African savanna in excess of 2 million years ago were but insignificant life forms in the general landscape:

> Foraging over large areas of the savannah, unable to outrun large carnivores and lacking the defensive advantages of large fangs and sharp nails, the natural solution seems to have been the formation of cooperative bonds. (Van den Heever & Jones 2019:14–15)

Survival was largely because of small groups bonded over time by reciprocal trust, mutual respect and increasing sociality. Subjected to the vicissitudes as well as bounty of the natural environment and powerless to exercise control over their existence, it was but a short step to acknowledge that the world at large was the domain, and at the whim of, unseen, unknowable, and uncontrollable forces and events. Similar behaviour is still observed in a wide array of domestic and wild animals.

Over time dangerous natural phenomena like thunder, lightning, floods, earthquakes and fire would have been interpreted as visible manifestations of imagined entities, as is still the case today in certain areas around the world. In the same way, the bounty of nature revealed a benign aspect of these phenomena. It stands to reason that these imagined entities were held in awe through a combination of fear, respect, and eventually, attempts to appease and curry favour. The universal theme of fear, respect and appeasement of imaginary deities seems not only to have been deeply imbedded in the early manifestations of the religious condition but has persisted throughout the religions of the ancient Near East, as well as in Western belief systems up to the present. Consequently, a natural origin for the religious condition seems to be the most parsimonious explanation, even though it flies in the face of the often convoluted and widely different scriptural interpretations voiced by the more conservative religious denominations.

Asma (2017:245) reflects on the fact that most early societies were constructed around fear-based directives in association with alpha-male dominance, or kin-based collaboration. As societies increased in size, religion not only supplied a common bond but also functioned as a mechanism to prescribe and monitor behaviour. Ethics in the Abrahamic religions consequently reflect the will and proscriptions of God:

> Imagination is required for the success of *divine command* morality because people must envision divinities that are not present to sense perception, and also imagine the future consequences of breaking or upholding the rules. (Asma 2017:245)

Axial Age religious morality is consequently suffused with imaginative constructs such as devils, evil spirits, and the prospect of life eternal after death.

Maienschein and Ruse (1999:1) note that historically, science and ethics have been interpreted as representing different magisteria, and '… many would agree that attempts to provide a compelling epistemic warrant for ethical theory have failed'. Wilson (2002:xv), in turn, points to the '… uneasiness which is felt when biology is brought close to the human condition, and especially when it promises real world applications' (see Van den Heever & Jones 2019) for a discussion of our evolved predisposition for a moral stance, as opposed to the plasticity of ever-changing moral codes, which are subject to and reflect

the *zeitgeist* of particular time periods. It therefore seems obvious that any ethical or moral stance of worth, regarding the human condition, should, at least, consider our biological heritage. However, most religious approaches have, through time, unanimously failed to view humans and their culture as a natural outcome of evolutionary biology, and concepts such as polytheism and monolatry were, over time, systematically erased from the Abrahamic religions in favour of monotheism. With reference to the Levant of biblical times, the two kingdoms of Israel and Juda shared one language, Hebrew, and a polytheistic grouping of gods of which Yahweh was the State Deity, accompanied by his wife, the goddess Asherah. This ensemble of deities eventually morphed into monolatry, with Yahweh ultimately achieving monotheistic status as the supreme God, *sans* his companion Asherah. She was systematically extirpated from biblical texts so that only traces remain in modern translations:

> Historically, the goddess's fall broadly reflects the decline of traditional, state-sponsored polytheism – a decline triggered by the Assyrian annihilation of the Kingdom of Israel in about 722 BCE, and the Babylonian destruction of Judah in 587 BCE. (Stavrakopoulou 2022:24)

Conclusion

The faculty of imagination is the lynchpin of our ability to reason counterfactually, and thus influences almost every aspect of our daily existence – from the mental development of children to expressive art and scientific practice in adulthood. The origin of this ubiquitous faculty turns out to be a complex version of that found in non-human animals, and which has been increasingly refined during the evolutionary development leading to *Homo sapiens*. An important aspect of imaginative reasoning turns out to be the ability to deal with missing information. This particular faculty has been found in a range of non-linguistic species showing that language is not a prerequisite for producing mental imagery. Demonstrating the continuity of mental processing across species, contributes to an increased understanding of our own mental attributes and that our evolutionary success has been enhanced by imaginative improvisation leading to human languages and culture. The spectre of anthropomorphism frequently raised when the mental attributes of, especially, primates are considered, turns out to be a legitimate research option, when responsibly approached.

Neurobiologically, the imagination functions either in a bottom-up or a top-down way, the former during dreaming and the latter during waking hours. Both can produce the same mental image but are triggered by different neural mechanisms. Both of these mechanisms were present and active during the evolutionary history of humankind.

As expected, the prehistory of humanity is infused with imaginative constructs – from the origin of religious convictions to the incipient development and refining of weaponry, art, symbolic behaviour and language. Religion, in particular, has claimed a central position in the imagination of Western cultures for thousands of years. However, in the light of more recent rational approaches to the role of imaginative constructs in human culture, some theologians now appear to lean towards a more secular approach.

It therefore seems judicious that any investigation into the moral and ethical aspects of the human condition should proceed from a biological base, employing a bottom-up approach and proceed from physical, evolved attributes to the mental, and not *vice versa*. This suggests that enquiries into and pronouncements about the human condition should give preference to the physical realities of our existence and not approaches centred around the prescriptions of changeable social realities (see Van den Heever & Jones 2022 on how World Athletics transgressed these principles in the case of the athlete Caster Semenya).

Once some clarity has been achieved by our bottom-up investigation of imagination, the question can be asked what the way forward entails? 'Why should we care about this ancient operating system at the root of cognition and culture?' (Asma 2017:269). Elaborating on the benefits of an imaginative approach in such varied environments as prisons to current environmental challenges, Asma's subject of choice turns out to be education. 'The main reason is because reality itself is messy, always changing, open-ended, and relentlessly coming at you in high speed' (Asma 2017:270). Therefore, the imaginative faculty serves as a construct where experiences are remembered and cultural stories are embedded alongside future aspirations, ultimately conceiving and dispensing normative attitudes:

> The minds of *Homo sapiens* evolved in the most volatile environments, not static predictable ones. The imagination is the operating system that evolved in such a variable world. We need to let this magnificent operating system off its leash, to run free in the uncertain, future environment. (Asma 2017:271)

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C.J. and J.v.d.H. contributed equally to this work.

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