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**Adaptive Imagination: Toward a Mythopoetic Cognitive Science**

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**Abstract**

A mythopoetic paradigm or perspective sees the world primarily as a dramatic story of competing personal intentions, rather than a system of objective impersonal laws. Asma (2017) argued that our contemporary imaginative cognition is evolutionarily conserved—it has structural and functional similarities to premodern *Homo sapiens*’ cognition. This article will (i) outline the essential features of mythopoetic cognition or adaptive imagination, (ii) delineate the adaptive socio-cultural advantages of mythopoetic cognition, (iii) explain the phylogenetic and ontogenetic mechanisms that give rise to human mythopoetic mind (i.e., genetically endowed simulation and associational systems that underwrite diverse symbolic systems); (iv) show how mythopoetic cognition challenges contemporary trends in cognitive science and philosophy, and (v) recognize and outline empirical approaches for a new cognitive science of the imagination.

Keywords: imagination, evolutionary psychology, human evolution, cognitive science, philosophy of mind, narrative, animism, emotions, cultural evolution, philosophy of biology

After WWII, archaeologists Henri and Henriette Frankfort (1946) proposed the theory that early human mind was mythopoetic. A mythopoetic paradigm or perspective sees the world primarily as a dramatic story of competing personal intentions, rather than a system of objective impersonal laws. The cognitive difference between modern and ancient humans was that “for modern, scientific man the phenomenal world is primarily an ‘It’; for ancient—and also for primitive—man it is a ‘Thou’” (12). More recent work in evolutionary literary theory has updated and strengthened the claim that narrative thinking is universal, natural, and adaptive. Extending the phylogeny to preliterate and even prelinguistic *Homo*, Asma (2017) argued that our contemporary imaginative cognition is evolutionarily conserved—it has structural and functional similarities to premodern *Homo sapiens*’ cognition. My thesis is that mythopoetic imagination is (still) at the heart of human cognition, yet fails to receive pride of place in academic studies of the human mind (i.e., scientific and humanities studies), resulting in a variety of blinkered research approaches and interpretations of the mind.

This article will (i) outline the essential features of mythopoetic cognition—a broader adaptive epistemology of symbolic formation, which has been glimpsed and articulated *ex parte* by subfields like literary Darwinism, religious studies, anthropology, and philosophy; (ii) delineate the adaptive socio-cultural advantages of mythopoetic cognition, often invisible in a post-Enlightenment (disenchanted) paradigm; (iii) explain the phylogenetic and ontogenetic mechanisms that give rise to mythopoetic human mind (i.e., genetically endowed simulation and associational systems that underwrite diverse symbolic systems); (iv) show how mythopoetic cognition challenges contemporary trends in cognitive science and philosophy; (v) recognize and outline empirical approaches for a new cognitive science of the imagination.

**The Dominant Model**

Cognitive science, philosophy of mind, and evolutionary psychology have all converged to give us a picture of the mind that is fundamentally flawed. This is not to disparage the excellent work and progress of these fields over the last half century (nor do I have some terminal despair about these disciplines), but they have extrapolated a small subset of mental processes, arriving at a confused overall picture of the human mind.

 I will refer to this constellation of flawed approaches as the *dominant model* (DM), as they tend to share a reigning set of assumptions. These assumptions include the notion that the mind is: (a) primarily a representational system, (b) those representations comprise our experience and are either simple sense-data or more complex propositional models of the world (e.g., doxastic belief states), (c) these mental models are primarily indicative and descriptive, (d) rationality is the inferential rule-based processing of those representations, (e) rational and non-rational forms of mental processing are algorithmically computational at some level and largely automatic, and (f) processing is formal and explanatorily independent of substrate.

 This picture of cognition has done more for AI and machine learning than it has for the mammalian mind. We’ve had trenchant critiques of cognitive science before, including its traditional disinterest in consciousness, emotions, the body, social life and so on (Noë 2004; Gallagher and Zahavi 2008; Thagard 2018). And my own work has developed some of these critiques at length (Asma 2017; Asma and Gabriel 2019). In this article, however, I will not make a piecemeal attack on parts of the reigning model, but instead describe an alternative paradigm—one that tessellates many previous criticisms and creates fruitful new research programs. And importantly, my mythopoetic model will hopefully capture more of the phenomenological texture of our mental life.

 In recent years the dominant model has been updated and there has been a growing appreciation of previous myopia, resulting in a DM 2.0, as it were. This newer version includes a recognition of the importance of embodiment and affect, and a move toward predictive processing as the grand unifying theory (Clark 2016). Unfortunately, while there is a growing recognition about the importance of affect/emotion, there has been no clear path to incorporate such embodiment in a DM that still thinks of processing as digital or formal (see Scherer, Banziger, and Roesch 2010; Kowalczuk and Czubenko 2016; Ong, Zaki, and Goodman 2019). In fact, recent research into affective processing has been relegated to improving AI facial-recognition patterns (or auditory recognition) of emotional states. For example, companies like *Affectiva* and *Kairos* are not interested in the embodied-neural causation of emotional mind but simply AI recognition of facial (or vocal) “symptoms” of emotion. Such approaches are less interested in understanding emotional states and more interested in improving marketing strategies for companies by reliably correlating emotional expressions and consumption patterns. Security companies and government militaries are also interested in this kind of “affective AI,” but for the purpose of quick threat detection, not for understanding the causality of emotional motivations and deliberations in human agents.

 Throughout this paper I will refer to my alternative model of the mind as Mythopoetic Cognition (MC). The MC model captures a kind of thinking that could alternatively be called adaptive imagination, to distinguish the biologically/culturally advantageous aspects of imagination from mere fantasy and fancy. Taken point by point, let us provisionally contrast MC with the assumptions of DM, and unpack it as the article progresses.

My MC model contends that the mind is: (a) primarily a simulation system, not a representational system (i.e., simulation habituates the pre-reflective organism, whereas representation is ideational content accessible to reflection), (b) the primary units of mentation are not simple sense-data or propositional models of the world, but instead motor-sensory-conative loops (i.e., my mind is a feedback loop of movement, perception, and *conatus* or motivation, and such multimodal pathways preexist abstract concepts), (c) these mental pathways are primarily imperative and enactive, rather than indicative, (d) conditioning and affective predictive processing (not rationality) are the primary modes of cognition, (e) some processing has algorithmic automaticity, but much is available to general intelligence and social learning modes of agentive manipulation, and (f) processing is not digitally reducible or independent of embodiment.

These aspects of mind are then sculpted by ontogenetic development and produce fairly reliable cognitive tendencies—*mythopoetic templates* (i.e., dramatically organized schema) that help us organize and predict our experience. For example, all human cultures that we have studied (especially pre-scientific cultures) contain a significant element of animism. Animism is extremely diverse but generally commits to the belief/behavior that there are many *persons* in the world, only some of whom are human (Harvey 2006; 2014). Animist cognition, or indigenous cognition, sees personal agency in many non-humanoid substrates, including rivers, trees, prairies, mountains, and of course non-human animals (Ojalehto, Waxman, and Medin 2013; Whyte 2013). Nature and the physical world generally is populated with non-human agentive minds and goals. On my view, as we’ll see shortly, animism is a species of cognition inside the larger genus that I’m calling MC.

I will try to show that MC forms a prelinguistic human cognitive system. My contention is that all *Hominina* probably thought in this way, and many humans still do (including ourselves as children, and our adult selves in specific psychological states). MC is the default human operating system, but specific kinds of social learning (e.g., scientific literacy, modern egalitarianism, etc.) among a very small subset of humans rewrites the MC operating system toward an idealized rule-governed rationality. The resulting rule-governed rationality looks much more like the DM as described above, but it is neither natural nor necessary. This small subset of humans (secular rationalists) corresponds significantly with what has been called WEIRD peoples (Western, Educated, Industrialized, Rich, Democratic; see Henrich, Heine, and Norenzayan 2010; Henrich 2020). In the same way that overreliance on WEIRD people by social science methods distorts psychology generalizations, so too overreliance on DM cognition distorts our understanding of how the mind works. Moreover, it even distorts our normative values about how the mind *should* work.

**A Phenomenology of Mythopoetic Cognition**

The world we live in is dramatic. Our everyday phenomenological world is not comprised of theories and hypothetico-deductive facts (e.g., laws of gravity, Milky Way location, synapses, ion-bonding, Boolean algebra, etc.). Our everyday world is a *story* of struggle, failure, overcoming enemies and challenges, forging alliances, nurturing children, hoping, dreaming, hunting, and being hunted. This is as true for my local librarian and mail-carrier as it is for the Kalahari Bushmen and Aboriginal Arrente People. The local librarian may have no worries about lion attack, of course, but if they are living with an abusive domestic partner, then they have the same high-stakes struggle as anyone else. The imperative sense of drama is the same even though the material resources and lifeways are quite different.

 I am the protagonist of my life, just as you are of yours (McAdams 2019a). This is not just a quaint redescription of personal identity and meaning. The DM tries to build up the individual mind from component cognitive ingredients: sense-data perceptions flow in piecemeal and get bound together, thoughts are individual concepts (descriptive categories) that somehow get woven into a stream of consciousness, and even emotions are now considered by many to be conceptual constructions. But the DM has it backwards. The protagonist is primordial. The ingredients are sifted out through rational reconstruction of the agent and her drama.

***Indicative and Imperative Modes of Mind***

Human knowledge appears to have two different channels, an *indicative* channel/function and an *imperative* channel. The mindbrain itself has two mental pathways—dorsal and ventral, cold and hot, indicative and imperative (Brand 1985; Millikan 2004; Borst, Thompson, and Kosslyn 2011; Kahneman 2011). In order to appreciate the interwoven pathways of mind, consider briefly an experience like fear of a predator—part cognitive and part emotional. The emotion/cognition complex in predator-fear is a Janus-faced experience, partly *imperative* (e.g., I should run away) and partly *indicative* (e.g., that creature is a snake). This two-faced representation is strongly coupled together in lower animals—mice, for example, simultaneously recognize cats as a kind of thing (in a category) *and* as dangerous (fear affect) (Millikan 2004). A gazelle sees a cheetah as a specific kind of thing (i.e., not a crocodile, and not a giraffe, etc.) but also as a fast approaching threat (imperative). Humans, on the other hand, can decouple these two pathways (indicative and imperative) and fear can be reattached to alternative kinds of creatures or perceptions. Sometimes the indicative aspect of “crocodile,” for example, can be so mentally decoupled from fear and active response, that we can simply study it in a cool, unemotional way. This is the foundation of science. The indicative channel of cognition is what the *dominant model* or DM is trying to explain.

 These cognitive pathways, imperative and indicative, correspond well with what psychologists call “hot” and “cold” cognition, respectively (Brand 1985). Knowledge that describes the world, and endeavors to describe it with increasing accuracy (e.g., science), is processed as cold cognition. It is slow, careful, reflective, deliberative, logical, and based in language and abstraction. Hot cognition, on the other hand, is fast, emotional, embodied, and more habitual than reflective (Kahneman 2011).

 Correct *descriptions* of nature are of course vital for scientific progress. Science applies our hard-won indicative knowledge to the imperative struggle of our species. When a NASA physicist needs to calculate a launch trajectory, she uses the best description we have of nature, and when an immunologist works on a disease, she uses adaptation models from evolution. That is not disputed. But you and I, and even these scientists, leave the office and reenter the fast-spinning world of real-time problem solving, and do not have the luxury of describing nature in fine-grained detail. Beliefs, feelings, and behaviors in that fast-spinning world are for something else, namely, surviving.

The imperative hot cognition approach to life is ancient, predating the rise of language, logic and even the expanded neocortex. It is how animals get around in the world. It’s the limbic life of gut feelings, and rapid responses, helping us detect quickly who is a friend, an enemy, a sexual partner, and more subtle social relations, like who is a good hunter, who is reliable, who owes me, and how I should treat this approaching person right now. The mind, on this view, evolved to be a “hedonic sharpener” rather than just an information processor (Knutson and Srirangarajan 2019). A hedonic sharpener reduces experiential noise, bringing each repetition of trial-and-error learning closer to pleasure or satisfaction. The mind tries to maximize positive affect and reduce negative affect.

In this imperative world, memories, instincts, and conditioned emotional systems guide me, not logic or science. Eventually, of course, we evolved language and developed symbol-based ways of navigating the world. But generally speaking, the symbols that rule this imperative world of action are *stories* and *images*, not the phylogenetically more recent descriptive language of science (Price-Williams 1999). Stories and images don’t just describe the world, they inspire action in the world. They push our emotions in specific directions. They motivate us, rather than just label, organize, and model the world. On this view, a factual description of the world comes after the hot cognition interaction with the social world—this is true phylogenetically and ontogenetically.

Many readers of this article will be well educated; well-trained as virtuosic language processors, inferential prodigies, mathematical adepts, as well as accomplished scoffers of magical thinking. Who else would be reading an academic journal article? But even this article (a seemingly neutral bit of cognitive information) is slowly becoming your “friend” or your “foe” depending on how it accords with your already formed sense of the world, your sense of the mind, your sense of good communication style, your level of hunger, and so on. This is not a trivial point. Even seemingly low-stakes, neutral, cognitive processing is colored by affective somatic markers, and somatic markers can be organized into higher frames of narrative processing (Bechara, Damasio, and Damasio 2000).

***Magical realism***

Our contemporary minds still have regular access to mythopoetic cognition. Access to MC can occur during special psychological states: childhood, credulity fog, creativity, and dreams. Unlike the religious mind (wherein MC thrives), these other special psychological states are not dependent on specific ideologies. I do not have space to enter into all these examples in detail, but a few comments here will suffice.

Children see the world in dramatic terms. The adults and other children in their social niche are good guys and bad guys, and they are immersed in a true adventure. To them, the way they feel about the world is indistinguishable from the way the world is. To be clear, I do not think that MC is childish thinking. Rather, I think that all cognition is originally MC, that all children use it, and that some children (like most readers of this piece) grow up to compartmentalize and repudiate that cognitive pathway in favor of another. The fact that indigenous peoples, as we’ll see later, still strongly enact MC is not an insult because I will show the continued adaptive value of mythopoetic cognition.

I’m using the term “credulity fog” to indicate the liminal epistemic state between established knowledge and uncorroborated data. MC can be more pronounced in epistemic zones of uncertainty. It was common for ancient folk cultures, but also Renaissance and Modern natural history, to think of gods, monsters, chimeras, cryptids and magical beings as real and existing in the world, just as dogs and squirrels and other mundane fauna. The clear distinction between appearance and reality is not so clear in MC. Imagined beings, dreams, hallucinations and so on are realities insofar as they dramatically impact the subject’s emotional, conative and doxastic states. Waking consciousness and sober consciousness are not epistemically privileged in MC. But we should not assume that mythopoetic thinkers are just gullible, since they are quite capable of accepting simultaneous magical and naturalistic explanations for events (Woolley and Ghossainy 2013; Li, Boguszewski, and Lillard 2015; Dehar 2019). Imaginative cognitions can happen in parallel with real-time perception (forming a co-present) or they can decouple and run off-line before and after real-time perception. Humans have a simultaneous second universe—a twin experience of real now and imaginal alternative. Occasionally this leads to epistemic slippage and confusion (e.g., conspiracy thinking, schizotypal disorders, etc.), but usually makes humans more awake to the potentials and affordances in a lived experience.

From this same vantage point we can see that the creative state (voluntary imagination) and the dreaming state (involuntary imagination) are cases of MC that all of us have experienced. The relationship between voluntary and involuntary imagination is complex and not well understood. It’s clear that dream life has always influenced and inspired artists and storytellers, but we’re also learning that waking-life storytelling can structure dreamlife in important and possibly constitutive ways (Schrage-Fruh 2016). Additionally, the psychology of “immersion” or “enchantment” in art and dreaming is finally receiving some empirical attention.

Understanding other humans is not easy. Paradoxically, high-quality social knowledge can be better acquired through stories than actual human interaction (Caracciolo 2014). A well told story or enacted performance usually reveals the interior of a character (i.e., her motives, thoughts, feelings, strategies), whereas these Theory of Mind elements (ToM) can remain submerged in real social interaction. We learn about the causal network of feelings, ideas, and actions from myths and stories, since the inner life even of our own family members are relatively opaque by comparison. Art allows for first-person embodiment of characters that in real life remain 2nd-person or 3rd-person entities.

It was out of himself, Nietzsche said, that man projected his will. “Small wonder that later he always found in things what he had already put into them” (Nietzsche [1889] 2016). To say, however, that humans are “projecting” or anthropomorphizing purpose or drama onto a neutral nature, is already playing the DM game. This begs the question about the true epistemology for nature and we should tread carefully here. People using a MC framework do not see themselves as using a dramatic “framework” that can be traded out for another (say, neutral) framework. Phenomenologically, the MC subject sees her own volition and intentionality as but a small expression of the intentionality, desires, values, and struggles that are animating all of nature; not the other way around. The idea that only humans have dramatic intentionality and that we smuggle it into nature assumes that an indicative description of nature, history, and the cosmos (as intrinsically neutral) is more real than an imperative description. But if our cognitive systems (i.e., DM and MC) evolved because of selective pressure leading to differential population success, then MC has evolved because it helped us leave more progeny and is not by that measure an inferior epistemology. One might argue that MC is a valuable user-interface masking the indicative world beneath, but then it’s a permanent one (or very deeply entrenched), phenomenologically speaking. Of course, populations relying on science and technology have dominated global resources to an unprecedented degree and this seems to establish the superiority of DM cognition, but actually such resource acquisition has always been part of a mythopoetic project too, like the biblically-sanctioned human dominion over nature or even Francis Bacon’s narrative that “Let the human race recover that right over nature which belongs to it by divine bequest” ([1620] 2008).

**Functions (Adaptations)**

If mythopoetic cognition is ubiquitous, then it is either an adaptation, an exaptation, or a byproduct (spandrel) of other adaptations. The mechanisms of evolution identified by researchers have broadened since the decline of strict Neo-Darwinism in the 20th century. Most importantly, many evolutionary researchers (Richerson and Boyd 2005; Henrich 2015) have argued persuasively for gene-culture co-evolution, or some equally pluralistic model of causal mechanisms (Asma 1996; Jablonka and Lamb 2005; Pigliucci and Muller 2010). Let us bracket the fraught question of how much genetic vs. cultural causation determines MC and accept both as crucial for the evolution of imagination.

Like many other biological and cognitive systems, MC is selected for indirectly because it produces behavior that increases fitness. My embodied view of cognition resists a clear line of demarcation between behavior and thinking. Nonetheless, the success and value of MC can be isolated and studied by investigating the dramatic and narrative thinking it produces. The means by which mythopoetic thinking replicates in a population is varied. It has horizontal spread across contemporaries in a community, as a prehistoric campfire song or a monster story or meme can catch fire and spread to many people sharing the same real-time lifespans (Asma 2009; Wengrow 2014). But it also has vertical transmission, since elders teach youngsters songs, stories, and teleological views of nature. Some mythopoetic content and transmission is downstream from our cognitive capacities for social learning (Heyes 2018), but, as I’ll explain in the Structures section, some content is more closely related to cognitive architecture.

So, what are the selectable uses and benefits of mythopoetic cognition? MC is a source of information about our physical and social environment. As such, it provides priors for predictive processing. Moreover, it is itself a more content-rich form of predictive processing (i.e., it comprises imperative-mode predictive processing). Additionally, MC is a form of psychological catharsis and emotional management, a form of communication, a form of recreation, a form of social bonding, and a form of spiritual cultivation.

Cognitive psychologist Keith Oatley (2008) calls fiction “the mind’s flight simulator”—a happy turn of phrase that captures the thrust of the adaptation argument (for a nuanced breakdown of adaptation arguments, see Carroll 2018). The significant research centering on the adaptive aspects of literature (Dutton 2009; Carroll 2011; Gottschall 2013) is grist for my mill. Work in literary Darwinism and the psychology of literature and film confirms the adaptive aspects of an imaginative system—a system that is deeper and more fundamental than literature. In my view, linguistic fiction is a clade that branches from the larger trunk of mythopoetic cognition. If I could extend my tree clade metaphor further, I would suggest that the trunk is mythopoetic cognition, the first branch-point is the metaphorical cognition outlined by George Lakoff and Mark Johnson (1980) and Johnson (2007), and the next branching point out on the limb is the storytelling communication described by literary Darwinism (Felski 2008; Asma 2009; Boyd 2009; Mar, Oatley, and Peterson 2009; Kaufman and Libby 2012; Murphy 2012; Clasen 2017; Bietti, Tilston, and Bangerter 2018; Bilandzic, Schnell, and Sukalla 2019; Goodwin 2019).

***Animism***

To argue for the adaptive advantages of MC I turn to forms of drama older than literature, namely religion and animism. More than literature and film, clearer cases for understanding mythopoetic cognition can be found in religion/animism (and other performative biosemantic traditions like music and dance). The reason for this is that an evolutionarily older form of embodied cognition (i.e., the imagination or mythopoetic cognition) preexists propositional language. So, we need to focus on non-linguistic, enactive paradigms like ceremonial rituals or other emotional-behavioral loops (Asma 2017; Zaidel 2020).

Animism contains some of the foundational *mythopoetic templates* (i.e., dramatically organized schema) that help us organize and predict our experience. All human cultures seem to contain a significant element of animism (i.e., the belief/behavior that nature and the physical world generally is populated with non-human agentive minds and goals) (Ojalehto, Waxman, and Medin 2013; Whyte 2013). Some of the most fundamental *mythopoetic templates* within animism are “agency attribution,” “teleological thinking,” and “affective entanglement” (affiliative or adversarial entanglement with other subjects—in other words, drama).

In my own ethnographic work I have studied the following forms of Asian animism: Cambodian “Neak Ta,” Burmese “Nats,” Thai “Phi,” Laotian “Baci,” Vietnamese “Vat linh,” and Chinese “Shenjiao.” All of these are diverse, but share common belief-ritual structures in which humans bridge the metaphysical divide by making small sacrifices at personal and public shrines, designed to appease and enlist spiritual agents. Additional forms of animism include many kinds of Native American religion, Japanese “Kami” and “Shinto,” Maori religion, Aboriginal Australian religion, Yoruba religion, the “Anito” of the Philippines, Korean “Muism,” the traditional religions of the Bantu, Dinka, Hausa, Maasai, and San peoples, and many contemporary “Eco-Pagans” of the developed West. Animism is strong just below the surface of more conventional official religions as well. Indeed, many monotheisms are also closet animisms (Lewis 2014). Spend some time in New Orleans, with its voodoo and hoodoo cultures, and you’ll see that animism is alive and interwoven with mainstream religions like Catholicism too.

Anthropologists today debate the usefulness of the term animism since folk religions are so diverse, but I suggest that three essential features mark all animism: One, belief that there are “agents” or even persons in natural objects and artifacts (and even geographic places); two, belief that nature has purposes (teleology) woven throughout it; and three, our wellbeing (personal, filial, and tribal) is entangled with those other agents and purposes.

Animism is not so much a set of beliefs, as an elemental form of enactive cognition. On my view, we are all natural-born animists, and those of us in Western developed countries slowly learn to discount this mode of cognition in favor of a mechanical view of the world. Indigenous approaches to nature are dubbed uneducated or juvenile (Casler and Kelemen 2008) because they use agency and purpose to think about nature (e.g., “the pine tree is for the warbler,” or “the river wants revenge”). However, some philosophers (Harvey 2014; Whyte 2018) and psychologists (Ojalehto, Waxman, and Medin 2013) counter this, pointing out that animistic thinking reveals many of the subtle ecological relations in nature that mechanical approaches miss.

When conservation scientist Henry Huntington interviewed Alaskan Inuit elders about changes in beluga whale populations, the elders switched immediately to discussing beavers (Robbins 2018). This puzzled Huntington who slowly began to grasp the ecological complexities that the Inuit hunters were enfolding. An increase in beaver population reduces the salmon population by interfering with their spawning habitat. This eventually means less prey for the belugas and therefore a reduced population. Huntington was surprised to connect the freshwater ecology of beavers to belugas, but Inuit have always known this connection.

 I am agnostic as to whether every such ecological fact can be reduced to a scientifically corroborated causal mechanism. I am inclined toward metaphysical naturalism, but we should not assume in a facile way that every case of indigenous knowledge (captured via the “I-Thou” perspective on nature) is discoverable and warranted in scientific knowledge (captured via the “I-It” perspective on nature). This is not a mystical point, but a concern about epistemic methodological constraints.

***Traditional Ecological Knowledge***

Traditional Ecological Knowledge (TEK) is getting a new appreciation by conservationists like Huntington, who seek to augment scientific knowledge with the hard-won and high stakes indigenous knowledge forged in the crucible of family and tribal survival (Huntington, Quakenbush, and Nelson 2016). But I want to extend the appreciation of TEK to cognitive science, evolutionary psychology and even philosophical epistemology. The traditional ecological knowledge of indigenous peoples is structured mythopoetically. The empirical virtues (e.g., attention, discernment, parsimony, prediction) are enmeshed in the dramatic agency stories, rituals, and structures. A critic could say that the MC structure is just the post-hoc coloring the human mind gives to empirical observations. But phenomenologically, it’s the other way around; empirical facts are abstracted from a primordial story that does not recognize any universalizable facts. Traditional Inuit culture ties spiritual agents to almost every ecological variable and event; Agloolik is an evil spirit of the sea that can tip boats, Pinga is a goddess of the hunt, Qualertetang is a weather spirit, Sila is the air itself, Tekkeitsertok is a spirit of the caribou, and so on. Sedna is the female goddess whose chopped-off fingers have become what we call beluga whales.

Anthropologists studying the process of plant-gathering and botanical knowledge among Tanzanian peoples near the Usambara mountains suggest that there is “semantic network” of plants in the Usambaras that creates a web of spiritual, ancestral, and ecological relationships grounded within local healers (Ryan 2011). This mythopoetically structured knowledge connects the health of the local people to the ecology that sustains them and heals them. Cameron Daddis (2018) joined plant healers (Fatuma and Ramazani) as they explored a region for botanical medicines for their tribe. The entire process is guided by a kind of “emotional education” they receive from childhood on, wherein they are guided by elders; sleeping in the woods for weeks, and building up affective associational states (directly via experience and indirectly via stories) with specific plant morphologies. This is not mysterious or miraculous, but just the affective encoding of habit, built up by long apprenticeship (Sterelny 2012). “Botanical learning with a respected elder produced an emotional connection to the land—the forest itself. I glimpsed this relationship one morning, following Ramazani as he flowed effortlessly through the narrow gaps in a thorny quagmire of shrubs and thorny Acacia trees. ‘Watch me,’ he instructs, ’move as I move, crouch as I crouch’” (Daddis 2018, 20). As Daddis mirrored and simulated his bodily movements, Ramazani told stories about specific people in his village with specific illness symptoms and showed the relevant plants for healing. Among other things, a grasp of local toxicology emerges, but not a causal theory about the underlying mechanisms. And each tree is considered as an individual that has a legacy (in the village memory) of healing certain illnesses. The tree is not primarily considered as a member of a species that cures an illness. Rather, it’s *this* tree. The indigenous instruction is embodied and particular, not theoretical and universal.

Without access to a mechanistic causal view of nature (which is arguably only four hundred years old) the human mind relied upon an agentive view of nature for almost a million years (if we mark the date from *Homo heidelbergensis*), or at least 50,000 years (if we mark the date by the Upper Paleolithic culture-boom). The agentive MC view facilitates a way of organizing information across non-immediate times scales (e.g., “these mushrooms mean harm to my family”). An affiliative/adversarial view of nature (identifying good-guys/bad-guys) provides a minimal cognitive scaffold to draw me out of the stimulus-response presentism of animal cognition. Mythopoetic cognition structures mental events in two directions: the past and the future. It structures memories, affect, and conative urges into something like a “plan”—a behavioral script, an expectation, a prediction. That prediction is not a simple if/then conditional, but rather the loose probable expectation that develops from our interaction with other human agents (i.e., childhood cognitive development in an ecology of conspecifics, some of whom are caregivers and some of whom are enemies, and some of whom are both).

Mythopoetic social learning replicates useful knowledge horizontally and vertically (across and down generations). This is part of the reason why indigenous peoples with animistic cognitive frames survive better in challenging local environments than scientifically trained Europeans with scientific cognitive frames (Henrich 2015). Teleological animism (agentive thinking) finds deep relational knowledge between organisms and ecologies (e.g., “jack pines are for warblers” and “these mushrooms are evil”). Controlling for familiarity with the same local environment may well give European scientists an advantage over TEK, but it is not a foregone conclusion. These are some of the epistemically adaptive virtues of MC, then, as it applies to the physical ecology (creating folk natural history).

My argument is not of the postmodern variety. I am not advocating a relativism of all knowledge forms. Rather, I am arguing from an epistemology of Pragmatism (Putnam and Putnam 2017), recognizing the adaptive knowledge of MC in its own right. Yes, some dramatic views of nature (indeed most) will upon scientific analysis reduce down to, say, chemistry (i.e., no unseen agents needed), but this is an arcane consideration to most indigenous peoples (and our ancestors) struggling to survive in hostile environments. We might hold out the promissory note that science will best explain x (indicative knowledge), but in the meantime mythopoetic thinking about nature is getting the job done (i.e., imperative knowledge). If the “unity of knowledge” consilience project (Oppenheim and Putnam 1958; Wilson 1998; Carroll, McAdams, and Wilson 2016) assumes that all knowledge will fold into the hard sciences, then my MC system is tantamount to a mere rung on a ladder of progress. But my view is that the *imperative* mode and the *indicative* mode integrate but do not conflate. Indicative descriptive knowledge is not intrinsically or always adaptively superior. Faith that scientific and mythopoetic thinking will conflate in some eventual, epistemic, beatific vision is too speculative for my taste (for similar forms of knowledge pluralism see Dupré 1993; Cartwright 1999; and Kellert, Longino, and Waters 2006).

***Social Intelligence***

There is an equally important social benefit to mythopoetic cognition. Social intelligence is the ability to know oneself and others, such that we can successfully predict behavior, cooperate, manipulate and generally enter into reciprocity and Machiavellian relationships (Humphreys 1976; Goleman 2007; Mithen 2007). If your world is thick with other agents—all vying for their desires and goals—then you spend a lot of time organizing, revising, and strategizing your own goals in a social space of many competing goals. The increasing size of social groups is considered a massive pressure on our ancestors, possibly even the cause of punctuated human brain growth (Dunbar 1998). Having to keep track of (and groom) many agents, social hierarchies, and obligations is a calorie-expensive lifeway. It also helps shape cognition, as a person must routinely formulate her conative goals, check her affective responses (with impulse control), and anticipate the obstacles and means/end relations to teleological goals.

Thinking of the world as a machine requires you to know the machine’s laws (unlikely in small group subsistence communities). However, thinking of nature as a contest, cooperation, and conflict between multiple agent desires transfers well to the social world and vice versa. This gives awareness and sensitivity to the complexity of others and nature, but also helps clarify one’s own values, motivations, and goals. If I have to figure out how to enlist benevolent spirits to help me and figure out how to distract malevolent/mischievous spirits, then I get clearer refinement on my and my family’s own values and priorities, and what obstacles and allies could be involved in actualizing those priorities. Animism indirectly helps structure psychological and social goals.

My ethnographic research in Southeast Asia (Asma 2005) reveals many animistic agent-juggling rituals and behaviors. Even the shortest visit to this part of the world acquaints one with the ever-present “spirit houses” that serve tutelary spirits. When people build a home or open a business, for example, they must make offerings to the local spirits, otherwise these beings may cause misfortunes for the humans. My Laotian friend would always put expensive sacrifices (whiskey) in the shrine on the day of the full moon, so that the mischievous spirits would not trouble his children’s dreams. The spirits are attended to on a daily basis.

Set aside credulity about magical thinking, and just consider the cognitive load of these kinds of practices. Social complexity and MC built the kind of mind that eventually could do scientific reasoning (DM). It was not the other way around. Since some of the earliest signs of human culture (i.e., cave paintings, etc.) have a clear shamanistic orientation (Conkey et al. 1997; Clottes 2016), it is reasonable to think that preliterate *H. sapiens* were enmeshed in similar kinds of animistic spirit devotions—managing invisible agents everywhere. If keeping track of over 150 people (Dunbar 1998) is a strong cognitive load, then what follows if all the forests, trees, and plants are “people” too—people that need to be served and attended on a daily basis. Trying to keep track of social obligations is difficult, but equally challenging is placating difficult or demanding agents (i.e., most spirits). There is also evidence now from parasocial relationship research that one-way social relationships with non-humans (e.g., kids befriending cartoon characters and toys) can improve general cognitive skills (Calvert, Richards, and Kent 2014). Parasocial bonding is a powerful motivator for acquiring information and skills, not to mention emotional satisfactions (Choi 2017; Derrick, Gabriel, and Tippins 2008; Gannon 2018). Legendary spiritual stories are also crucial as psychological motivation for group esteem, and some anti-slavery rebellions, for example, were fueled by mythopoetic African traditions long before they were fueled by Christian mythopoesis (Hanserd 2019).

Humphreys (1984) and Mithen (2007) suggest that agriculture may have emerged in part as a misapplication of social intelligence. That is to say, the protracted care and attunement of a parent (or alloparent) to offspring (and other human intimacies) was misapplied to plants, leading to the elaborate dedication of hoeing, fertilizing, watering, pruning, and so on. Mithen convincingly marshals evidence that early agriculture emerged in part from social competition between groups to outgrow each other—not for utilitarian food maximization, but to create social prestige from luxury foods, or gifts and special feast foods. I would add that the increasingly elaborate tutelary devotions of mythopoetic animism were also likely to help structure seasonal, sequential or seriatim behaviors like resource development. But the noteworthy point here is about the logic of exaptation. Farming for prestige also helps you get better at feeding populations. And on my argument, appeasing invisible agents also helps you better handle flesh-and-blood agents.

Imperative MC also structures the social world in adaptive ways—creating stability and safety for enriched learning. Peter Swift describes how the loss of spirit forests in Kuy communities can over time affect village unity since “respect for elders comes largely because they are the ones who take care of the spirits and their authority derives in part from their role of mediating with the spirits. They can use that authority to deal with social issues, land issues, and everything else, but if they lose that authority because no one cares about spirits anymore, you’ve lost that social organization” (quoted in Adams 2011, 24) Prestige bias is increasingly understood to drive certain aspects of gene-culture coevolution (Jiménez and Mesoudi 2019). The theory of MC helps explain how humans attach increased attention and devotion to charismatic agents.

One might respond to all this praise of magical thinking with an eye-roll about “that was then, and this is now.” But I submit that most contemporary humans—even those with exposure to science—are still mythopoetic thinkers to varying degrees. In some contemporary communities it is still very adaptive to be mythopoetic cognoscenti. In some areas of Bible-belt America it is much more prestigious to be a Creationist minister than a scientific expert. One will reap the many rewards of prestige by proffering certain mythopoetic (biblical) stories; gaining access to potential mates, material resources, trust of allies, and so forth. Mythopoetic thinking is not just a Conservative phenomenon, since many people on the secular Left have their own melodramatic formulations (Taylor 2007). While far-Right conservatives saw Covid-19 as a Chinese plot against the West, far-Left liberals saw it is Mother Nature punishing the human species (a scourge) for trampling Her. Troubling as it seems to our Enlightenment assumptions, from the perspective of biological fitness, a mastery of the local mythos (including our political mythos) is more adaptive than mastery of any objective facts.

Lastly, mythopoetic cognition is composed of many melodramatic beings with fantastical biologies, and magical properties—sometimes called “sticky memes.” These properties give the cultural memes (stories/images) epidemiological qualities (Sperber 2001; Boyer 2002; Wengrow 2014). For example, humans have an innate or an early developmental folk taxonomy of the world. We have a way of organizing the world into predictable categories for easy understanding, cognition, and manipulation. The brain employs the categories to parse the “blooming, buzzing confusion” of sensory information. Prediction-processing pattern recognition requires default categories to function in the background, against which deviations arouse attention. Our brains create predictive models of the world that help us extract useful signals from ambient informational noise. Category violations strongly arouse the human mind. Unnatural ideas or images survive and spread well because they surprise us, making them harder to forget or ignore. This means that MC helps make some of the core elements of culture itself, because monsters and heroes create social solidarity through cultural kinship. The counterfactual nature of imagination is one of the earliest and most effective ways to create cultural kinship. Early human groups grew to social scales beyond genetic kinship, and culture helped create fictive kin groups.

**Structures**

We now have a better picture of *why* mythopoetic cognition works (its adaptive functions), but *how* does it work? This section will consider the structural elements of imagination, the neural substrates, and the semantic mechanisms (i.e., low-level semantic units and more cumulative narrative semantics).

***Syntax of Imagination***

One of the elemental ingredients for MC is a syntactical or grammatical architecture—a flexible system by which narratives can be coherently composed, modified, varied, and understood. Broadly speaking, the last century of theory has fastened all cognition to linguistic grammar (Carnap 1935; Chomsky 1957; Rorty 1967). Indeed, one might ask: What other grammar is there? Thought itself was modeled on language in the expectation that percepts were bundled into concepts and concepts were manipulated in a system of categories like subject, object, and verb, via sequencing (e.g., 85% of known languages usually start sentences with the subject).

There are many problems with this approach, the most troublesome being that it renders nonlinguistic creatures (i.e. animals and infants) as lacking a mental armature. But I’d like to focus on two issues. One, there is a large amount of cognition that is not linguistically or even conceptually structured (Peacocke 2001; Bermudez 2007), and there are indeed embodied grammars that form an alternative cognitive architecture to propositional language. Even those who tend to argue for “mentalese” or lingua mentis (Fodor 1975; Pinker 2005) still assume a logical and propositional framework as the syntactical foundation underneath semantically rich natural language. Framing sense-making activity and communication as propositional in this way plays into the DM view of the mind, whereas image-based and movement-based grammars align more with the MC view.

Perhaps the most well-known alternative to propositional grammar is the embodied metaphor theory (Johnson and Lakoff 1980, 2003; Johnson 2007). My view of mythopoetic cognition is indebted to Johnson’s view that language emerges from deep metaphorical ways of organizing and projecting bodily feeling states. Concepts, on this view, are built up from embodied experiences that are stored in implicit and explicit memory and then mapped from source domains (e.g., up/down) to target domains (e.g., happy/sad). This mapping “grammar” is pre-propositional, but Johnson’s work focuses on its manifestation in our natural language. From the developmental (ontogenetic) and evolutionary (phylogenetic) perspective, however, an earlier grammar of images can be said to shape cognition.

Image schemas are templates that function as prototype concepts (e.g., radial categories). We think with images by using prototypes (e.g., an analog, mental, memory picture of a dog) to categorize new experiences (e.g., a new creature I’ve never encountered), and to map and predict affordances (e.g., this unfamiliar thing looks dangerous). Cognitive activity can make simulations via perceptual (rather than code) systems of representation (Barsalou 2009). The cognition of prelinguistic children and non-human animals presumably makes good use of such visual thinking. Music too is a syntactical system that humans learn and use before language (see Mithen 2005; Asma 2020).

Before images, music, and language, however, is an even earlier grammar, a syntax of motor sequencing. Our mind is first and foremost “internalized movement,” not a spectator or recorder of data bits. By doing a comparative study of monkeys and apes, Barton (2012) discovered that cerebellum evolution happened six times faster in apes than in other primates. The capability to build up complex sequences from subroutines is *behavioral parsing*, and as memory and motor coordination became more robust in our ancestors, the behavior sequences could extend out—by replication of subroutines. Decomposing larger routines into parts also creates the possibility of rearranging the sequences, not just repeating parts. Thus, a kind of task grammar emerges in our ancestors.

Mythopoetic cognition does not need to wait for the evolution of indicative language to do its work. Once we consider syntax as a capacity for sequencing simulations (i.e., behaviors, images, sounds) then we have an early grammar for thinking imaginatively (Bickerton and Szathmáry 2009). Moreover, our contemporary minds are still using this operating system for general sense-making, hedonic sharpening, and predictive processing.

***Bio-Semantics of Imagination***

Semantic theories in traditional cognitive science have tried to find a bridge between computational processing and phenomenal folk-psychology. This approach has been so unsuccessful that most cognitive scientists now simply refer to phenomenal consciousness as a user-illusion (Churchland and Churchland 1999; Frankish 2019) without clarifying how *meaning* happens (and Hoffman 2019 doubles down on the skepticism by calling reality a user-illusion, too). Additionally, semantic issues have been tethered to linguistics and the question of how signifiers refer to the signified (the extralinguistic entity). From Logical Empiricism to Saussure, Chomsky, and Lakoff, the focus has been on meaning as a conceptual, mental event that satisfies truth conditions (e.g., the meaning of “the car is red” is true if and only if it is the case that the car is red). In contrast to that, mythopoetic cognition (MC) takes a biological approach to semantics. Meaning, on this view, is about the animal’s system of feeling states, or more precisely, the conative-affective-doxastic loop.

As great apes, we humans almost certainly engaged in the kind of subtle, antiphonal, body-language communication that we see throughout all social primates. The imagination is a mimetic simulation system that ranges from sensory to abstract representational abilities. The meaning of “representation” is contested and complex, since some philosophers define it as anything mental that sits in-between a stimulus and a response, whereas others reserve the word for concepts and image schemas (see Tye 2000; Chalmers 2004). My theory of MC does not stand or fall with this debate, but suffice it to say that, as embodied mind, MC is capable of sophisticated responsive behavior without much higher representational activity (i.e., logic and conceptual manipulation), but it is also prevalent and constitutive in higher faculty storytelling (which does indeed draw upon concepts and image schemas). MC is at work, for example, in the low representational activity of group simulated ritual dancing (e.g., a dance reenactment of a tribal hunt). But it is also at work in the high representational activity of narrative stories about the same ritual and hunt. The dance is communicated more by “contagion” (by simulation, involuntary and voluntary), whereas the story is communicated via linguistic symbols (representation proper).

Music, storytelling, and visual art expresses or represents internal feeling states in the performer and catches its listeners or audience in a viral contagion of those same feeling states. The etiological metaphor is strong because the music or story listener, for example, cannot unfeel the feelings as music and stories infect him. The emotionally-laden meaning communicated is robust, requires little education in the listener, and cannot be easily resisted. Music and storytelling contain affect-laden messages, but also create a shared emotional field—like an environment or ecology of meaning for all the people sharing it. The semantic system does not need to be optimized to give a population an advantage over competitors.

Some philosophers and cognitive scientists argue that concepts are derived from language (see Laurence and Margolis 2012). If human conceptual thought was largely generated by the evolution of language (and that’s a big “if”), then we can estimate the birth of our conceptual cognitive skills somewhere between 200,000 and 30,000 years ago. Compare 200,000 years of language-based *cognitive* life with approximately 200 million years (the late Triassic) of *emotional* life. When mammals first began to emerge is when the rudimentary emotional systems of lust, aggression, seeking, care, panic and so on began their rise to dominance (Panksepp 1998, 2011). However this timeline shakes out, we humans have been “emotionally intelligent” for much longer than “conceptually intelligent.”

Mythopoetic cognition structures our environment into a story and provides a prediction tool of hedonic experiences. The nuclear family and the tribe (whether it’s Pleistocene or Anthropocene) give us a template of pain-inducing and pleasure-inducing agents (e.g., parent, sibling, neighbor, enemy). Feeling states of approach and avoid are integrated with affective systems (e.g., lust, fear, care, rage). The master affective system (i.e., Panksepp’s SEEKING system, or Berridge’s Wanting system) forms the dopamine driven conative drive that motivates us toward environmental resources, enlisting affect along the way. Add a rudimentary representational ability for memory and mental time-travel, chronesthia (Tulving 2002), and we have all the ingredients of imagination.

Unconsciously extrapolating our own personal, emotional, memory (episodic memory) of our angry father and our nurturing mother, say, to nature and even the cosmos is how we created spirits, gods, and ways to appease them. But episodic memory (loaded with personal emotional history) is also a guide for present and future child rearing (education of the young), seasonal planting, economics, burial rites, coalition building, warfare, and other socio-cultural lifeways. Some of this extrapolation from memory to future is subconscious and some of it emerges through daydreaming or mind-wandering activities (Østby et al. 2012). My ontogenetic development becomes a template for mythopoetic cognition about the present and future.

The cognitive architecture of imitation (Gallese 2005; Heyes 2010) connects a sensory representation of an action to a motor representation of the same action. And this simulation system is always colored with affect or emotion. So, I see a hand grasping, and this matches with an inner motor sense or feeling of my own hand grasping—these are “matching vertical associations” (Heyes 2010). Observational learning requires a conversion of visual or auditory patterns to bodily patterns (action and affect), and mirror neurons act as the requisite converters. When I hear certain sounds or melodies (e.g., lullabies), I feel these soothing experiences (e.g., mother’s touch and a flood of oxytocin), and an adaptive association is forged that can be drawn upon for emotional regulation ever after. Mother-infant interaction, with its strong physiological, emotional, and even sonic synchronizing, may help shape the earliest cultural templates like music and story, and this may have started with *H. heidelbergensis* (Dissanayake 2000a). My action-states (e.g., squeezing hand, grooming motions, tool use sequences, even sexual technique) and my feeling states (emotions) are heavily correlated with the action states and feeling states of my social group. This helps me learn, perform and comprehend those actions (Delalandea and Cornarab 2010). The result of all this is that imagination is a powerful semantic system, built up slowly through the traditions of small-group peoples, as they organize innate affective feelings (primary level), idiosyncratic conditioned feelings (secondary level), and finally conceptually-entangled feelings (tertiary level).

***Brain Systems for Mythopoetic Cognition***

Since MC emerges from embodied states, like motor simulations, affects, image manipulation, and conditioned learning, we may need to look for the neural substrates in older mammalian areas of the brain. The brain is not a layer cake of discrete phylogenetic levels, but there is clear vertical orientation of shared vertebrate functions (homologies) in subcortical regions.

When we read a Stephen King novel or listen to Robert Johnson’s deal with the devil at the *Crossroads*, or observe the Maori do a Haka dance, we experience levels of fear. While structured in a human cultural framework, that fear is a shared mammalian process of anatomical, neurochemical, hormonal, behavioral, and psychological responses. Fear is a *natural kind* at its root (physiologically), but flexible and highly diverse (psychologically) when it blends with conceptual cognition and cultural habits (Asma and Gabriel 2019).

Neuroscientific investigation is still needed on how the brain processes narratives and poetic experiences generally, including visual, ritual, and motor narratives like dance. Some research has mapped word-level concepts in the brain (Huth et al. 2016), but a story is different. A story or mythopoetic cognition requires us to sequence events, understand cause and effect relations, make inferences about character motivations/intentions, and grasp themes and messages (holistically and in parts). An important study (Dehghani et al. 2017) compares brain activity across cultures, looking for common neural activity while subjects understand stories. English, Mandarin, and Farsi native speakers were exposed to native translations of the same story during fMRI scanning. Clear patterns emerged across cultures and languages. In specific, the default mode network is strongly activated during story cognition.

Since the development of EEG technology, in the 1920s, we’ve seen evidence that the brain has a default mode network, or DMN (Raichle et al. 2001; Buckner 2012). This is the brain phase that we slip into once we stop attending to specific things or tasks in the external world. It consists of medial or midbrain regions, like the medial prefrontal cortex (mPFC), the posterior cingulate cortex (PCC), the hippocampus (in the medial temporal lobe), and the amygdala. This brain system is active when we are in wakeful rest, like mind-wandering or daydreaming, mild introspection, and other less directed or less task-based states of mind. As a default system, it characterizes our *goal-*diminished frame of mind. And it contrasts strongly with the task positive network or TPN, which consists of more peripheral brain regions: lateral prefrontal cortex (lPFC), the anterior cingulate cortex (ACC), the insula, and the somatosensory cortex. The TPN underscores our focused attention and goal-directed activities—everything from concentrating on a chess game, or analyzing a mechanical problem, to following a cooking recipe.

The imagination is often associated with daydreaming, and now there is growing evidence that imaginative work happens in the default mode network, DMN, rather than the TPN. To be more precise, many creativity researchers see imaginative thinking as a complex interaction between the DMN and other control centers, like the frontoparietal control network, and the dorsal attention network (see Carroll 2020). The introspection of memories and our fantasticating tendencies dominate the DMN. Indeed, some excessive DMN activity underlies certain ruminating forms of depression. Imaginative activity may a toggle between decentered associational mind (i.e., stream state and DMN) and goal-directed intentionality (i.e., centralized state and TPN) (Asma 2017).

***Biological Aboutness: Naturalized Intentionality***

Like other strains of embodied cognition, MC requires a new biologized view of intentionality. Non-human animals, after all, are very good at dealing with their environment (physical and social) in adaptive ways, but they don’t seem to have propositional minds. The traditional intentionality model ignores animal minds and treats them as complex stimulus-response machines. The dubious logic is that animals don’t have proper language, so they don’t have concepts, so they don’t have reasoning, or plans and goals. On this traditional view, acting one way (getting a drink) rather than another way (climbing a tree) is because I have a *reason* for doing so, and I’ve reasoned and judged accordingly (Arnold 2012). Since animals don’t think in this indicative way, it is often assumed that animals have a very impoverished mental life, or it is assumed (by the lay-public) that they have rational minds like us. But these assumptions are both incorrect, and instead we must appreciate how imperative thinking is intentional (having aboutness) without being conceptual or propositional. Imperative categories of the world (e.g., trees, rivers) are not conceptually precise (definite descriptions) but serviceable and actionable taxonomies (e.g., trees = climb-up-ables, rivers = drinkables). These action-oriented taxonomies are loaded with affective content. Emotions are more than just mechanical responses to stimuli, but they are not intellectual appraisals either. Emotions occupy a unique middle-ground between instinctual reactions and deliberative judgments, but they share territory in each of those domains. Emotions have “aboutness” because they can take an object—lust for *her*, fear of *that*, rage at *him* (i.e., they are not simply moods). Emotions are *about* their physical/social environment, as well as interoceptive needs. They are also forms of evaluation or appraisal (e.g., my fear is an evaluation that this dog is a threat). More than conditioning or stimulus-response, mammals have moderate agency in the expression of emotional action patterns (i.e., impulse control). Additionally, basic emotions in humans and some mammals are decoupled and flexible (pointed by natural selection and cultural selection, but capable of novel targets). The agency of the human is derived first from the broadly intentional structure of mammalian mind, and second from the representational/conceptual amplification of that intentionality. Evidence for this can be found in the way decorticated rodents and hydranencephalic children can still have adaptive emotional responses when lacking parts of the brain (neocortex) that we associate with higher reasoning and meaning-making (Bechara, Damasio, and Damasio 2000; Liotti and Panksepp 2004; Merker 2007).

***Naturalizing Aristotle’s Dramatic Arc***

How does mythopoetic cognition embed meaningful memories, perceptions, emotions, and representations into adaptive retrieval and prediction models? In his *Poetics*, Aristotle famously described the structure of Greek tragedy. His outline has been a useful template for mythopoesis for over two millennia. A story, he argues, needs to be holistically coherent—containing events that follow each other by probability or necessity in a causal relationship. The first half of the story is “the knot,” by which he means “all that extends from the beginning of the action to the part which marks the turning-point to good or bad fortune” (Aristotle 1961, Part XVIII). The protagonist is struggling with the knot entanglement in the first half and then the second phase of storytelling is the “unraveling.” The knot is unraveled in the end, bringing the protagonist to ruin or triumph. Aristotle mentions a few other internal structural scenes, like the “reversal” which throws action in a surprising albeit probable direction, and the “complication” which puts the moral character of the protagonist into the causal story.

 Do we see our lives like stories because we’ve learned to do so by consuming art all our lives, or does the Aristotelian arc simply reflect our natural daily lives? My preference is for the second, as each day of everyone’s life—from childhood to adulthood—is truly an entanglement process followed by varying degrees of unraveling. The natural struggle for biological, social, and cultural survival is an arc (Bruner 1991; McAdams 2019b). Mythopoetic cognition processes or manages this arc. It perceives it, recalls it, recomposes it, and communicates it.

 Neil Cohn (2020) argues that we process visual narratives like comics by weaving together parallel representational levels of semantic elements and overarching narrative schema. This is done in a context of temporal structure—past and future, which Cohn translates into computational format; retrieval, prediction, and updating. If the comic panel is a semantic element, the viewer must engage in front-end information gathering about the panel contents, and using those cues build up a situation model of the larger meaning (recruiting memory, folk psychology, specialized knowledge, and so on), then check subsequent information against that situational model. The situational model becomes a set of expectations constraining the meaning of subsequent panels until expectations are violated and then the model is revised and continues. While the comprehender is reading the visual narrative, the situation model is held in working memory, but then it shifts to episodic long-term memory storage and is retained for future activation (Magliano et al. 2016). All this is presumably so fast that the sequential becomes the simultaneous.

There are some helpful features of Cohn’s approach and much of it can be extrapolated to mythopoetic cognition generally. Cohn’s approach nicely atomizes the analytical elements of comic reading, but the phenomenological texture of comic reading is truant. This sort of research (i.e., rational reconstruction) could be improved by supplementation from the affective/conditioning semantics that I’ve been sketching. I wish to end this section on the structures of MC by adding my own contender for how narrative arc schema are integrated with online processing (i.e., perception, memory, affect, motor activity, prediction), or what I’ve called the conative-affective-doxastic loop. The key, in my view, lies with analogy.

***Analogy***

Analogical cognition discovers similarities between behaviors, forms, sequences, and patterns generally. Discovery of similarities may be automatically achieved through association, or actively constructed. Analogies are useful and adaptive because they help the agent see a novel event as similar to an already experienced event, opening up response maneuvers and capacities. Douglas Hofstadter (2001; Hofstadter and Sander 2013) argues that analogy is the very heart of cognition. And analogical cognition works best when its elemental terms are fuzzy enough to admit of meaningful comparison.

Analogical cognition is the perception of common elements between two things. The sophistication of such perception will be contingent on other faculties, including memory, conditioning, representational power (e.g., motor or linguistically based), affective memory, and so on. Analogy-making underlies a very wide range of animal skills, including the way we plan and map our movements through spatial environments, but our sophisticated poetic achievements (like Plato’s “cave analogy” of learning itself) shows us how far analogy can go in sense-making. Linguistic metaphors and similes are just the tip of the iceberg, once we realize that perception itself can have analogical aspects (e.g., “seeing as”) and associative mechanisms (Behrens et al. 2008; Heyes 2012). Apes have been tested, using the Relational Matching to Sample test (RMTS), and show significant analogical abilities, and more recently monkeys have also been shown to possess analogical cognition (Fagot and Thompson 2011; Truppa et al. 2011). Such tests, I would argue, are capturing the kind of rapid and ubiquitous analogical connections that primate minds are regularly making.

Analogies can be said to have fundamental structures and mechanisms—they have a source domain, and a target domain. During our ontogenetic development analogies map relatively known patterns (e.g., my mom is nurturing) onto relatively unknown patterns (e.g., newly discovered mothers, or female characters) and thereby gain better traction (pardon the analogy) on the environment. Then the analogy circles back again, switching the role of target to source. For example, one learns the Greek story of Demeter who is willing to let the whole earth perish to save her kidnapped daughter (or one reads *The Joy Luck Club*, or watches *The Kids are Alright*, etc.), and one analogizes back to one’s own mother, getting new insights and perspectives. These analogical models are always being cycled through the cognitive process of retrieval, prediction, and updating. New events and experiences always cause revision in the overall gestalt of “mom” (who is both a token and a type).

Affect and emotion play a crucial role in analogical thinking. From the most basic analogies to the most sophisticated ones, source patterns will have affective tone—affective content. This affective content will map on to the target pattern of the analogy, and the degree of this affect transfer will depend on the executive control level of emotional editing the animal can do. Likewise, most target patterns—like a newly encountered animal or environment pattern—will trigger affective and conative content automatically. Indeed, in some cases, the affective experience is the largest part of the analogy because different percepts may stimulate a similar emotion and inform a conditioned connection. Many trauma victims experience involuntary emergence of specific monster imagery during triggered episodes. These monsters intrude into consciousness (waking and dreaming) and act as both phenomenological present threat and symbolic reference to earlier trauma. The monsters are image-based analogies. Carefully facilitated therapeutic revisiting of such imagery/scenarios is effective sense-making activity, and helps patients process otherwise abject terrors. Using storytelling and even films, therapists can place the trauma monster into a teleological narrative that has a resolution (e.g., defeat, repudiation, acceptance, transformation). (Hamilton 2020)

Analogical cognition via emotions is a key reason why humans only produce a handful of archetypical story genres. Universal (cross-cultural) story patterns are themselves reflective of specific emotional trajectories (Hogan 2011). The typical *romantic* plot—found all over the world—is a narrative expression of the LUST system described by affective neuroscientist Jaak Panksepp. The typical *horror* plot is a narrative expression of the FEAR system. *Tragedies* are expressions of the GRIEF (separation distress) system, while *mysteries* and hero stories enact the SEEKING system and so on. Any good story is usually a mix of several affective trajectories within the overarching arc.

When language evolves, Homo sapiens acquire a whole new system for analogically triggering adaptive emotion, in addition to communicating needful information. A whole new off-line lexicon of counterfactuals can conduct emotion and action between speaker and listener. But our *propositional aboutness* of language (indicative referential content) is already embedded in the *biological aboutness* of our social interaction with other humans who we are trying to assuage, impress, attract, or destroy. While expository descriptions of events help us gain theoretical modeling of our world, stories help us with the aforementioned assuaging, impressing, attracting, or destroying.

**Integration with Cognitive Science**

***Predictive Processing***

How does the MC theory integrate with contemporary cognitive science? Predictive processing (PP) has quickly become the contender theory about how the mind works (Clark 2016). It goes beyond previous computational and algorithmic models by showing how a universal system of informational retrieval, prediction, and updating can govern so many specialized and open-ended cognitive processes. The mythopoetic cognition I’ve sketched in this paper can integrate with and improve predictive processing models. MC is a kind of predictive processing, albeit in the 5E manner (i.e., embodied, embedded, extended, enactive, emotional).

 One main problem with PP is that is has remained largely focused on perception as a kind of cognition and as a model for other forms of cognition. A perceptual field is recorded, and as new perceptual information streams in, it is checked against prior templates for exceptions and then confirmed or revised. There’s nothing new in this perception bias, as philosophy from Plato onward has preferred a spectator/vision model of epistemology (Heidegger [1927] 2011; Dewey 1929). But treating the mind as a form of perception is severely limiting and fails to capture the enactive essence of the mind (Noë 2004).

 One of the major sticking points in the PP theory is how *priors* are established. According to PP, mind is a statistical probability calculator. The brain gathers info from experience, makes probability predications about what will be perceived next, based on priors, and then compares expected information (the generative model) against actual information. Divergence between probable and actual data results in prediction error, whereas smooth fit between the generative model and actual info gets passed along to other cognitive systems in a hierarchy of integrated functions. The Bayesian aspect of this process refers to the way our brains seem to approximate Bayes’ theorem for predicting outcomes of events based on prior knowledge of relevant conditions. The problem with the model as currently articulated is that (1) it treats cognitive states as relatively neutral predictions about probability, when in fact according my view there are no such neutral states (i.e., somatic coding of valence is ubiquitous), and (2) it artificially stipulates probability values to priors without a clear method or mechanism for doing so (e.g., say your prediction of an impending dog attack is 34% …), and (3) no such method or mechanism will emerge because (via 1 above) the relevant coding of the world is affective/imperative, and this form of causation is biological, analog and volumetric rather than mathematical. Somatic markers and vertical associations are tipping-points, not Boolean gates. Humans navigating the social world are facing very complex calculations, and it sheds little light to assert that their brains are doing high-level Bayesian calculations unconsciously on the fly with causally relevant statistical priors. That is a huge promissory note for the theory and bears little resemblance to the texture of everyday conscious mind.

 However, the predictive processing model works fine without the Bayesian approach, because conditioned social learning, affective somatic markers, and affordances can all provide generative models with priors that are crude (compared to Bayesian models) but serviceable. In my view, stories (internalized narrative arcs) make up rich semantically-coded generative models for subsequent prediction and updating, and this is driven by conative homeostatic processes. Mythopoetic cognition is *heuristic predictive processing*, not statistical predictive processing.

Another important way in which MC advances current cognitive science is that it restructures our thinking about “Theory of Mind” (ToM). Several researchers have now recognized that the phylogenetic game-changer for genus *Homo* was probably not language but an evolved ability to think about the non-present (e.g., mental traveling through time and space) (Corballis 2019), and an ability to recognize and predict other minds, via shared intentionality (Tomasello et al. 2005; Tomasello and Carpenter 2007). Rather than positing dedicated cognitive modules for theory of mind and mental time travel, the MC theory folds these under the domain-general abilities of adaptive imagination. Knowing another mind, for example, is an elaborate imaginative process (involving analogical source-target mapping of beliefs, feelings, perceptions, etc.) that emerges in both social interactions and stories, and then feeds back into future social interactions. The art-life loop reinforces itself and there are many ways such social intelligence can fail, malform, be atypical, or be suboptimal. That approach seems more nuanced and accurate than a domain-specific module that supposedly comes online in kids between ages 4-6.

Mythopoetic cognition is a form of embodied cognition, and rejects the neo-Cartesian view that other minds are trapped behind a veil of representation, requiring inferences or special modules to access or decode. Rather, our intentional mental states and those of our friends, families, acquaintances, and enemies are on display (albeit fallibly) in our embodied social interactions. These social interactions are read directly by the body as affordances and intentions, without the need for us to build an elaborate, internal, mental model of the social world. Following Gallagher and Hutto (2008), I agree that reading affordances, or as they put it, having perception-based understanding, is not mind reading. “In seeing the actions and expressive movements of the other person one already sees their meaning: no inference to a hidden set of mental states (beliefs, desires, etc.) is necessary” (22). My discussion of indigenous animist cognition above shows how agentive attribution is not a late-occurring special adaptation to large-scale human societies (Theory of Mind acquisition), but an early form of “protagonist” thinking. Recent anthropological, philosophical and psychological work (Wiessner 2014; Asma 2017; Bietti, Tilston, and Bangerter 2018) describe the social rituals by which narrative protagonist templates were built up and transmitted in cultural groups, thereby enriching “mind-reading” or ToM capacities.

***Affective Affordances***

Another important way that the MC theory fixes problems in contemporary cognitive science is that it replaces the representational/conceptual paradigm in favor of *affordance* psychology. I’ve already explained how somatic coding gives us a coherent semantic world. We don’t need an internal copy of the world to handle the world. Recent theories of emotional constructionism (Barrett and Simmons 2015; Barrett 2017) have replicated the usual problems by treating emotions on the model of representational concepts. According to this view, interoceptive experiences are collected and constructed by us (unconsciously and consciously) into concepts that we call “anger” or “lust” or “sadness.” On this view, we need constitutive labeling language to do this organizing of internal affective states, because those inner states are too vague or imprecise to determine a specific identifiable emotion and behavioral responses.

This view of emotions and the mind generally is popular but unconvincing (see Asma and Gabriel 2019; Cowen et al. 2019; Keltner et al. 2019). Neuroscience reveals some diversity of neural pathways during anger, or lust, for example, but not enough diversity to confound the density distributions of the data (Panksepp 1998; Damasio 1999; Davidson and Begley 2012; Berridge 2018; Damasio 2018; Knutson and Srirangarajan 2019; Burgdorf, Brudzynski, and Moskal 2020). One problem with characterizing the mind and emotions as concepts or conceptual, is that it constitutes a kind of speciesism. The idea that emotion depends on higher conceptual cognition, the understanding of cultural context, and language, means that non-human animals and even babies don’t have emotions. This seems remarkably inconsistent with evidence from animal studies, developmental psychology, and neuroscience, as well as common sense.

My MC theory avoids these problems by placing conceptual thinking at the end (phylogenetically and ontogenetically) of cognitive development, not at the beginning. Instead of conceptually modeling the world, the imagination is absorbing, reading, and processing physical and social “affordances”—storing them in the memory for later predictions, creative constructions, expressions, and behaviors. First proposed by psychologist James Gibson (1966), affordances are relational properties that afford actions/feelings, and they come from the ecological relationship between the perceiver and perceived thing (Romdenh-Romluc 2011; Withagen et al. 2012; Van Dijk and Rietveld 2020). A chimpanzee, for example, *sees* the posture of the new approaching chimp as dominant—the dominance and subordinance exists in the real-time relationship between the two animals’ bodies and behaviors. The chimp doesn’t need to use concepts to reason about the relationship, because the perception itself contains a lot of actionable information and prediction about status, disposition, character, and possible behaviors. Humans call this subtle processing “reading the room,” and a lifetime of subconsciously reading rooms (reading people) gives us a palette of insights, feelings, and behaviors (Jensen and Pedersen 2016).

Perception is usually *perception for action*, for doing something or pursuing a goal or intention. Objects in the world are sit-able, or climbable, but my awareness of my own body is also comprised of affordances—I understand (pre-reflectively) that I’m over 4 feet tall, and under 10 feet tall. I have a general sense of what height I can reach, what distance my step will take me, and so on. Understanding what object in the room is hide-under-able, is also understanding roughly how big and flexible my body is. I gain this associational knowledge by particular experience and inner simulations rather than deduction, induction, or inferential logic generally. Imagination is a mental workspace for running affordance scenarios. As Hubert Dreyfus (2014) puts it, the world is made of “for whats,” not “whats.”

**Empirical Pathways**

Obviously empirical research is the way forward for a mythopoetic cognitive science. Happily, good work is emerging. I will mention a few approaches and studies as examples to illustrate how MC can mature into a full-fledged paradigm.

Exciting research is now emerging on the difference between phantasiac and aphantasiac minds. Aphantasia is a mental condition in which a person cannot voluntarily visualize mental imagery. Aphantasiacs also report difficulty calling up mental representations of other sensory experiences as well (sounds, smells, touch). People with aphantasia still have involuntary imagery, as in the case of dreaming, but they may have a deficit when activating the visual cortex or other sensory memories in waking life.

This work is only beginning (see Zeman, Dewar, and Della Sala 2015; Keogh and Pearson 2018), but it suggests that some people have more imaginative cognitive systems than others. It may be the case that neurotypical minds have an easy facility with quasi-visual mental formations, and atypical minds reside at the ends of this bell-curve. But if more data reveal a clearer picture of overall population numbers for aphantasia and they are high (e.g., similar to left-handedness), then there may indeed be two different modal channels of cognition. Preliminary data suggests for example that aphantasiacs are more represented in quantitative science and math vocations, whereas phantasiacs are more represented in the arts (Zeman et al. 2020). Another interesting study hypothesizes that the traditional “two-cultures” divide between sciences and humanities, described by C.P. Snow, may in fact be a result of cognitive orientation rather than disciplinary cultures. Tanaka (2012) argues that autistic minds are extreme forms of “mechanistic” thinking (low attribution of other minds), and psychotic spectrum disordered minds are at the opposite end of this continuum—seeing “minds” everywhere. The rest of us, according to Tanaka, reside somewhere in the bell-curve middle of this continuum.

The distinction that I’ve been drawing throughout this paper between the Dominant Model of cognition (DM) and the mythopoetic model corresponds remarkably well with the aphantasia and phantasia cognitive styles now emerging (and possibly Tanaka’s continuum as well). Consequently, the dominance of propositional/computational theories of mind (as opposed to embodied theories like MC) could be a reflection of the dominance of aphantasiacs working in philosophy and cognitive science.

Another empirical direction that is very promising is the experimental work being done on the “fiction as rehearsal” thesis. Some researchers have started testing the details of this prediction (Felski 2008; Mar, Oatley, and Peterson 2009; Kaufman and Libby 2012; Murphy 2012; van Krieken 2018; Bilandzic, Schnell, and Sukalla 2019). All this work strengthens the MC theory that imagination is an adaptive cognitive operating system, still working in the modern mind. Raymond Mar (2018)finds evidence that readers of fiction score better in understanding the social world, and readers of non-fiction score better in understanding the physical world. That is a bold and controversial claim and needs additional experimental corroboration, but if true it gives strong confirmation to the claim that MC is an adaptive form of social intelligence.

A recent study (Scrivner et al. 2021) reveals fascinating data about a specific case of adaptive imagination, but also serves as a model for future empirical work. Testing the “fiction as rehearsal” thesis, investigators conducted a study during the COVID-19 pandemic to see if past and current engagement with media fictions, including horror and pandemic films, could be correlated with greater preparedness for and psychological resilience toward the pandemic. They found that fans of horror exhibited greater resilience during the COVID-19 pandemic and that fans of “prepper” genres (e.g., apocalypse and zombie films) exhibited both greater resilience and preparedness. The investigators conclude that exposure to frightening fiction allows audiences to practice coping strategies that may translate well to real-world situations.

Horror in particular is a good imaginative genre for research because fear is so clearly adaptive (Darwin 1871, 1872; Panksepp 1998; Clasen 2017; Asma and Gabriel 2019), and so physiologically measurable. The Recreational Fear Lab at Aarhus University Denmark, led by Mathias Clasen, is providing another robust empirical research program studying the nuances of fear, especially the consumption of imaginative horror experiences. Tracking subjects through multiple data collection vectors (e.g., phenomenological self-report, eye-tracking, galvanic response, heart-rate monitors, and video recordings), the investigators follow subjects through haunted houses during Halloween season (Andersen et al. 2020). The lab is discovering specific physiological states (heart rate fluctuation) that correlate with subject-reported fear enjoyment, but also showing how experimental research into imaginative psychology and culture can be done. Studies like those of the Recreational Fear Lab may tell us which affective triggers, contextual factors, personality dispositions, and cognitive expectations are constitutive of adaptive imaginative experiences and MC processing generally. Adding neuroimaging research like fMRI to this empirical work will only deepen our insight into how and why humans use imaginative experiences.

Some very fine-grained empirical work that promises to bolster mythopoetic cognition and embodied cognition generally is exemplified by the work of the Embodied Cognition Lab at Lancaster University (Carney 2020). The Lancaster norms project is mapping the sensorimotor associations of 40,000 concepts in English (Lynott et al. 2020). Online subjects rate large numbers of concepts, correlating embodied experiences. This work can reveal the subtle affective semantics that make somatic meaning coherent at the personal and even cultural level. It has the potential to show how human appraisal, evaluation, and preferential judgment operate at the somatic level—prior to rational processing—through the build-up of associational/connotative conditioning. Interestingly, this research is based on the sensorimotor responses to words/concepts, so it will be helpful for understanding propositionally rich imaginative experiences like literature, but similar fine-grained studies will need to be done on pictorial imagery, and dramatic arcs as well. Similar empirical research is underway on music and this is very promising because it goes to the pre-propositional affective semantics that probably evolved well before spoken language and other symbol systems (Dissanayake 2000b; Hagen and Bryant 2003; Hagen and Hammerstein 2009; Egermann et al. 2015; Killin 2018; Angulo-Perkins and Concha 2019; Bainbridge et al. 2020).

Finally, important neuroimaging research is starting to happen on specific aspects of mythopoetic cognition (Jones 2017; Horikawa et al. 2020; Koide-Majima, Naki, and Nishimoto 2020). As I discussed above, animistic cognition is ubiquitous in humans, especially agentive attribution and teleological attribution. Research by Wheatley, Milleville, and Martin (2007) and Looser and Wheatley (2010) looks at brain activity during animacy attribution for example, trying to ascertain which neural systems are activated when we think of something as animate rather than inanimate. This empirical approach is very promising and could be tailored to questions of agency detection in general, and protagonist thinking in particular. Are different neural systems recruited when we shift from seeing nature as blind causal machine to dramatic, agentive and goal-directed?

**Conclusion**

Philosopher Galen Strawson (2015) disagrees with the idea that we all position ourselves in a narrative version of our lives. His objection seems to be a normative claim that narrative thinking leads to compromises and revisionist recreations of ourselves. He finds this pusillanimous and thinks we shouldn’t do it. But this is not a refutation so much as an expression of distaste. Strawson rehearses the usual critique about the storied life—“but is it true?” He dismisses the mythopoetic self as non-veridical, but I have been arguing that the older and more foundational function of mind is “hedonic sharpening” or, if you like, “biological flourishing;” not accuracy of indicative models and theories. The latter serves the former, in my view, not the other way around.

More importantly, the idea that our mythopoetic constructions are always self-aggrandizing is false, as we frequently narrativize dark elements of our lives—reliving failures, traumas, and tragedies (Ruebsaat 2013). Indeed, like dreams, which are predominantly negative, stories tend toward strife, stress, and drama because they are threat rehearsal spaces (Revonsuo 2000; Pesonen et al. 2020). These imaginings can become pathological (Somer 2002) but are not generally ego-trip indulgences of wishful thinking. They are ways of pragmatic sense-making. They are not cowardly falsifications of the world but attempts to get a better grip through imaginative trial-and-error runs.

The goal of this paper is not a normative argument for poetic truth over objective truth, but rather a revaluation of their respective importance and function. Academia in general and cognitive science in particular have either ignored poetic cognition or dismissed it as non-epistemic. Abuses of poetic cognition (e.g., conspiracy theories, wishful thinking, cultish worldviews) are taken as tokens of mythopoesis generally, and this prevents deeper examination of the imperative/motivated mind at the core of human experience. That’s not to say we don’t use story for self-aggrandizement and egoistic fantasies (Kjeldgaard-Christiansen et al. 2021), but that is only one such function. Poetic truth is a sense-making version of reality that gives power in many ways (personal, social, political). But this must be understood as a fundamental Darwinian adaptation rather than an intrinsic corruption of knowledge. In most human endeavors, plot is more important than truth.

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