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# Vol. 5, issue 2, Fall 2021

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# Adaptive Imagination: Toward a Mythopoetic Cognitive Science

Stephen Asma

## 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*'s cognition. This article will (i) outline the essential features of mythopoetic cognition or adaptive imagination, (ii) delineate the adaptive sociocultural 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*'s 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 sociocultural 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 nonrational 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 prereflective 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 prescientific 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 nonhumanoid substrates, including rivers, trees, prairies, mountains, and of course nonhuman animals (Ojalehto, Waxman, and Medin 2013; Whyte 2013). Nature and the physical world generally is populated with nonhuman 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 attacks, 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 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 dream life 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 lives even of our own family members are relatively opaque by comparison. Art allows for first-person embodiment of characters that in real life remain second-person or third-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 twentieth century. Most importantly, many evolutionary researchers (Richerson and Boyd 2005; Henrich 2015) have argued persuasively for gene-culture coevolution, 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 versus 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 nonlinguistic, 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 nonhuman 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 well-being (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 400 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 nonimmediate 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 nonhumans (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 antislavery 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 as 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 prepropositional, 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 nonhuman 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 sociocultural 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 hear about Robert Johnson's deal with the devil in "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 particular, 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. Nonhuman 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 the 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 18). 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., your prediction of an impending dog attack is 34%, say . . .), 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 nonpresent (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) describes 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 nonhuman 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 (prereflectively) that I'm over four 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 nonfiction 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 prepropositional 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 nonveridical, 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 nonepistemic. 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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# The Problem of Equating Content with Process in the Mythopoetic Model

Anna Abraham

The target article sees Asma distinguishing the characteristics and workings of the "mythopoetic mind" from that of its counterpart; a counterpart that turns out to be a bit of a shapeshifter as it is nameless and inconsistent in form. Depending on which part of the paper one is attending to, this counterpart to the mythopoetic mind could be referring to the representational mind, the propositional mind, the rational mind, the Western mind, the modern mind, the impersonal mind, the unemotional mind, the conceptual mind, the objective mind, and so on.

There are two directions this commentary could take. One approach would be to contrast the mythopoetic model of the mind with the so-called dominant model to see which has better explanatory power. Unfortunately, the scanty citations provided in the feature paper in relation to the dominant model do not actually indicate who the proponents of this view are and which of their works form the basis of these claims. In the absence of explicit detailing of this information, the reader has to speculate to determine (a) which scholars within the fields of "cognitive science, philosophy of mind, and evolutionary psychology" the author is referring to, and (b) whether the dominant model of the mind is indeed what the culprit scholars subscribe to, or if it is merely the case that their particular microlevels of scholarly analysis do not actually extend to the kind of big picture views of the mind that Asma is arguing for.

The approach taken in this commentary, therefore, is necessarily an alternative one. It takes the proposed mythopoetic model at face value, and reflects on the many questions this view of the mind raises. In doing so, three selected considerations are highlighted.

## 1. Process/Content Confusion

The idea of indicative versus imperative channels of knowledge is invoked by the author when attempting to situate the mythopoetic mind. The distinction made is one between the type of knowledge that is purely descriptive in relation to a stimulus (indicative: "this is a snake") and the type of knowledge that attributes what can probably be described as action tendencies to that stimulus (imperative: "I should run away"). However, to support this idea that a distinction in the type of knowledge *content* is central to defining the mythopoetic mind, Asma does not cite literature on conceptual knowledge, but instead leans on dual *process* models to make his case. Dual model explanations of how the mind works are ubiquitous in the literature and are applied to all levels of psychological function, including perception (top-down versus bottom-up [Kastner and Ungerleider 2000)], emotion (conscious versus unconscious [Smith and Lane 2015]), memory (implicit versus explicit [Squire and Zola 1996]), language (automatic versus controlled [Jeon and Friederici 2015]), problem solving (intuitive versus analytical [Pretz 2008]), social cognition (reflexive versus reflective [Satpute and Lieberman 2006]), and reasoning (intuitive versus reflective [Evans and Stanovich 2013]), to name a few. However, they do not map onto the Asma distinction of indicative versus imperative knowledge content. This is because modes of processing are not

necessarily paired one-to-one with specific content. The burden of explanation hence is to make a convincing case for how and why content in the mythopoetic model is tied to one stream of processing.

## 2. Animism in How We See the World Versus How We Explain the World

The conflation of process and content continues in the discussion of animism. Asma states: "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." The mythopoetic mind, then, is a stable way of perceiving and engaging with the world (premise A) that has become dormant in Western developed nations (premise B), a claim based on a lack of evidence in such nations of "the belief/behavior that nature and the physical world generally is populated with nonhuman agentive minds and goals" (premise C). Premises A and B raise the issue of whether the author is proposing that different models of the mind are required to account for cross-cultural differences. In this reading, the dominant model may not be "fundamentally flawed" but rather misplaced or overemphasized depending on the cultural context. Premise C suggests that what matters for the mythopoetic mind is not *that* we tell stories, but *what kind* of stories we tell. That is to say, it is precisely how we explain our world (which is culturally bound) that matters to the mythopoetic mind, not how we see our world as human beings (which in large part relies on general purpose operations of the mind). This is noteworthy when considering evidence that demonstrates the penchant for the human mind to readily read personal significance into seemingly neutral contexts (Sui, Rotshtein, and Humphreys 2013; Abraham 2015), and that our perceptual systems are generally primed to ascribe animacy, agency, and attributions even when deriving explanations of events containing nonsocial stimuli (Heider and Simmel 1944; Bloom and Veres 1999; Scholl and Tremoulet 2000). This fits with the idea of the intentional stance, which holds that an involuntary reading of intentions will occur even in sparse, low-narrative contexts when the events that unfold cannot be explained by applying a physical stance (appealing to immutable laws of nature) or a design stance (based on preordained properties of an artefact) (Dennett 1987). The question for the mythopoetic model, then, is to specify the parameters of the type of story that engages the mythopoetic mind, and how the processes involved differ from these general purpose mechanisms of reflexive intention ascription.

## 3. Deriving the Mythopoetic Mind from Mythopoetic Processes

The author derives insights about the mythopoetic mind based on work that examines purportedly mythopoetic operations (e.g., engaging with fiction). Making a case for the principal involvement of the default mode brain network (DMN) in the mythopoetic mind based on empirical research on daydreaming is a particularly curious choice for a model that is repeatedly characterized throughout the paper as one that is nonrepresentational, noninferential, embodied, enactive, and extended. The DMN, after all, is notably "suppressed during tasks that demand external attention" and is engaged during states of internal mentation tapped by tasks involving "remembering, envisioning the future and making inferences about other people's beliefs" (Buckner and DiNicola 2019, 593, 596). In the same vein, the claim that the lack of imagery in the case of aphantasia and "the low attribution of other minds" in the case of autism is evidence of the unimaginative counterpart to the mythopoetic mind not only constitutes a blunt lumping together of very different facets of imagination (Abraham 2016; 2020), but also provides no explanation of the preserved/enhanced

imagination that can and does occur in such populations (e.g., Maras et al. 2014; Kasirer, Adi-Japha, and Mashal 2020).

Notwithstanding the many thorny issues that come with juxtapositions of simple binaries like the exotic old world/mind versus the mechanistic new world/mind, the examination of the utility of the mythopoetic model cannot be established by merely going head-to-head with an amorphous dominant model. It also needs to address how it offers a better explanation of the human mind than other models of the imagination that are similarly informed by psychological, neuroscientific, evolutionary, and philosophical traditions (e.g., Schacter et al. 2012; Mullally and Maguire 2013; Abraham and Bubic 2015; Abraham 2016; Irish 2020; Andrews-Hanna and Grilli 2021).

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# Mythopoetic Cognition Is a Form of Autobiographical Simulation

Donna Rose Addis

In a compelling paper, Asma critiques the dominant model (DM) in cognitive psychology as reducing experiences to descriptive concepts and categories governed by rules and logic. In contrast, his model of mythopoetic cognition (MC) conceives of the mind as primarily an embodied simulation system that draws on motor-sensory-cognitive loops that provide the means of (en)acting responses necessary for survival; logical indicative cognition is an optional extra. Although Asma's view stands in contrast to the DM, it does speak to one area of cognitive psychology: autobiographical cognition (AC). Here, I outline the ways in which MC overlaps with current conceptualizations of AC, including an emphasis on internal experience, the relative unimportance of objective truth and fine-grained detail, and the incorporation of nonverbal and/or implicit content. I end by proposing that MC is likely just one form of an expansive range of ACs.

In my recent model of AC (Addis 2020), I argue that our stream of consciousness is dominated by simulations that seamlessly combine perceived, remembered, and imagined experiences. Underpinned by the brain's default mode network (DMN), AC can occur spontaneously or with little direction, particularly when "mind-wandering" (Andrews-Hanna 2012). However, contrary to Asma's depiction of this state as "goal-diminished," mind-wandering is often biased by affective-motivational states to center on current concerns and goals (Baird, Smallwood, and Schooler 2011) or constrained by preservative or overlearned patterns of thought, such as rumination (Ottaviani, Shapiro, and Couyoumdjian 2013). Additionally, the DMN can be purposefully harnessed to intentionally remember the past or imagine the future. The DMN or AC is not, however, limited to self-relevant thoughts; this neurocognitive machinery is engaged when solving problems and thinking creatively, when imagining the minds or experiences of others (i.e., Theory of Mind), and when absorbed in fiction (Andrews-Hanna 2012; Richardson 2012). Like Asma, I argue that neurocognitive modules dedicated to different forms of simulation are unlikely to exist; instead the DMN is a domain general simulator that can be utilized to construct an infinite array of inner experiences (Addis 2020).

The brain's simulation system is highly flexible and adaptive. Imagining ourselves (and others) in hypothetical situations provides opportunities to refine and hone our behaviors—our actions, interactions, and reactions—should similar situations actually arise in the future (Schacter 2012). Adaptive imagination need not be prospective. Reworking past experiences, including integrating them to construct life stories and extract meaning, can reveal useful insights into why events played out the way they did and how they could have turned out differently (counterfactual thinking). Whether instantiated during internal mentation, imaginative play, conversations, or even psychotherapy, these forms of simulation help us "unpack" the dramas of everyday life, come to know our intentions, motivations, patterns of behaviors (including conditioned responses) and those of others, and to learn about the consequences of our decisions and behaviors.

Internal experiences, such as intuitions, emotions, intentions—and simulations themselves—are central to both MC and AC. This is unsurprising given that some level of internal experience is omnipresent, with agency and self-awareness core aspects of the conscious self (Damasio 1999). There is, however, a long-standing tension between the study of internal phenomena and the experimental traditions of the DM that require a degree of objective verification (Miloyan, McFarlane, and Suddendorf 2019). While some experimental AC measures capture both internal and external experience (Tulving 1985), other approaches focus on the current subjective experience of remembering the original details, such as having a "field" perspective where the self looks outward on external happenings (D'Argembeau, Comblain, and Van der Linden 2003). Notably, many simulations that people generate do not fit easily into frameworks that strictly demarcate internal and external experience. For instance, we can imagine scenarios from any perspective: an observer perspective on events we experienced firsthand, or a field perspective on events we never experienced. We can even combine the two: I remember, from an observer perspective, myself on the phone as my mother described herself cutting her hand while cooking *and* I remember the simulation I constructed whilst listening to her, in which I was observing this event unfolding from a field perspective as if I was sitting at her kitchen counter.

The centrality of internal experiences, and the reworking and revising of past experiences to fit current and future needs, raises the question of whether accuracy is even necessary to convey an adaptive benefit. Decades of research has established that memory is a reconstruction of details comprising an event with varying degrees of accuracy (Schacter 2012). However, the resolution of detail appears to matter. Supporting Asma's point that real-world success is unlikely to hinge on fine-grained details, findings show that the gist of experiences can be recalled at above-chance levels, while the precision of individual event details is relatively poor (Cooper and Ritchey 2019). Moreover, despite the "episodic-centric" focus of cognitive science on unique events and fine-grained detail, and the tendency to pathologize more general or gist-based constructions (e.g., in aging and depression [Williams and Scott 1988; Addis, Wong, and Schacter 2008]), there is evidence to suggest episodic simulations are the exception rather than the rule in non-Western cultures (Wang 2019). Indeed, the most efficient way of understanding and retaining the vast amounts of information we encounter on a daily basis with as sufficient accuracy as is necessary is in the forms of stories (Mar et al. 2021), with schemas helping to structure and sequence our simulations of the world (Addis 2020).

Further reducing the need to capture every fine-grained detail, our simulation system can "fill in" the gaps with details that, although imaginary, are consistent with the gist of the story and our understanding of the world (Bartlett 1932). Thus, that memory is constructive blurs the line between the external and internal, and reduces—or even eliminates—the distinction between memory and imagination, and between truth and fiction (Michaelian 2016; Addis 2020). A recent debate in the literature has focused on this issue: How much experienced content does a memory need to possess for it to be considered "real"? Akhtar et al. (2018) argue that memories of childhood events experienced before language is acquired are largely fictional. However, the argument that young children cannot form memories because they cannot describe their experiences is to deny the multifaceted nature of lived experience. Notably, adults also form memories that lack narrative cohesion, such as fragmentary memories of highly traumatic situations (Brewin 2014). Simulations will take whatever form is most useful in the present moment, whether this involves verbalizing a past event with words and concepts acquired since the original experience (Bauer et al. 2019), or omitting aspects of the original experience that are not functional or do

not fit with cultural norms. For instance, relative to European American participants, those of East Asian origin focus less on the idiosyncratic details of their experiences, including emotions and internal thoughts (Wang 2019). Indeed, this may also be evident in other cultures where the "self" is not individual but rather embedded in a relational space (e.g., *whanaungatanga* in Māori culture; *le va fealoa'i* in Samoan culture)[1] which, as Asma describes, can include both the animate and the animated. Simulations are dynamic constructions not only shaped by the contents of our experiences and our current needs/goals but also by cultural expectations, constructions of self, and the language we have available.

The focus on verbal content in AC research reflects, of course, a methodological constraint. Even so, it is easy for researchers to forget that the array of possible ACs that could comprise a simulation is limited only by the bounds of our external *and* internal experience. By this view, simulations go well beyond language and propositions to include: perceptions of the external world (e.g., images, sounds, odours, tastes, physical sensations [Willander, Sikström, and Karlsson 2015]); thoughts (e.g., evaluations, goals, mental imagery of any sort—visual, musical, kinaesthetic, etc.), other simulations (past/future/fictional events, other minds) that come to mind intentionally or involuntarily; and our inner milieu including affective-motivational states, attentional states, and meta-cognitive states. Moreover, Asma reminds us of the importance of implicit cognitions that are concurrently active and shape our responses, including somatic markers, conditioned associations, and motor programs, as well as their conscious manifestations (e.g., intuitions, emotions, motivations, and agency). Although memory researchers draw a line between the explicit and implicit, there is increasing focus in the DM on the ongoing integration of these two forms of cognition, for instance, in work exploring the interface of explicit event memory and implicit oculomotor behavior (i.e., eye movements [Ryan and Shen 2020]).

The brain's simulation system is capable of generating a multiplicity of autobiographical simulations, from highly elaborate narratives that capture years of our lives to individual fragments of experience. The DMN provides the relational machinery to integrate and update our ongoing internal and external experience as it accumulates, all the while using schemas to structure this experience and optimize meaning (Addis 2020). Although Asma contends that an "elaborate, internal, mental model of the social world" is unnecessary for functional success, the DMN clearly provides a general simulation capacity that is utilized for an extensive range of autobiographical simulations, of which MC is but a subset. This explanation recasts the apparent "flaws" in the system (when viewed from a Western perspective), such as its penchant for subjective information that is often "low resolution" and lacking precision, as adaptations that maximize the ability to process and draw meaning from our complex and dynamic experiences—both external and internal—with a view to enhancing our future success.

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[1] The author is New Zealand-born and of Samoan ancestry.

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# Neurocognitive and Evolutionary Perspective on Adaptive Imagination

Fatima M. Felisberti and Robert J. King

Asma examines the links between adaptive imagination and mental imagery (e.g., aphatasics vs. phantasics) as well as self-perception (e.g., interoception), but only briefly. Such an endeavor involves a web of evolutionary processes that led to the development of complex, and often entangled, brain networks dedicated to the processing of contextualized information related to the self. Here, we provide further evidence that may enrich his mythopoetic insights, since mental imagery and self-perception are essential to introspective, retrospective, and prospective behaviors. We also challenge the author to elaborate further on how those processes may contribute to adaptive imagination from both evolutionary and neurocognitive perspectives. Finally, we argue that insufficient attention has been paid to the full range and depth of neo-Darwinian explanations already on offer to explain the adaptive features of human behavioral traits. In particular, we suggest that Asma overlooks the Baldwin Effect (Baldwin 1896), which might be usefully invoked to help explain some of the lacunae in Asma's call for a mythopoetic cognitive science.

## The Baldwin Effect

Asma states the following when talking about *functions*: "If adaptive imagination is ubiquitous, then it is either an adaptation, an exaptation, or a by-product (spandrel) of other adaptations." While frequently believed, this is not quite true. Failures to grasp what Darwinian explanations offer in terms of explanatory clout—traditional Darwinian explanations, as well as those derived from the more recent "new synthesis"—have led to repeated calls for bloated ontologies (such as gene-culture co-evolution and niche construction).

To start with, the development of human skills is not necessarily genetically encoded. Farming, which emerged simultaneously in different continents and cultures after the ice age due to improved weather conditions, paved the way for physical and social changes in unexpected directions (Mithen 2007). Instead of an existing genetic variation being subject to natural selection in the existing environment (normal evolution), the environment itself can evoke phenotypic, rather that genetic, variation and this can *then* become genetically fixed. This is called the Baldwin (1896) Effect. Such a process is a reasonable candidate for what Asma is proposing because the varying environment of threats and opportunities is, of course, the large range of social interactions in which humans can be engaged. The ability to rapidly acquire strategically useful social information—in all the forms he describes—is exactly the sort of candidate trait for a Baldwin Effect explanation that we find in other species. Baldwin himself suggests that predator avoidance may be conveyed in birds by rapid acquisition of fear responses to silhouettes prompted by parental reactions.

The fact that these responses generate internal representations that we can see as myths—which can be shared with conspecifics—begins to make a lot more sense. They seem real, and in many senses, *are* real to those involved. They are as real as colors. For example,

think how much information is conveyed in a story by a term like "witch" (ageing, malevolent female with uncanny powers and special antipathy towards children) or "big bad wolf" (bestial, yet cunning and deceptive, male predatory behavior with sexual overtones) and think about how much coding would be required to represent such frames in AI terms. Stories, and the mythopoeic imagination, are efficient in this way (King 2015). However, if anything exists as a by-product of this strong tendency to ascribe intentionality promiscuously, and in recognizable packets of character, then it is likely to be, as the author states, "a significant element of animism." The by-product is likely to be akin to pareidolia—the ease of seeing faces where none exist (in clouds, say) because of the gain being turned up in our perceptual systems due to the extreme salience of faces in our *Umwelt*. The fitness contribution of this part of the mythopoeic vision is much less clear than the factual knowledge of which plants cure which ailments, or which people are likely to be trustworthy.

In terms of proximate processes underlying the empirical pathways relevant to the adaptive imagination paradigm, it is important to include mental imagery and self-perception.

## Mental imagery

Mental imagery refers to *quasi*-perceptual experiences, often visual in nature, which can include a plethora of cognitive, environmental, and sensory information. It straddles times, from introspection (to look inward, a self-examination of feelings, acts, and states) and retrospection (episodic remembering, an ability to "travel back in time"), to prospection (an ability to "travel into the future").

The existence, nature, and affordances of mental imagery led to heated debates between philosophers and scientists in the late 1960s and early '70s. The empirical studies that followed showed that such imagery is not only relevant to memory and motivation, but also to semantic grounding for language, reasoning (Kosslyn et al. 2003), and even cognitive processes (such as those involving career choices [Pérez-Fabello et al. 2018]). The brain networks involved in mental imagery are complex and distributed: a left hemisphere supramodal, two modality-specific bilateral networks for auditory and visual imagery, and a deactivation network (suppressed during mental imagery) (Zvyagintsev et al. 2013).

Adaptive imagination and mental imagery resonate on many levels, as both are integral to our survival and associated with inner worlds that conflate past events and memories with the creation of desired or feared imaginary futures, incorporating their emotional tones, actions, and perceptions. It is not clear, however, where and how mental imagery processing differs from, or integrates with, the adaptive imagination paradigm. Here is one suggestion: the physical threats and opportunities of particular ecologies (e.g., trees that can be climbed to reach the honey of wild bees, snakes that may be hiding in the long grass) represent, among other things, when combined with a mature body image (see below), a set of *affordances* that form part of the embodied cognition of both the individual and their shared cultural environment. It is not clear to us that any special dual inheritance or extra epistemological ontology is required to add to this paradigm or, if it is, what is additionally explained.

## Self-Perception

It has been argued that a brain that needs to be able to tell (and understand) the story of others also needs to be able to tell (and understand) a story of itself. This story is normally, at least in fitness terms, connected to reality. Said reality may not be in terms of strict local fitness maximization, but it cannot be wholly disconnected; else the organism would not have survived. The perception of one's *self* has been linked to two important aspects of brain activity: lateralization and the "default mode" activation and deactivation; neither of them has been addressed in

depth by Asma in his adaptive imagination paradigm.

Brain lateralization was demonstrated empirically by Roger Sperry and collaborators in split-brain patients in the '60s. The studies with those patients demonstrated that although lateralization of brain function is only partial, it is irrefutable, despite some nonsensical beliefs in folk psychology. Evolutionary selection shaped brain asymmetries in humans, who saw their corpus callosum—the structure that connects the two hemispheres—not only shrink in (relative) size, but also assume a stronger inhibitory role. The left hemisphere tends to selectively attend to linguistic and cognitive processes, fine motor control, and self-reflection (a "narrow focus of attention"), while the right hemisphere tends to be more involved in visuospatial processing and social bonding, which demands a "broader focus of attention" (de Haan et al. 2020; McGilchrist 2009).

We tend to perceive ourselves as the "I" and the "me/myself"; one-self that reaches outwards in time and space, and one-self that is the center of narrative gravity (Dennett 1992). The ability of the left hemisphere (via frontal cortical areas) to process concreted, verbal, and embodied information (i.e., metaphors, implicit learning, emotions) is essential to rationality, and it seems to function as an "analyzer" of self-behavior and concoct explanations that would make sense in the context in which such behavior was triggered, no matter if they are real or not (as attested in split-brain patients). The right hemisphere, on the other hand (no pun intended), seems to function as a holistic and metaphorical "interpreter" of the world in which our behavior is embedded (McGilchrist 2009).

Other studies suggests that specific interactions between stimulus-induced activity and resting state activity in the midline brain regions overlapping with the default mode network (DMN) also contribute to the sense of self. The DMN, which is often activated during self-reflection, encompasses a group of distinct cortical and subcortical areas which are essential to the integration of neural processing. An increase in DMN activity is commonly observed during autobiographical, semantic, and episodic memory, mind wandering, perspective-taking, or future thinking tasks, while a decrease in DMN activity is associated with tasks demanding attention or oriented externally to the self (Qin and Northoff 2011). The emergence of a self-centered narrative enabled by the changes in DMN activity and brain lateralization may underpin the neurocognitive framework for an adaptive imagination. What remains to be explained is the existence of not one, but many *selves*; the possibility of islands of consciousness in one single brain, which can overlap with each other, like Venn diagrams, and can, or cannot, be fully integrated. That this sense of fluid selves will integrate with the wide social and ecologically embodied "one" *self* seems to be a fruitful line of research (Fadiman and Gruber 2020).

By drawing attention to the way we humans *self*-perceive and communicate, Asma raises interesting and provocative questions that deserve attention.

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# The Perils of MC, Lost in the Forest of DM

Geoffrey Galt Harpham

I am writing in the midst of two singular events, or rather two events that I would call singular if one of them had not already occurred twice and the other might never stop occurring. I am referring, of course, to the impeachment trial of Donald Trump and to the COVID-19 pandemic.

Oddly, these events share a distinctive feature, a confounding of the categories that define them. COVID-19 is a highly contagious disease of the sort that should provoke general alarm, and yet some people refuse to protect themselves, arguing that prudence would be inconsistent with freedom, without which, they say, life is not worth living. The disease kills, in terrifying numbers—the US has just raced past the half-million mark—but many of those who contract the illness remain ignorant of the fact, and go out and infect others, as oblivious as their victims to the fact that they are carriers of death.

Such a structural confusion also characterized the impeachment trial of President Donald Trump. Formal legal processes such as impeachment testify to the rule of law, but in this case, the accused is the nation's chief law enforcement officer. To make matters worse, the members of Congress whose lives were endangered by the insurrection were, like the president, part of the legal establishment. Still, some of them were apparently co-conspirators, who nevertheless actively assisted in the defense before serving on the jury. What a mess.

As these things were happening, I read Professor Asma's prodigious effusion on mythopoetic cognition (MC)—and found myself in very familiar territory.

What is MC? According to Asma, it is a system, or rather several systems—a "simulation system," a "semantic system," a "system for mythopoetic cognition," a "prelinguistic human cognitive system," and the "default human operating system." A lot of systematicity, but one would like to know more precisely what Asma means by "system." What constitutes a system in the brain? Is it defined by the parts of the brain involved, or by the kinds of interactions between parts of the brain? Does the brain construct the system all by itself, is it learned, or is it naturally occurring? What kinds of evidence do we have for it; how do we know it's in there? How many such systems does the brain contain? All brains, or only some? Do brain systems interfere with, complement, negate, or dominate each other?

Asma does not entertain these general questions, but focuses on the relation of MC to another system with which it shares quarters in the brain: the "*dominant model* (DM)," a kind of precipitate, or outgrowth, or perhaps an adaptation, of MC with an altogether different MO. In contrast to DM, MC is holistic rather than segmented, concrete rather than abstract, metaphorical rather than literal, animistic rather than static, emotional rather than logical, oriented toward the sacred rather than the secular, and narrative rather than conceptual.

It appears from the way Asma constructs the opposition that systematicity as such might be characterized as a creation of, or perhaps as evidence for, DM. Be that as it may, Asma's argument is that, once upon a time, MC reigned over the mind unchallenged, but then DM appeared, and over the course of many millennia created

the modern, rational, scientific, progress-oriented West, an ethos and a discourse exemplified—one cannot help but notice—by Professor Asma's own essay.

And therein hangs a tale. For in Asma's account, DM has achieved its dominance at the expense of MC, which Asma argues nevertheless constitutes the "heart," "core," and "trunk" of the tree of human cognition: "All *Hominina* probably thought this [MC] way," he declares, "and many humans still do (including ourselves as children)." Indeed, so foundational to mammalian brain functioning is MC that traces of it can be detected in "decorticated rodents and hydrancephalic children." But in today's world, or at least the adult, rational part of today's world, MC, the veritable Mother of Cognition, is a diminished thing, waning as DM has waxed. This doomed struggle, ancient in origin, is reenacted in each person born into a "modern" world—a very large number which Asma, taking the long view, still characterizes as "a small subset of humans."

To explain what happened, Asma turns to a metaphor drawn from the heart of DM itself, saying that DM "rewrites" MC, producing a mental bias that, over time, becomes a cultural bias in favor of "an idealized rule-governed rationality." But I wonder about the adequacy of this metaphor in describing such a vast process, and suspect that Professor Asma's narrative ambitions are greater than "rewriting" suggests.

The story begins long ago, "somewhere between 200,000 and 30,000 years ago," as Asma says, with less precision than one might wish, when a catastrophe akin to a meteor strike or an obliterating flood befell humankind, altering the brains of those affected. DM, having been birthed by MC and charged with such vital and necessary tasks as making fire, clothing, shelter, tools, and so on, turned on its loving parent—who, for its part, was as blameless as Duncan for Macbeth's treachery—and usurped its place in the mind. The unnatural violence of the event makes one suspect that DM might have been a changeling, or, like Heathcliff, an adopted orphan of doubtful parentage; or perhaps simply a bad seed like Richard III—dark, deformed, and unnatural; or maybe a ruthless, grasping, and cruel child, like Goneril or Regan.

The catastrophe did not befall a single sacrificial individual, but the entire species; or rather, it befell all those who for whatever reason became modern, whether by choice or inheritance. And from that point on, whenever that point was (if it was indeed a point at all), MC was demoted, becoming the beta to DM's update, knowable even to itself only in the terms provided by its master ("default operating system"), and holding sway only over a diminishing number of adults, and those the least distinguished or ambitious. Perhaps as compensation, or perhaps because DM did not think the effort was worth it, MC was given complete control of all children.

Given the closeness of the bond between MC and children, it is fitting that the tale Asma tells conforms in its broad fabulistic outlines to certain deep-laid templates in the Western imagination when a later generation tries to explain its sense of tragic belatedness, or what we might call "fallenness," by reconstructing (hoping thereby partially to recapture) an original condition of innocence, simplicity, or plenitude, now lost, by positing a narrative sequence involving struggle and defeat. Asma also draws on other elements in that tradition, including a heroic role for the one who, for example, hacks his way through the brambles and thorns surrounding the castle where the princess, placed under an enchantment, lies sleeping, awaiting the kiss of the prince; or, to take one specific example, for the Grand Duke who scours the kingdom looking for the girl whose dainty foot fits the glass slipper. In MC, Asma has found her, and has written "Adaptive Imagination: Toward a Mythopoetic Cognitive Science" in order, he says, to restore to her "pride of place."

A noble and generous undertaking; and a brave one as well, since Asma is contending against DM itself, the mode in which he is

constrained to operate. But a worry arises. What if MC—a name she may not answer to—does not want to be queen of anything? What if the very notions of "pride" and "place" are anathema to her, as are wealth, royalty, and rule? What if she declares, to our dismay and astonishment, that life was much *better* among the ashes, which were dirty but *heimlich*, and that the company of those horrid stepsisters and their cruel mother was actually preferable to that of the servants, guards, and courtiers who worry about "'Theory of Mind' (ToM)," not to mention that simpering prince? What if she does not want shoes made of glass? What if, surveying the magnificent prospect presented to her by Asma, she simply declines?

But then—is this option open to her? Could she ever return to the ashes in a state of unaltered innocence? Was not DM "always already" there, as deconstructionists would put it, latent but inoperative within MC, awaiting only the need? Was a pure and simple MC ever sustainable without the complement of DM, without which little *Hominina* would have found herself alone in the forest of wolves? In short, is not MC herself more complicated and as it were self-defeated than she would acknowledge?

Asma has awakened these many questions for us through this layered fable of the brain-species-culture-ethos. His narrative, with its rich strata of MC streaking through the deposits of DM, may perhaps be faulted for a certain overreliance on these ur-narratives of our literary and theological inheritance. But such an investment in archetypes bespeaks a happy childhood and an imagination teeming with images that testify to the enduring power of the mythopoetic mind, which is, after all, his point.

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# Appetence, Key Stimuli, and Core Affects: Foundational Elements of Human Behavior and Mind

Henrik Høgh-Olesen

Asma promotes a model of "Mythopoetic cognition" (MC) that tries to capture what he calls "adaptive imagination." The model contends that the mind is primarily a prereflective simulation system (rather than a representational system based on ideational content accessible to reflection). The basic units of mentation are imperative feedback loops of movement-perception-motivation (not simple sense-data or propositional models of the world). Traditional psychology and philosophy have a "perception bias" and fail to capture the primacy of movement and the enactive essence of the mind. Finally, yet importantly: affective predictive processing (not rationality) is the primary mode of cognition. Some of this Mythopoetic processing is hardwired. Some is open to social learning and ontogenetic sculpturing. The former does not exclude the latter, I may add.

I am able to follow Asma's model and its premises a long way, but I have some reservations and clarifications to make. Let us take a closer look at the movement-perception-motivation loops and the primacy of movement over perception advocated by Asma.

Before images, music, and language, we are told, is an even earlier grammar: a syntax of motor sequencing. The human mind is primarily "internalized movement", not a spectator or recorder of data bits.

## The Primacy of Movement

The primary movements dominating behavior, initiating actions and grounding mind and mentation are what psychologists and ethologists, after Lorenz (1971), call *appetence* or *appetitive behavior*. Appetence is active, explorative search and orientation behavior, where an animal is roaming its habitat striving for a triggering stimulus situation where a key stimulus will cue an *innate releasing mechanism* (IRM) and activate a fixed action pattern (FAP) that will satisfy an inner drive and lead to *consummatory behavior*, and hence program closure.

The human nervous system is made for high activity. We are busy, stimulation-seeking creatures that are neophile animals with an inner drive to roam and explore, and an optimal stimulation level among the highest in the animal kingdom (Høgh-Olesen 2019; 2020). Therefore, we move, investigate, and explore, even when we have plenty of resources, because that is what curious, high-stimulation-seeking animals do, as an intrinsic need in itself. So movement is basic, but it is cued by an inner drive (e.g., need for stimulation—or something else from the human need repertoire), or by an external stimulus activating an orientation reflex and a relevant behavioral program.

In this field of forces, it does not make sense to give movement priority over perception. Movement and perception are complementary entities in a functional unit, and to ask if one or the other is primary, is like asking a physicist if light is waves or particles. The answer is "Yes." "Perception is for action," as Asma himself puts it. Therefore, the movement-perception-motivation loop, with which Asma's MC model operates, has to be clarified and supplemented. Figure 1 may illustrate my points.

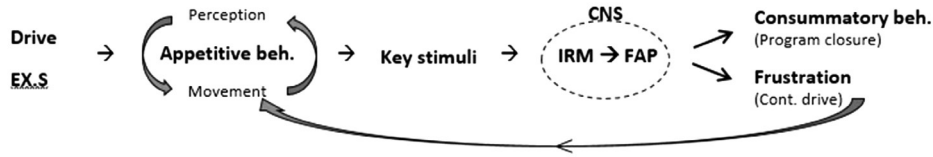


**Figure 1.** Foundational Elements of Human Behavior

EX.S=External stimuli, IRM= Innate releasing mechanism, FAP=Fixed Action pattern, CNS=Central nervous system

Due to our frontal lobe ability to top-down organize our constitutive programs, the FAPs in humans are less fixed, that is, more flexible and open to ontogenetic sculpturing, than in the rest of the animal world, but otherwise the dynamics are the same.

## Affective Primacy

Affective predictive processing (not rationality) is the primary mode of cognition, Asma tells us, and I agree. Drives manifest themselves as inner urges and core affects, and incoming stimuli release immediate affective responses that determine whether the perceived input or object is:

**Interesting – Uninteresting** (innate bias for novelty)
Next, if it is:
**Pleasant – Unpleasant**
**Helpful – Harmful**
**Rewarding – Threatening**
Finally, if we should:
**Approach – Avoid**
**Accept – Reject**

The fascinating key stimuli (Tinbergen 1951; Lorenz 1981; Høgh-Olesen 2019), which we are hardwired to be especially aware of (because they have guided us toward making the right fitness-enhancing choices), activate core affects in the form of organismic moods of **pleasure – distaste** based on predictions that something is **Good – Bad** or **Safe – Harmful**. So again, every stimulus comes with an affective predictive loading, and this perceptive-affective-predictive loop is a functional unit.

## Animism

Animism is a fascinating psychological phenomenon and the mediating cognitive processes of agency attribution, teleological thinking, and affective entanglement are well described, and may be seen as "mythopoetic templates," as Asma suggests. However, naming is not explaining, and a new model should ultimately try to explain and phenomenologically understand the phenomena it describes as well as their origin.

As a species, and as human beings, we may have conquered nature, but to solitary individuals in nature, it is a completely different matter. After only a few hours in the wilderness, everything seems to vibrate, and we begin to take full notice of the rustling of leaves in the wind. Two days later, most of us will once again have become animists in a personified and spirited universe that we try to appease and negotiate with.

To the modern, worldly individual, a concept such as "the gaze of nature" is mystified. Nature has no soul, no subjective will, and therefore no eyes. "The civilized world" left behind such notions long ago. Nonetheless, such ways of thinking and experiencing the world form a natural part of the human DNA and the way in which our brains function, which is why they exist in all cultures today—and in us when we are left alone amid the forces of nature, or when the lights are turned off.

Humans are hunters, but first we are prey, and the primordial experience and anxiety of a prey animal is that something or someone is

lurking in the shadows. We merely see the world from one viewpoint, one perspective. However, in nature, we are being observed from all sides. The world's all-seeing eyes surround us, so to speak. In the tangle of scrub, branches and trees, hills, mountains and valleys, soil, rocks, and liquids, of which we have no overview, someone or something senses us, and watches what we are doing. The animistic idea that nature has a soul and influences our lives takes its starting point in these primordial experiences, and in this kind of existential alertness.

## Friend or Foe?

The abovementioned reservations and clarifications do not negate or reject the basic pillar of the MC model. They are supplementary precisions that could be integrated.

Likewise, we do live dramatic narrative lives full of fights, alliances, victories, and defeats, and our stories do not just describe, label, or model the world. They motivate and inspire us to take up existential challenges and fill our engagements with meaning and emotional charge.

So is this article friend or foe, helpful or harmful?

I enjoyed reading Asma's article, so "friend" before "foe." However, part of this friendliness is probably based on what we in social psychology know as the "familiarity principle" or "the mere-exposure effect" after Zajonc (2001). The mere-exposure effect is the psychological phenomenon by which people tend to develop a preference for things merely because they are familiar with them. To people familiar with narrative psychology, from Heider and Simmel (1944) to McAdams (1993) and further, Asma's assumptions will seem familiar. To people familiar with Merlin Donald's *Origins of the Modern Mind* (1991), and its "oral mythic stage" with its primacy of narrative over syntax, Asma's Mythopoetic cognition will seem familiar. Moreover, what do we gain from the distinction imperative/indicative that we do not already have in Kahneman (2011) and consorts' "hot and cold cognition"?

Like most new models, the MC model needs further clarification. Clarification regarding its internal foundational principles and processes, as well as its relevance and demarcations vis-à-vis older concepts, models and theories in the field of evolution, narrative psychology, and cognition. It would be a worthwhile effort.

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# Collective, Joint, and Shared Imagination?

Jeppe Sinding Jensen

"Adaptive imagination"—or, as Stephen Asma also dubs his theoretical object, "mythopoetic cognition"—draws attention to one of the most salient features of human life. Yet it has been overlooked in the flourishing cognitive sciences. As Asma points out, this may have to do with personal and institutional factors in research environments rather than the importance of the subject matter: "Academia in general and cognitive science in particular have either ignored poetic cognition or dismissed it as nonepistemic." A similar attitude would make the study of, say, religion a vacuous affair. It may be nonsense to some, but the study of it is not nonsense.

I fully concur with Asma's ambition of paying closer attention to the importance and functions of poetic truth as a sense-making version of social reality as well as his insistence that mythopoetic cognition has (had) adaptive value. In fact, imagination is a globally advantageous adaptation. Where would the human species have been without it, we may ask—imagination makes us human. However, "imagination" has a bad press in the cognitive sciences and related fields (e.g., philosophy and psychology). Online searches on serious webpages (e.g., the *Stanford Encyclopedia of Philosophy*) provide rather meagre results. Overviews of relevant disciplinary fields in otherwise commendable works yield little as well (e.g., Robbins and Aydede 2009; Doris 2012). Explicit, detailed, and valuable attention is offered only in works such as Paul Harris's 2000 book *The Work of the Imagination*, which is part of the series "Understanding Children's Worlds"—somewhat tellingly, suggesting something about the place given to imagination in the scientific community. Lately, however, a more robust interest has arisen to solidify the field (Abraham 2020). So, consider Asma's proposal and our rejoinders as hopeful additions to this development.

My own perspective and take on this subject stem from decades of work in the study of religion, myth, and religious narrative in general (e.g., Jensen 2019). As a result of this work, I find it essential to stress an amplification of Asma's points; that is, to extend his points and stress the collective aspects of the conceptualization of mythopoetic cognition. The majority of works in Asma's references appear as exponents of individualist methodology; in a philosophy of science perspective this is a general trend in Anglo-American thinking and especially so in the cognitive sciences. That methodology has undeniably contributed greatly to present knowledge, but it may inhibit the ability to admit the adaptive benefits as they would emerge from collectivist perspectives. These will be pursued in what follows here—in a thoroughly Durkheimian manner. It seems obvious that full-blown mythopoetic cognition and adaptive imagination are primarily collective: humans must agree (more than less) for both to have adaptive value. Collective narratives express and support collectives. Religious traditions express this more clearly than many other human feats.

## Imagination: The Sine Qua Non of Religion

Some colleagues were really offended when I once, at a scholarly symposium, ventured the view that imagination is the most crucial feature of religious worldviews. It was interpreted as if imagination was the only feature of religious thought and, consequently, that it had no truth

value at all, being merely wishful thinking and illusion. However, the point is that, for humans to be religious in the first place, they must be able to imagine Heaven and Hell, God(s), to meta-cognitively wonder "What would Jesus have done?" or: "Is this kosher?," "halal," "dharma," or perhaps "the way of the ancestors." My question, then, is this: How could anybody be religious without imagination, and perhaps more particularly, without explicit metacognition (Schjødt and Jensen 2018)? Religion, as habitually conceived in the academy, is many "things." For one, religion is a cognitive organizer, one that enables humans to imagine collectively (as do the arts in post-traditional societies). It enables humans to engage the world in a mode of interactive cognition. Peter Berger pointedly addressed this in his now-famous *The Sacred Canopy*: "put differently, religion is the audacious attempt to conceive of the entire universe as being humanly significant" (1967, 28). So, in the religious perspective, the meaning of life is a collective imagination based on interaction, attribution, projection, and intentionality. The world is human-like and may therefore be addressed as "one of us."

## Imagination in Normativity

To appease the skepticism of descriptivist philosophers, it should be pointed out that imagination also is the sine qua non for normativity—that is, how things ought (or ought not) to be. Any kind of normative perspective, such as moral or ethical, would be unthinkable without "the work of the imagination." How could humans be moral animals without imagination? This, conversely, could be seen as one more facet of the human imaginative "drive": imagination makes it possible to desire valuable things, good food, and sex, and as such it is the basis of classification systems—once a favorite subject in anthropology. Consider the work of Claude Lévi-Strauss as being fundamentally about imagination. And so, further down the line, imagination provides the *Leitvorstellung*—the governing principles —of scholarly and scientific practice. No less. Honestly, imagination reigns. And collective, joint, and shared modes of imagination even more so.

Ontogenetically, it is obvious that imagination of intention is the basis for children's pretend and role play (Reddy 2009, 164ff), but the imaginative acts of being or feeling like "someone else" seem never to leave adult humans. Luckily, some things are never lost; they may, however, become restrained, subdued, and forbidden—depending on cultural contexts. The total sum of the arts witnesses the human imaginative play with intentions. This is perhaps where humans truly differ from all other animals: in the ability to imagine and, even more importantly, to imagine collectively. These abilities are closely tied to other features of human cognition, especially joint intentionality, cognitive fluidity, and the remarkable ability for cognitive decoupling. For instance, humans not only can hunt together, packs of other predators can do that; however, humans can organize the hunt in advance and stage it afterwards (e.g., in ritual or by painting it for others to imagine) by acts of imagination (Donald 2001). Karl Marx once said that "what distinguishes the worst architect from best of bees is this, that the architect raises his structure in imagination before he erects it in reality." Thus, although there is no doubt that imagination is fiction, it is also the case that in light of these ruminations, imagination and fiction are the most important of human adaptive achievements (Herman 2013). Then, at least two questions remain: First, is imagination a cognitive gadget? That is, not innate, but something acquired during ontogeny through social and cultural interaction (Heyes 2018). Most likely. And second, is imagination language-dependent? Again, most likely, and certainly when it comes to sharing imaginations—which is foundational, for example, in religious worldviews. The resulting picture would be (while awaiting further investigation) that adaptive imagination is a collective cultural gadget. If so, and slightly rewriting the ideas of John Searle,

adaptive imagination and mythopoetic cognition are among the fundamental building blocks of human civilization (Searle 2010). Searle's "social institutions with deontic powers" truly are works of the imagination. Imagination was needed all the way from organizing a Paleolithic hunting party to the current prognostic deliberations of the World Bank International Monetary Fund. Human thinking has a history (Tomasello 2014).

As some philosophers see it, it may well be that mythopoetic narrative thinking is nonveridical. This is for the very simple reason that the veridical, or indicative, modes of intentionality concern what has been or is the case, whereas invented modes of intentionality in imagination (such as desiring, forbidding, wishing, etc.) are future-oriented and concern what may be the case (English lacks a distinct future tense here). This goes for scientific practice as well. In any science, imagination leads the investigative agents and their predictive coding mental activities. Scientists imagine together, using all kinds of props for their shared imaginations. In such procedures, my imaginations may become props that extend to your brain (e.g., Menary 2010). Very often, what we take to be immediate perception is actually made up, imagined, by our own brains (Frith 2007).

All things social are products of the imagination and social constructionism is the imagination of imaginations. But, behold, all these things are real—they have deontic powers (Plotkin 2003; Searle 2010). And, should you wish to imagine yourself, you will inevitably do so in the webs of the imaginations of others. The workings of the social world obviously depend on perception, but ever so much they depend on prediction and imaginative cognition. Thanks to Stephen Asma for calling attention to this rather neglected, but absolutely fundamental mythopoetic dimension of human cognition. Then again, it seems that it gains even more importance when prefixed with "collective," "joint," or "shared."

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# Narrative in Mind

Keith Oatley

Stephen Asma argues that we should make human stories more central in cognitive science. I agree but offer some modifications and suggest that we might think of the psychology of human interaction, along with that of imagination and stories, as already becoming significant in psychology.

In the nineteenth century, the pioneering work of Hermann von Helmholtz (e.g., [1866] 1962) on psychological and physiological mechanisms shed light on individual perception of the physical world. This work was, and continues to be, important. With his influence, perception of material objects and scenes has become the part of psychology that has come to be understood better than any other part.

Almost a century and a half later, it seems likely that the most important recent psychological research has been that of Michael Tomasello and his group at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. Asma mentions two of Tomasello's papers on shared intentionality (the latest being Tomasello and Carpenter [2007]). In order to advance Asma's proposal, however, some further findings of this group are helpful. Here is one of them. Esther Herrmann, with Tomasello and other colleagues (2007) in the journal *Science*, reported on a study of human children who were two-and-a half-years old, chimpanzees up to age 21, and orangutans up to age ten. They had to complete two sets of tasks. One set was in the physical domain. An example was finding a hidden reward. The other set was in the social domain. One of these was watching another individual solve a problem, then trying to solve the same problem. In the physical tasks, human infants and chimpanzees did not differ. They were 69% correct; orangutans scored 59%. On the social tasks, the human infants scored 74%, whereas chimpanzees and orangutans scored in the 30s, with chance being a substantial factor. For the most part, the apes were unable to do the social tasks.

This kind of human social ability indicates that a huge change has occurred in human evolution, since our species separated from chimpanzees. Here is a piece on this subject from Tomasello's book of 2014:

> Although humans' great ape ancestors were social beings, they lived mostly individualistic and competitive lives, and so their thinking was geared toward achieving individual goals. But early humans were at some point forced by ecological circumstances into more cooperative lifeways, and so their thinking became more directed toward figuring out ways to coordinate with others to achieve joint goals or even collective group goals. And this changed everything. (4-5)

In this book, Tomasello proposes that the "everything" which changed was the evolutionary arrival of our human ability to cooperate. He says that this occurred in two phases. He calls the first "joint intentionality." For instance, chimpanzees tend to roam around together. Then, when they come across a tree with fruit on it, each one takes something and goes off to eat it alone. In contrast, early humans started to gather food together and share meals. Here is a quote on this idea from *Our Minds, Our Selves* (Oatley 2018):

> This kind of cooperation involves people taking on joint goals, "We" goals, and promoting them to make them more important than individual goals. Then, with such goals, joint plans are arranged, and these often involve separate roles. You pull out these roots, and I'll hold this animal skin (as a bag) that we can put them in there, and take them back so that everyone in our group can eat them. (192-93).

In his book of 2014, and following it in a later book (2019), Tomasello identifies a second phase, in which our human ancestors didn't just make joint arrangements with others but began to identify with their communities. He calls this "collective intentionality." Here occur rituals and normative activity in cultures, such as people, when eating together, taking just their fair share, and helping others who have less ability. So those who acted in ways that seemed unfair in the group, or who did not contribute what they could, were frowned upon. In this second phase, morality emerged, some of it based in stories.

The work of the research group of Tomasello, and the proposals in his recent books, are highly relevant for Asma's argument. With these critical changes in evolution, however, the human world is not as Asma says in his first paragraph, "primarily . . . a dramatic story of competing personal intentions." Yes, of course, there is competition in human societies. It is also sometimes depicted in myths, as well as in stories of other kinds. But, as Jane Goodall (1986) has shown, competition and conflict are more typical of chimpanzees than they are of humans. With the new movement in evolution that Tomasello describes, the human social world has become primarily one of cooperation.

The comparison between mechanisms of human understanding was put rather well by Jerome Bruner in *Actual Minds, Possible Worlds* (1986). He proposed that we humans have two distinct modes of thought. One is of the kind to which Asma objects: the one with which cognitive science has primarily been concerned, mechanisms. Bruner calls this mode "paradigmatic thought." But the other, far more pervasive and critical for our interactions with each other, is "narrative thought." In his article, Asma mentions "narrative" frequently, but does not mention this book in which Bruner says that narrative "deals with the vicissitudes of human intentions" (16). It is the principal mode for understanding other people and ourselves. This kind of thinking occurs in most conversations. It is also the mode of plays, novels, short stories, films, and television series. Research on such issues has been proceeding rapidly in the last 20 years.

The work of Helmholtz has been very important. The quest to understand mechanisms of mind and brain has fascinated researchers. It has also been productive. It has led to people being helped with perceptual problems, to artificial intelligence solutions that include diagnoses of patterns such as those in X-rays, as well as those that involve search and identification, even extending to video games.

Thinking in what Bruner calls the narrative mode is becoming more important. Research on this mode is already coming towards the center of psychology (e.g., Dias, Roazzi, and Harris 2005; Mar 2018).

In this journal of *Evolutionary Studies in Imaginative Culture*, as we consider the history of psychology and cognitive science, we may imagine Hermann von Helmholtz standing at the top of some broad stone steps, looking out over a city, a place of social interaction. Helmholtz, a modest person, seems to be thinking, with some satisfaction, of what he has given to the world. Standing next to him, companionably, we may imagine Marcel Proust. He, too, feels rather pleased because, although the first book of *À la recherche du temps perdu* was rejected by several editors so that he had to pay the costs of publication himself, his novel did become well known. As he looks out, we may recognize that he has offered people an improved understanding of psychology. A little way into the first part of his novel, he put it like this:

> However deeply we sympathize, a real human being is perceived mainly by our senses. This means that the person remains opaque to us, and offers a dead weight that our perceptions cannot lift. If a misfortune should strike this person, it is only in a small part of the total understanding we have that we can be moved by this. . . . The discovery of the novelist is the idea of replacing those parts that are impenetrable to the mind by an equal quantity of immaterial parts, that is to say parts that our minds can assimilate . . . and within an hour set free states of happiness and unhappiness of kinds that would take years of our ordinary life coming to know. (Proust [1913] 1987, 84, my translation).

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# The Importance of Narrative and Intuitive Thought in Navigating Our Realities

Valerie van Mulukom and Micia de Wet

Stephen Asma presents an alternative model of mind, "mythopoetic cognition" (MC). We applaud Asma's Herculean effort in bringing together this many ideas—with considerable breadth and depth—in a single article, and wholeheartedly agree that the importance and adaptiveness of "nonrational" cognition are often rendered invisible in post-Enlightenment ("disenchanted") perspectives. We do believe, however, that some additional nuance is required.

## Narrative Thought and Social Realities

The distinction between Asma's "indicative" and "imperative" modes of mind is not new, as he also mentions: another, similar distinction was previously made between "paradigmatic" (indicative) and "narrative" (imperative) thought by Jerome Bruner (1986): Paradigmatic thought is a formal system of description and explanation, organizing thought through abstract categorization and conceptualization. Narrative thought, on the other hand, deals with "human or humanlike intention and action and the vicissitudes and consequences that mark their course" (Bruner 1986, 13), and organizes thought by "story devices." These two modes of thought operate by their own principles and aims, and are complementary rather than reducible to each other.

The paradigmatic mode of thinking seeks to explain relationships between sets of observable variables, thus providing causal explanations about "natural" reality (we can call this "objective truth"), whereas the narrative mode of thought seeks to understand relationships between individuals, thus providing meaningful explanations about social reality (we can call this "subjective truth") (Brendel 2000). This is not to downplay the aim of narrative thought: Subjective truth is still a truth, in the same way that social realities are real. It matters whether someone is considered a king or queen, even if there is nothing in the natural world that scientifically demonstrates this (e.g., "royal blood"), and belief in gods and other supernatural beings has similarly significantly exerted shaping force on human evolution (van Mulukom 2019). However, the different aims mean that the two modes cannot be rendered equal, and their merits not judged by the same criteria: we suggest that there may be a conflation as to which reality needs to be explained, and that an epistemology of the natural world is better served by paradigmatic or indicative thought, whereas an epistemology of the social world is best served by narrative or imperative thought.

Thus, we resist the notion that the natural world is inherently intentional or teleological, and that instead intentionality occurs when other agents are involved (whether human or animal), but not beyond that. Considering that human procreation is inevitably tied up with social relationships—after all, it takes two to tango—it may appear that imperative epistemology is superior to indicative epistemology when it comes to human survival. However, we resist the more extreme notion that indicative thought is "neither natural nor necessary," as

Asma puts it. We don't believe that earlier developments are more "natural" than others (e.g., lactose intolerance is not more natural than being able to drink cow's milk), or more necessary. Moreover, the evolution of indicative thought has allowed culture and technology to expand at a tremendous rate, and has ultimately contributed enormously, via culture and technology, to the survival of the human species—though we concur that this development may also have contributed to the prestige of indicative thought in the Western world (Henrich 2020).

## The Vilification of Intuitive Thought

It is clear that nonrational thinking is increasingly vilified in the West, whether through its educational systems (van Mulukom 2018) or its researchers (van Mulukom 2017). This means that it now has to be defended that "[i]ndicative descriptive knowledge is not intrinsically or always adaptively superior," in Asma's words. A similar bias against nonrational cognition is evident in the literature on analytical and intuitive thinking, which positions rational, logical thinking against emotional, holistic thinking (Evans 2008). For example, one of the literature's most common and important measures, the Cognitive Reflection Test (Frederick 2005), determines analytical and intuitive thinking through *correct* and *incorrect* answers to mathematical puzzles, respectively. We suggest that there is a persistent indicative understanding of an imperative phenomenon (intuitive thinking). As a corrective, we need to appreciate both as valid ways of thinking, which can occur simultaneously (e.g., in magical and naturalistic explanations).

We must be careful not to swing the pendulum too far the other way either: Imperative or intuitive thinking is not necessarily superior either. For instance, imperative/intuitive thinking is associated with more cognitive biases than indicative/analytical thinking, such as the bandwagon bias, which refers to the tendency to agree with something because everyone else is saying it, or prestige bias, which refers to the tendency to agree with something because a prestigious individual says it. However, aim matters here too: If the aim is to make a decision based on empirical facts, these biases can lead one astray; but if the aim of the decision-making is social—that is, to create and/or maintain relationships—then such "biases"—following others—can undoubtedly lead to a successful outcome.

The lack of understanding of the value of mythopoesis, and the reduction of it to conspiracy or (equally dismissed) magical beliefs in a Western narrative, is tragic. Its consequences can be dire, as illustrated by legislations to remove arts subjects in schools in favor of scientific ones, forgetting that meaning-making is as important as fact-generation. Symbolic systems, emerged from the organization and projection of bodily feeling states, do not just describe (label, organize, model) the world but importantly also inspire us and motivate us, something which is particularly clear in the arts (van Mulukom 2021a). However, we do maintain that representation (not necessarily propositional) in the form of simulation underlies these symbolic expressions (van Mulukom and Clasen manuscript), and that simulation as a system supports the various functions of imagination, including Theory of Mind (van Mulukom 2020).

## Emotions, Motivation, and Predictive Processing

Emotions are affective states differing in arousal (from low to high) and valence (unpleasant to pleasant) (Barrett 2017). The interoceptive experiences that we call emotions are interpretations of bodily signals which tell the individual to pay attention to something. While there is no universality in identified emotions and their labels, we argue that this does not mean that the interoceptive experience underlying them requires higher conceptual cognition to be felt. Emotions signal salience and induce motivation (to approach or avoid). By extension, rather than

calling the amygdala a brain region preoccupied with emotion, it can be called a salience detector (Cunningham and Brosch 2012)—it just so happens that fear is a highly salient and significant emotion. Motivations are important because they "get the job done," as Asma says, which may be another reason why indigenous knowledge—imbued with emotion—and its transmission may be so important (cf. Alcorta and Sosis 2005), and indeed superior in specific, local contexts. In this regard, a probabilistic, generalizable explanations may be of less use than specific, unique perspectives (Brendel 2000). This underlines the context-specific, pragmatic usefulness or appropriateness, and indeed adaptiveness, of imperative knowledge.

Nonetheless, we suggest that a predictive processing framework can be used in conjunction with the MC model, even as a statistical probability calculation. We argue that priors can be established through imperative processing as much as indicative processing (van Mulukom and Lang forthcoming). Indeed, this is what makes imperative thought so important yet underappreciated: imperative narratives shape not only how we interpret the world but also perceive it (Schjoedt et al. 2013; van Mulukom 2020). Such narrative structures or mythopoetic templates exist in a Western context too, such as the Hero's Journey (Campbell 1949). Narratives work with and through characters (social worlds), not only with plot (predictions) and plot twists (prediction errors).

However, we suggest that the merger Asma presents between predictive processing and embodied cognition may benefit from more nuanced contextualization; overlaps of predictive frameworks with embodied cognition disguise fundamental theoretical differences and disagreements (Bruineberg, Kiverstein, and Rietveld 2018). For instance, the predictive coding and processing frameworks rely on inference and representation, which cannot survive in enactive contexts of embodiment (Hutto and Myin 2018; Gallagher and Allen 2018).

In the same vein, imagination may be highlighted as an active embodied cognitive facility beyond the default mode network; concerns for MC may be better served within psychology and anthropology than neuroscience. The story unveils itself between people in social narratives; the power of myth does not reside in objective truth, but rather, in its value to affectively mobilize people through its narrative (Armstrong 2004). Indicative, disembodied, and individual understandings of the mind and imagination would profit from embodied, narrative, and social understandings, and fortunately a trend towards this is gradually appearing (van Mulukom 2021b).

## Conclusions

Imaginative cognition is undervalued and under-researched. We commend the mythopoetic cognition model, albeit whilst disagreeing with some of its implications: We argue that the different modes of thinking have different aims. Indicative processing is for factual understandings of natural reality; imperative processing for meaningful understandings of social reality. Thus the function of cognition is to motivate but also to inform, and both functions are adaptive. Overall we believe that this is a timely model in the cognitive science of imagination and imaginative culture.

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# Evolution of Imagination: From Completely Involuntary to Fully Voluntary

Andrey Vyshedskiy

The greatest fallacy of natural philosophy is the assumption of the evolutionary permanence of imagination. Consider the difference between involuntary and voluntary imagination (Pearson 2019; Vyshedskiy 2020). Involuntary imagination, such as dreaming, can conjure up a myriad of novel mental images, and while the same exact images can be created by an individual voluntarily when she or he is awake, the neurological mechanisms of these two processes are different. Voluntary combination of mental objects is mediated by the lateral prefrontal cortex (LPFC), and patients with damage to the LPFC or its extended connections to the rear part of the brain often lose this ability (Waltz et al. 1999; Dragoy, Akinina, and Dronkers 2017). Conversely, the combination of mental objects into novel images while dreaming does not depend on the LPFC: LPFC is inactive during sleep (Braun et al. 1997; Siclari et al. 2017), and patients whose LPFC is damaged do not notice a change in their dreams (Solms 1997). Thus, the difference between the involuntary and voluntary imagination is in the LPFC and its long connections to the rear part of the brain.

Components of imagination rely on multiple neurological mechanisms that evolved over time. Dreaming, the simplest mechanism of involuntary imagination, likely evolved 140 million year ago (ya) when marsupials and placentals diverged from the monotreme line (Thakkar and Datta 2010). Periods of REM sleep, the best marker for dreaming, have been observed in marsupials and placentals but not in the monotremes. Since REM sleep in humans is associated with vivid dreaming, it was hypothesized that animals could experience similar incidences of dreaming during REM sleep (Hobson 2009). Novel combinations of mental objects during dreaming present possible scenarios to our judgment. An envisioned juxtaposition of mental objects can provide a solution of heretofore unexperienced problems important for future survival (Ólafsdóttir et al. 2015). Thus, dreaming is the evolutionarily oldest adaptation that simulates the future in the neocortex.

Imagination was further improved with acquisition of the LPFC by primates 70 million ya (Striedter 2004; Petrides and Pandya 2002). One of the functions of the LPFC is encoding objects' categorical information (Sidtis et al. 1981). The LPFC can facilitate simulation of the future by priming a mind-wandering fantasy over a single category (worry about an upcoming exam, an anxiety about a missing child, impulsive fantasizing about sex, racing jealous thoughts, etc.). Objects inside the primed category are encouraged to spontaneously combine and recombine (Vyshedskiy 2019a). One of those random combinations can result in the envisioning of a solution. Humans still rely on these spontaneous insights or "Aha!" moments that often enlighten us while walking or showering (Bowden et al. 2005; Sternberg and Davidson 1995; Weisberg 2006). The mechanism of categorically primed spontaneous imagination (CAPSI) seems to be the default mode of a relaxed mind. Consequently, the brain areas mediating CAPSI are called the Default Mode Network (Seli et al. 2016; Christoff et al. 2016). On the spectrum of volitionality, CAPSI is in the middle between involuntary dreaming

(completely independent on the LPFC) and the voluntary imagination mechanism used to comprehend fairy tales with unrealistic scenarios (completely dependent on the LPFC).

Voluntary imagination significantly improved 3.3 million years ago when hominins began to intentionally modify cobbles into choppers (Toth et al. 1993; Harman et al. 2015). According to Ian Tattersall, stone tool manufacturing demanded "a mental template in the mind of the toolmaker that determined the eventual form of the tool" (Tattersall 1999). This "mental template" must have been created voluntarily by a toolmaker, based on the unique features of each cobble. Thus, the quality of manufactured stone tools provides a window into the voluntary imagination abilities of our ancestors.

Acquisition of the "mental template" ability by hominins is a clear sign of improving voluntary imagination. Further inferences about the evolution of voluntary imagination can be derived from observing the stasis in stone tool quality. For more than 1 million years, from 3.3 to 2 million years ago, our ancestors were stuck manufacturing crude and inefficient *Mode One* choppers. Apart from weak arguments of inferior hand dexterity (Crast et al. 2009) and lack of cultural transmission (all apes exhibit cultural transmission in many aspects of their lives [Whiten et al. 1999]), the most sensible explanation is that the next breakthrough, the *Mode Two* symmetrical hand axe, required an upgrade in the mechanism of voluntary imagination, which was not acquired until 2 million years ago (Vyshedskiy 2019a). In a similar display of stasis, best explained by voluntary imagination limitations, hominins were stuck with the Mode Two hand ax over the next 2 million years.

It was not until just 70,000 years ago that the last component of voluntary imagination, the ability to voluntarily juxtapose mental objects (*prefrontal synthesis*) (Vyshedskiy 2019a), was acquired and enabled a revolution in toolmaking: in a short period of time our ancestors invented the bow and arrow (64,000 years ago) (Lombard 2011), bone needles with an eye (61,000 ya) (Backwell, d'Errico, and Wadley 2008), musical instruments (43,000 ya) (Higham et al. 2012), ceramic technology (31,000 ya) (Soffer et al. 1993), and much more. The explosion of these different kinds of manufactured tools shortly after 70,000 ya, along with the production of composite figurative objects (e.g., lion-man 39,000 ya) (Dalton 2003), a sudden abundance of adorned burials suggesting beliefs in an afterlife (Giacobini 2007) (e.g., Sungir burial 30,000 ya [Pettitt and Bader 2000]), extraordinarily fast migration to Australia (presumably by boats around 62,000 ya) (Thorne et al. 1999), and the demise of Pleistocene megafauna (presumably with the aid of animal traps) (Harari 2014), is consistent with hominins acquiring the full extent of voluntary imagination similar to our own. This abrupt modernization of human imagination 70,000 ya has been called the "cognitive revolution" (Harari 2014) and the "great leap forward" (Diamond 2014).

In the article "Adaptive Imagination: Toward a Mythopoetic Cognitive Science," Stephen Asma presents a theory of the evolution of imagination. Asma's theory, however, is presented without use of clear "imagination" terminology based on neuroscience and without clear identification of hominin species based on archeology. When Asma writes that "our contemporary imaginative cognition is evolutionarily conserved—it has structural and functional similarities to premodern *Homo sapiens*'s cognition," who is the "premodern *Homo sapiens*" and what part of his "imaginative cognition" is conserved? This sentence is self-contradictory. The modernity of *Homo sapiens* is determined based on its "imaginative cognition." Modern *Homo sapiens*, by definition, exhibits fully modern voluntary imagination (observed since 70,000 ya). Therefore, "premodern *Homo sapiens*" couldn't have the "contemporary imaginative cognition."

Asma also refers in several places to "prelinguistic *Homo*." Since articulate speech and

recursive language were acquired at different times (Dediu and Levinson 2013; Vyshedskiy 2019b), it is unclear who is the "prelinguistic *Homo*." Is it prearticulate speech *Homo habilis* or prerecursive language *Homo erectus* or Neanderthal? The terms "language" and "prelinguistic" are too ambiguous to understand the intended reference for the "prelinguistic *Homo*."

Asma doesn't make it clear if his model, called "Mythopoetic Cognition (MC)," is a stand-in for voluntary imagination (completely dependent on the LPFC), involuntary (completely independent of the LPFC), or something in between. Asma explains that "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." Since "mere fantasy and fancy" are primarily associated with involuntary imagination, it is likely that MC stands in for voluntary imagination. However, the sentence can be interpreted either way since any component of imagination is adaptive. If I have seen the result of my possible future actions in a dream (e.g., sleeping with a lover), woken up in a cold sweat and decided to never do that in real life, the effect of my involuntary imagination is as adaptive as voluntary imagination.

If I understood correctly and MC means voluntary imagination, then the two main ideas of Asma's manuscript are: 1) voluntary imagination was "evolutionarily conserved," and 2) voluntary imagination evolved before articulate speech: "MC forms a prelinguistic human cognitive system," and later: "MC does not need to wait for the evolution of indicative language to do its work."

I have to disagree on the first point that voluntary imagination was "evolutionarily conserved." As I explained above, the million-year stasis in stone tools undoubtedly demonstrates stepwise improvement of voluntary imagination from the first stone tools manufactured 3.3 million ya to Mode Two tools manufactured 2 million years ago, to the cognitive revolution 70,000 ya. However, I totally agree with the second point. Judging by stone tool manufacturing, voluntary imagination improved in hominins around 3.3 million ya (Harmand et al. 2015), that is, over 1 million years before the first changes associated with the acquisition of articulate speech (Vyshedskiy 2019a). Alexander Luria tested this prediction experimentally over 100 years ago. He used educational games developed from a set of blocks to try to improve one twin's voluntary imagination while the other twin was used as control. When tested at the end of the program, the twin following the voluntary imagination program was superior in both voluntary imagination and language (Cole, Levitin, and Luria 2005). Our group recently followed in Luria's footsteps and studied 6,454 children with autism for up to 3 years. Children who engaged with our voluntary imagination intervention showed 2.2-fold greater language improvement than children with similar initial evaluations (Vyshedskiy et al. 2020).

In fact, the argument in favor of the speech apparatus limiting the acquisition of recursive language is fundamentally weak, as speech is not an obligatory component of language at all. If hominins had neurological machinery for voluntary imagination, they could have invented a sign language. All formal sign languages include spatial prepositions and other recursive elements. In a large natural experiment of language origin, 400 Nicaraguan deaf children assembled in 2 schools in the 1970s (genetically modern children, with the innate propensity for normal voluntary imagination) spontaneously invented a new recursive sign language in just a few generations (Senghas et al. 2005). Thus, the capacities of the speech apparatus could not have been a limiting factor in the acquisition of recursive language. Additional supporting evidence comes from the observation of the variety of sound boxes in birds and the uniqueness of human voluntary imagination. Articulate sounds can be generated by Grey parrots and thousands of other songbird species (Pepperberg 2010). This shows that improving sound articulation is,

evolutionarily speaking, a simpler process than improving voluntary imagination.

Many lines of evidence, from the hominin evolutionary timeline to children studies and the observation of the variety of sound boxes in birds, point to a conclusion that the evolution of the hominin speech apparatus must have followed (rather than led to) the improvements in voluntary imagination (Vyshedskiy 2019a).

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# Asma and Shakespeare on Dual Cognition

Robert N. Watson

What aspects of our thinking should we trust?

Stephen T. Asma advocates for the importance of a mythopoetic paradigm of cognition (MC), adaptively acquired, that receives and reacts to the world as a set of competing intentional agents, rather than primarily as a set of objects to be rationally conceived, as in the currently dominant model (DM). We therefore live more in the world of drama, generally understood as scenarios of agents in conflict, than in the world of physics. We predict and react (at least usually and initially) at the level of somatic experience, accumulated both collectively through evolution and personally by experiences of emotionally registered importance, rather than by any intellectualized model of interacting objects.

Asma is impressively agile in walking the swaying tightrope between dismissiveness toward indigenous nonrational readings of the world and, on the other side, patronizing them with a reverence that can fall into mere sentimentality. In disputing the inherent primacy and superiority of the Enlightenment mode of grasping the world, he also offers a scientifically grounded defense of the artistic imagination. Asma's argument reinforces my objection to the US. government's emphasis, in the Common Core curricular guidelines, on replacing fiction with nonfiction (seemingly a euphemism for "non-foolishness"), especially in high school reading assignments. If the mythopoetic is as primary a driver as Asma skillfully asserts, then literature and other narrative forms may be an indispensable ground on which sociopolitical battles could be diplomatically anticipated and averted.

My expertise is much less in cognitive science than in English Renaissance literature, so my response will focus accordingly, but my book on cultural evolution (Watson 2019) did wrestle with the problems of cognitive overload and the consequent role of storytelling in allowing the extraordinarily complex human mind to function profitably as human beings and cultural systems coevolve.

Asma is interested in our nonreflective proclivity for presuming and perceiving agency in nonhuman and even nonanimal entities. My interest within the cultural evolution field has been primarily the opposite: our often costly failure to recognize that evolutionary competition among cultural forms has endowed many such forms (especially "isms") with what functions as self-interested agency, enmeshing us unwittingly and often unhealthily in their own project of replication.

The other side of the fact that shared fictions "create solidarity through cultural kinship" is that cultural variations create conflict: multiculturalism is almost a contradiction in terms. Maybe most people can tolerate violations *only* in the form of storytelling: a container of marked fictionality and aestheticized ritual. In other words, this professor of literature wants to believe that an MC mode of imaginative scenarios integrated with the rational DM may be a last best hope for peace in a globalized world.

With a team of experts on the scientific aspects of Asma's article responding alongside me, I hope I may be excused for ducking back into my own professional territory to provide further commentary.

The primal MC mode of perception Asma highlights—a world "made of 'for whats,' not 'whats'"—reminds me of the transition in late Renaissance botany from naming plants primarily by what human beings can use them for, to Linnaean categorization.

On the topic of "predictive processing," Stephen Booth, though not a linguist, has performed a mesmerizing analysis of the ways literary works exploit the predictive reflexes of their readers and audiences to introduce subliminal micro-moments of complication and surprise, which Booth considers to be often the real core of the reader's or listener's pleasure in the imaginative play that literature provides (1998). His examples range from books for young children (*Go Dog Go*) to the plays of William Shakespeare (*Twelfth Night*, *Macbeth*).

Shakespeare may not have been what we would call a scientist, but I think his credentials as an observer of some durable aspects of human nature are compelling. Asma's article can be read as a cognitive-evolution adaptation of some Shakespearean psychological insights. Shakespearean drama is certainly a prime example of the way a storyteller "reveals the interior of a character." It is noteworthy, however, that he sometimes actually obscures the motivation that is clear in his source story, thereby better replicating our actual experience of digging imperfectly into the minds of others (Greenblatt 2004).

Shakespeare's characters themselves often navigate their world by comparing their circumstances to those in canonical stories they have heard and wondering whether to be guided by those narratives (Asma's MC) or instead by rational calculation (Asma's DM).

Hamlet asks himself, why am I not like the loyal mourners Pyrrhus and Hecuba? Am I not, like the more efficient protagonists of other revenge plays of the period, "the son of a dear father murdered?" What if I play the role of a madman to expedite my revenge, as Hieronimo did in *The Spanish Tragedy*, the hit English play that relaunched that genre? Why can't I bring myself to undertake the insane (from any pragmatic perspective) heroics of Fortinbras's army? In the famous "To be or not to be" soliloquy, Hamlet complains self-accusingly that "conscience doth make cowards of us all, / And thus the native hue of resolution / Is sicklied o'er with the pale cast of thought." "Hamletism" was a known ailment to nineteenth-century Romantic commentators, caused by the disabling Enlightenment rationalism that mandated "thinking too precisely on the event"—in other words, trying to calculate exactly what would eventuate from each available path of action. Hamlet later saves himself by acting "rashly—and praised be rashness for it, let us know our indiscretion sometimes serves us well when our deep plots do pall." The paranoid, fast-acting MC mind outperformed the dithering DM functions.

Juliet struggles to assure herself that Romeo is not one of the rapists that classical literature has warned her about: Tereus, Tarquin, Paris, or Hades (Watson 2005). As the final act of *The Merchant of Venice* opens, the newlyweds Lorenzo and Jessica experiment uneasily with casting each other in the roles of the most notoriously disastrous couples in the Renaissance imaginary: Troilus and Cressida, Pyramus and Thisbe, Dido and Aeneas, and Aeson and Medea. The play's heroine Portia, too, has read her Asma: tempted to choose the mate she immediately desired, rather than obeying the elaborate test of potential mates her late father ordered, she observes that "The brain may devise laws for the blood, but a hot temper leaps o'er a cold decree."

The power of the MC mind's drive to discern both benign and hostile agents even when there are none (shaped, Asma compellingly suggests, by the evolutionary advantages of that presumption) cannot often have been expressed—and dismissed—as clearly as by the hyper-rational Duke Theseus in *A Midsummer Night's Dream*, act 5, scene 1:

> Such tricks hath strong imagination,
> That if it would but apprehend some joy,
> It comprehends some bringer of that joy.
> Or in the night, imagining some fear,
> How easy is a bush supposed a bear!

Certainly, safer that than the other way around, however. Furthermore, Theseus's critique of MC thinking is framed by a larger critique of the DM scientific view, including the fact that the play ends, not with Theseus's neat bedtime couplet, but with the fairy Puck whose magical world outranks and outflanks the rational human organization of society and reality throughout this *Dream*.

Theseus's scoffing about bushes mistaken for bears is the culmination of his explicit rejection of the MC mentality that is driven by poetic imagination, terror, and desire:

> I never may believe
> These antique fables nor these fairy toys.
> Lovers and madmen have such seething brains,
> Such shaping fantasies, that apprehend
> More than cool reason ever comprehends.
> The lunatic, the lover, and the poet
> Are of imagination all compact.
> One sees more devils than vast hell can hold—
> That is the madman. The lover, all as frantic,
> Sees Helen's beauty in a brow of Egypt.

His bride Hippolyta replies with an important dissent:

> But all the story of the night told over,
> And all their minds transfigured so together,
> More witnesseth than fancy's images
> And grows to something of great constancy.

We may, in some sense, dream the world, yet there is a noteworthy constancy in the way we perceive its material objects. This seems to me an important argument, not just against Theseus's dismissiveness, but also against runaway versions of Asma's assertion that "We don't need an internal copy of the world to handle the world." My argument here is less with Asma than with Hoffman's work that Asma cites, but it seems obvious to me that a fairly consistently representative model of what is out there is indispensable. Wouldn't the lack of one be too costly for human beings (and probably other species) to endure? That our reception of Kantian *noumena* falls short of direct and total knowledge does not mean we receive no practical input about the properties of objects we encounter.

A better conceptual frame is what Asma and others call "affordances." These are close kin to what Renaissance theologians called "accommodations": the way God meets humanity not fully as Himself (to see whose face was death), but in forms He knew would best allow humanity to understand Him. Milton's *Paradise Lost* asserts that the deity, who takes on human form as Christ, uses human language to convey information to human rationality, but also speaks in myths and parables, thereby reaching both mental systems Asma identifies.

Philip Sidney's 1595 *Defense of Poesie* insists a poet does not lie, because a poet "nothing affirmeth": the poet explores by imagination, creating an optimal world we can both yearn towards and build towards. Asma concludes, "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." Percy Shelley's 1821 "Defence of Poetry" claims that "poets are the unacknowledged legislators of the world." Asma makes a strong case that the MC is the unacknowledged legislator of the human mind.

But how much power should we grant such a legislature? The widely admired poem "Diving into the Wreck" by Adrienne Rich—among the most important figures in post-World War II

American poetry and feminism—explores the wreckage of a love-relationship through the metaphor of a deep-sea diving expedition. It concludes,

> We are, I am, you are
> by cowardice or courage
> the one who find our way
> back to this scene
> carrying a knife, a camera
> a book of myths
> in which
> our names do not appear.

The mythopoetic story may be important, but it can also be biased, exclusionary, violent, and otherwise harmful towards women and other disempowered groups.

So, at the risk of being tiresomely predictable in the current climate of academia, I will close with questions about social justice. Can the tools of science—deduction, dissection, and technical reproduction; hence, the Dominant Model, armed with knives and cameras, analysis and representation—excise those malignancies? Or is the DM so intertwined with oppressive premises that our most promising ameliorative efforts may lie instead in the subtle subversions performed (I suspect Asma might say) by jazz or (I would say) by Shakespeare? The spontaneous mind seems to serve the crucial human project of unselfish cooperation better than the calculating mind does (Rand, Greene, and Nowak 2012). How can we best intercede ethically within the collective mythopoesis, the power of which has been direly underrated?

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# The Strangest Sort of Map: Reply to Commentaries

Stephen Asma

I am grateful for the thoughtful and careful responses to my article. All the respondents have been charitable with their time and energy, producing a series of provocative challenges and supportive additions to my theory of adaptive imagination.

Most of the respondents were sympathetic to the overall argument, seeing my work as congenial to their own. Several people offered additional data to strengthen my overall argument, and I'm delighted to pursue these paths of consilience in my future work.

In this necessarily brief rejoinder, I'll try to dedicate greater attention to the more critical points. Tackling the less sympathetic arguments helps to clarify my theory and see how it succeeds and fails against challenging data and alternative theories.

In my target article, I argued for the primacy of mythopoetic thinking. In addition to arguing that humans shape reality through image and story schemas (Bruner 1986; Hutto 2008, 2016; Asma 2009), I have labored to show that these schemas are so deeply embodied that they cannot be derived from literal descriptive sense-making, and must precede concerns of verisimilitude. The common mistake is asking to what degree imaginative schemas correspond with external referents, when it would be better to examine the imagination's sense-making ability to adaptively manage our emotional, somatic, affordance-rich world. Why are language and image-making so inevitably dramatic, and why is drama such a common default form of cognition?

Consider the map envisioned by Lewis Carrol in *Sylvie and Bruno Concluded* (1893). First, we start with a map in which one inch represents one mile. So far, so good. Then for greater detail make a map wherein six inches represents one mile. Now keep scaling up. Eventually we arrive at the most detailed map conceivable, a map in which one mile represents one mile in the world. For obvious reasons, you should never fully open up this map.

This is a typically wonderful Lewis Carrol episode, but his map is still just a representational map—one thing on the map stands for (or is a symbol of) a real thing off the map. Most people think of language and image-making on this same model—a mode of symbolizing and referring to something externally real. But now consider an even weirder map— "Asma's Microcosm Map." Imagine a map of Chicago. In the place of the John Hancock building there is a little piece of the John Hancock building, and where Lake Michigan is drawn there is a tiny wet area of the lake's actual water, and so on. This strange map is how our imperative language and imagination really work. And it is why mythopoetic cognition has such power.

When you first perceive a thing like an apple, many modes of perceptual memory will be stored, and then activated later by other triggers (including language). The word "apple" creates a reverse flow of associations, affects, and memories—from abstract word to concrete perceptual information (a reversal of the original experience, which was sensual first, and symbolic/linguistic later). Language is a reverse activation of embodied information, feelings, or associations. Language is virtual reality (a trigger of the simulation system), but also a shared manifold of experiences. The map *is* the territory, albeit writ small. Since language and images reactivate the

embodied pathways directly, they do not stand like a digital code or map of experience—they are part of experience itself. Language has representational power like a map, but this map also has little parts of the territory within it. This is important because most linguistic theories, from Ferdinand Saussure to Hilary Putnam, have foundered on the question of how the word (symbol) tethers to the *referent*—always deferring the verification. On this view of language as embodied map, the semantic content of the word "apple" just *is* the embodied pathway (affective states, imagery, affordances). This is the biosemantic view that underlies, in my opinion, Addis's (2020) claim that *story* schemas help structure and sequence our simulations of the world and act as highly efficient ways to retain and understand large amounts of daily, seasonal, social, and natural information.

## Where's the Self?

Some of my respondents called for refinement regarding the role of the self and its relationship to the activity of adaptive imagination. Fatima Felisberti and Robert King, as well as Addis, called for greater integration of recent Default Mode Network (DMN) research, and Andrey Vyshedskiy argued that the lateral prefrontal cortex (LPFC) is the crucial neural substrate for voluntary imagination. These are very welcome insights and help to refine my understanding.

My sense is that the interpretation of DMN research has been changing, and while it has coalesced into some general functions it is still too early to put all our eggs in the DMN basket. For example, one way to think about the DMN is that it is a state of hypofrontality, in which task networks are relaxed—a kind of spacing-out that may or may not be generative for creative thinking. Research that links DMN mind-wandering to dreaming brain states seems to imply that the DMN is a network that decenters the self and produces a heightened form of "field" consciousness, what Buddhists might call mindfulness—a greater awareness and immersion into the objects of perception and/or the inner play of ideas. This default toggle away from task consciousness reveals the phenomenology of things—an awareness that Heideggerians might call present-at-hand (*Vorhandenheit*) and Buddhists might call "thusness" (*tathata*). It's a nonutilitarian but also nonautobiographical awareness well known to psychedelics users. Whether this is DMN or not, it is a potentially rich generative space for imagination.

However, more recent studies of the DMN, pointed out by Addis as well as Felisberti and King, reveal that there is plenty of self-consciousness and autobiographical (and social) rumination at the heart of the DMN. Philosophically speaking, this is interesting because the original distinction between a task-positive network and a default network seemed to capture the difference between goal-directed instrumental mind and free-playing noninstrumental mind. With increasing DMN studies emerging, however, it looks instead like the distinction is actually between two kinds of instrumental goal-directed mind. Addis argues that the mind-wandering activity of the DMN is often biased by motivational states to center on current concerns and goals, rendering it (to my mind) as an autobiographical task-positive activity. It may well turn out to be that, but then the DMN looks less like the locus of undirected and disinterested stream-of-consciousness activity that many of us had taken it to be. The DMN is clearly important to imagination, but it is further complicated by little-understood affective components. Mental health problems and cognitive deficits have been linked to both hyperactivity and hypoactivity of the DMN. It is not clear how the philosophy of mind, psychology, and neuroscience all get their various taxonomies of mind to map onto each other in this case. Until the picture clears I'm being careful to avoid pinning too much of the MC theory to the DMN.

For similar reasons I am cautious about Vyshedskiy's confident assertion that voluntary imagination is distinguished from involuntary because the former enlists the LPFC. This is welcome news and I hope he's right, because it would give us a neural locus of the switching system from involuntary (e.g., dreaming and mind-wandering) to executive controlled imagination. His confusion about whether my MC applies to involuntary or voluntary imagination is something I take responsibility for, since I could have been more clear. But the truth is that I am trying to track *both* modes from a developmental perspective—the voluntary emerges out of the involuntary. My stronger claim that MC is conserved stymies Vyshedskiy. Phylogenetically, involuntary imagination preceded voluntary, and the same is probably true ontogenetically, but the mindbrain is a kludge (Marcus, 2009) and the new system is built on top of (and through) the old system, which means (if I'm right) that we still have some contemporary access to the different systems (e.g., during ecstatic activities, art-making, etc.). In fact, if the activation of the LPFC is the crucial switch between two systems then it is even easier to see how all three cognitive abilities may be conserved; that is, involuntary imagination (dreaming, free associating), voluntary imagination (creating art), and nonimaginative indicative cognition (scientific reasoning). When I refer to "premodern *Homo sapiens*," I am referring to anatomically modern humans (300,000 years ago) who do not yet have sophisticated indicative language (which may be as recent as 50,000 years ago).

Additionally, I find Vyshedskiy's overly confident dating of evolutionary innovations somewhat troubling. He is a fan of "great leaps." He says voluntary imagination jumped forward 3.3 mya when stone tool manufacturing *demanded a mental template* in the mind of the tool-maker. It demanded nothing of the sort. A much simpler "template" for creating an Oldowan or even Acheulean stone axe is just another stone axe carried around with the tribe or individual. Much simpler associational mimicry, not mental templates, can explain the replication and transmission of stone technology.

Høgh-Olsen reminds us all to be careful about cleanly separating images and stories, as well as deep biocapacities like perception, affect, and motor systems. The chicken and egg question (which part of imagination came first?) is so tempting—and I did argue that motor coordination precedes other forms of imaginative simulation—but Høgh-Olsen reminds us that it doesn't really make sense to give movement priority over perception when they are complementary entities in a functional unity. I agree completely and attribute my zeal for the primacy of movement as a way to emphasize the dynamism of mind (Noe 2004; Dreyfus 2014) against the spectator theory of mind (see Dewey 1929).

## Reality Check: Social Reality, Nature, and Art

Several respondents (Jensen, Oatley, and Watson) point out that I do not give enough attention and weight to the social dimension of imagination. I stand duly chastened, and I agree entirely. Jensen nicely argues that collective stories express and support collectives, and religion shows this clearly. My own work on religion (Asma 2018) explores the emotional aspects of religious ritual, but Jensen's work illustrates the way religious imagination establishes and recapitulates norms. I'm not sure I follow him as far when he suggests that imagination is a cognitive gadget (Heyes 2018) nor am I convinced that imagination is language-dependent.

Keith Oatley helpfully connects my theory with Michael Tomasello's research on joint intentionality and cooperation. The research clearly shows that humans are much more cooperative than chimpanzees, and Oatley thinks this throws doubt on my pessimistic view that humans develop in hostile conditions. I may have oversold the hostility of the human social environment, and merely wanted to capture all of the psychodynamics of the nuclear family or early

social environment as "dramatic." By this I didn't mean that every kid is under siege (although sadly too many of them are), but rather that children see their earliest conspecifics in dramatic terms as helpers, harmers, heroes, villains, and so on. It is unclear from Oatley's response where he places the imagination in the process of joint attention. While Tomasello seems to think that cooperation requires a Theory of Mind mechanism, I am inclined to think that the human affective CARE system (Watt 2005) is flexible enough via neotony and neural crest cell development (Wrangham 2019) to attach affiliative emotions to a much wider social group than chimpanzees. Imagination can then amplify those emotions or, as Robert N. Watson reminds us, diminish those cooperative emotions.

Watson beautifully reveals the way master artists, like Shakespeare, play with cognitive and cultural expectations. Shakespeare builds innovative forms of mythopoetic imagination while sometimes satisfying and sometimes confounding audience expectations (i.e., established mythopoetic schema). Watson may agree with Angus Fletcher's recent arguments (2021) that literature, properly understood, is a tool for opening and broadening the mind, not establishing universal archetypes. By carefully contextualizing a story/play like *Hamlet* within Renaissance culture, Watson shows us how stories slowly build up meaning through accretion. We look to Hamlet to better understand ourselves, but Hamlet is also looking to older literary stories, like that of Hecuba, to understand himself. The stories may not be capturing and retelling some hidden universal archetype, but may seem to do so because we are too close to our own cultural evolution. In a meta-move, Watson shows how some Shakespeare plays articulate a distinction between the bold and fast-acting MC and the dithering DM cognition that is remarkably similar to the distinction I am proposing. But his worry about the politics of imagination is a real one. The MC I'm so fond of is also a major troublemaker, quick with bias, prejudice, and paranoia (see Giamatti and Asma 2021), and it needs occasional correction from cool-headed, less embodied, indicative rationality.

Just as the social world needs occasional correction and redirection from the indicative scientific mind—what Bruner called the "paradigmatic mode" (1986)—we need, as Van Mulukom and de Wet remind us, a similar redirect in the natural world . Van Mulukom and de Wet effectively argue that we cannot return to animistic cognition and intuitive thought and still solve our real global problems. Paradigmatic scientific cognition, not narrative cognition, creates vaccines for pandemics and puts rovers on Mars. I agree. My project is to see how far MC scales up—how far humans can adapt and have adapted to social and natural environments using a sophisticated simulation system of associations and imaginative schema. I have scaled it up sufficiently to explain a lot of human success, but perhaps we are reaching the limit now. While I do think that it pervades our thinking at every level (including in science), our species is lucky enough to be able to break away from mythopoetic cognition sometimes. Notice, however, that while we can all agree that Pfizer is better than shamans in a pandemic, the nemocentric scientific worldview is much less accessible (and phenomenologically inhabited) than you might think. Even in a pandemic most people are not relating to the biological causation of immunology, but rather to a folk sense that viruses are enemies and vaccines friends; a perspective of personified protagonists (Rossolatos 2020). Former president Trump described COVID-19 as our great enemy in an "all-out war" in March 2020. Additionally, many people moralized COVID-19 on the grounds that our encroachment on nature and our environmental sins brought on the zoonotic spillover as "Nature's retribution." Evidently, a mythopoetic sense of good guys versus bad guys is still driving the sense-making of the population.

Geoffrey Galt Harpham beautifully demonstrates my main point by humorously recasting my entire theory as a misunderstood "hero"

(MC) struggling against a nefarious "enemy" (DM). *Quod erat demonstrandum.* I love it. Harpham (and Watson) reminds us to keep our theorizing close to art and art-making itself, and sensitizes us to the fact that healthy imagination often requires a supportive and safe childhood. Still, Harpham misunderstands an important point about the phylogenetic and ontogenetic development of indicative scientific mind. Yes, our species evolved new capacities (in parallel with descriptive language) that gave us the ability to think abstractly/conceptually and formulate lawlike theories, but that does not mean that ontogenetic development inevitably activates and develops those capacities. Childhood development happens within cultural and ecological frameworks, most of which do not produce WEIRD populations or indicative scientific minds. Since I think unscientific minds are still very successful from a Darwinian viewpoint, this doesn't worry me too much.

## Confusion of Content and Process?

Perhaps the most telling and fruitful disagreement with my theory comes from Anna Abraham's claim that I have confused content and process. Abraham correctly states my view that indicative and imperative cognition differ in part by the action tendencies entailed, and this difference coheres with many dual-process theories. For Abraham, processing appears to be the mere condition for content, and content is independent of process (rendering content equivalent to information). The perceptual pathway is one thing, the color red another; dual System II is one thing, the logical judgment another. But I am trying to question this standard distinction. While my embodied approach is certainly controversial, there is no confusion on my part. For me, the process *is* the content.

My commitment to a simulation-system approach to mind, as opposed to a representational system, undercuts most traditional distinctions between "process" and "content." My view has its roots in David Hume's claim that *ideas* are attenuated *impressions*, and these are governed primarily by associational systems. If we update this general view, we get the kind of somatic semantic view that I am advocating (Asma and Gabriel 2019; also see Barsalou 2009; Ray and Heyes 2011).

I'm arguing that we abandon a longstanding prejudice regarding mind, namely the idea that intentionality is intrinsically representational. The longstanding view of mental "content" goes like this: The mind is *about* stuff. It's about tomorrow's dinner, Mom's phone call last week, the political future of Rwanda, and the hopes for eventual retirement. Traditionally, the biology of brain processes is considered as a series of mere cause-and-effect mechanical events like stimulus and response, but such processes are not "about" something (Brentano 2005 [1874]; Searle 1983). They are especially not about nonpresent content. It is unclear how my eventual retirement, for example, can be causally influencing my brain and body to do things, since my retirement does not exist yet. But it is clear that the idea or *representation* of my retirement is *about* something specific, and that this can cause me to act toward that (currently nonexisting) goal state. On this view, *action* (as opposed to stimulus-response) occurs if and only if a representation of the goal of the activity accompanies and causes the bodily changes toward the goal state.

On this traditional view, beliefs and concepts are representations of the world, and in that way the mind has content. A rock cannot have intentionality about a tree and vice versa—they cannot take each other as "content" and be "about" each other. But cognition can do this. Traditional philosophy of mind assumes that belief-states achieve this aboutness of content via symbols, signifiers, and the propositional representations of language. Abraham seems to be adopting such a position when she wants a strong distinction between the *content* (in my example "I should run away" when I see a snake) and the *process* (affective affordance perception). But I don't think there is an important distinction.

Imperative thinking is intentional—has aboutness—without being conceptual or propositional. Imperative categories of the world (e.g., trees, rivers) are not conceptually precise, but serviceable and actionable taxonomies (e.g., trees = climb-up-ables, rivers = drink-ables). In my view, imperative thinking corresponds well with what is sometimes called "gist-based" or fuzzy cognition (Setton et al. 2014). The main difference between a content (say, "snake") of indicative mind (cold cognition, System II) and imperative mind (hot cognition, System I) is that one of them—indicative—has been automatically abstracted from its rich "impression" source (in the Humean sense) by decoupling its formal qualities from its affective and action-oriented ingredients. The processing difference (affective conditioning versus symbolic reasoning) produces most of the content difference. And somatically loaded gist-based cognitions are the rule, not the exception (following Addis above, and Wang 2019).

It is possible that Abraham is suggesting a much simpler sort of critique, and I have read too much in. It is not my suggestion that mythopoetic cognition is exclusively hot cognition and scientific cognition exclusively cold cognition. Rather, mythopoetic cognition retains much more of its System I-generated affective and action-oriented ingredients. MC in its most foundational form builds meaning out of elements that are already semantically potent. In the basement of cognition, the conative drive (striving, seeking, wanting) is crudely intentional as a goad with flexible goals. On the next level up, subcortical affective/emotional systems are intentional because they fix approach/avoid feelings on specific resources and threats in the environment. And on the next level up, the neocortical, fully representational mind is intentional because it can redescribe reality into models (like imperative stories and then indicative theories) that we recognize and act upon.

The difference between my view and Abraham's arises again when she suggests that my MC is a species of Dennett's "intentional stance." But this reasserts the distinction I am trying to collapse in my discussion of animism. For Dennett (and Abraham?), the "intentional stance" is a kind of pretend heuristic perspective in which we decide to ascribe mental intentions to an object that may or may not have them, and then we try to make predictions about behavior from those projected intentions (Dennett 1989). This, however, is a game we play in post-Darwinian biology to help us track means/end relationships when we know that the teleology of natural theology is dead (e.g., we ask, "What do the ants *want* when they build this bridge?"). As such, it is perfectly fine. But it's not animism.

As the theory of mythopoetic cognition develops, I would like to see research deepen. Neural substrates and systems underlying imagination need continued exploration. Theories of meaning (like biosemantic simulation) need further articulation and research in order to take imagination out of the trifling box (fantasy) in which traditional verification theories place it. Further tessellation with empirical research on therapeutic imagination is needed. A rapprochement with cognitive science should continue. And importantly, the specific genres, stories, and imaginative works themselves (whether idiosyncratic or seemingly universal) need careful unpacking in light of adaptation. The substantial dialogue in this special issue in *Evolutionary Studies in Imaginative Culture* is a strong contribution to deepening the theory of mythopoetic cognition.

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# Dad Jokes and the Deep Roots of Fatherly Teasing

Marc Hye-Knudsen

## Abstract

Dad jokes, I argue, are a manifestation of a much older fatherly impulse to tease one's children. On the surface, dad jokes are puns that are characterized by only violating a pragmatic norm and nothing else, which makes them lame and unfunny. Only violating a pragmatic norm and nothing else, however, is itself a violation of the norms of joke-telling, which makes dad jokes a type of anti-humor. Fathers (i.e., "dads") may in turn seek to embarrass their children by purposively violating the norms of joke-telling in this way, thus weaponizing the lame pun against their children as a type of good-natured teasing. Given their personality profile, it makes sense that fathers should be particularly prone to weaponize dad jokes teasingly against their children like this, with the phenomenon bearing an illuminating resemblance to the rough-and-tumble play that fathers have engaged their children in since before the dawn of our species.

**Keywords:** dad jokes, puns, humor, anti-humor, teasing, benign violation, fatherhood, rough-and-tumble play, evolutionary psychology

In recent years, dad jokes have gained increasing notoriety both as a concept and as a phenomenon, yet they remain poorly understood. In 2019, *Merriam-Webster's Dictionary* added an entry on dad jokes with the following definition: "a wholesome joke of the type said to be told by fathers with a punchline that is often an obvious or predictable pun or play on words and usually judged to be endearingly corny or unfunny." This definition raises a number of questions: Firstly, why is this type of joke specifically associated with "dads"? Are fathers actually more prone to employ them, and if so, why? Furthermore, how can we make sense of the popularity of dad jokes given that they are explicitly said to be "unfunny"? Even those definitions of the genre that do not specifically use the word "unfunny" include some reference hereto, instead calling them "lame" (Dictionary.com 2020), "hackneyed" (*OED* 2020), or "embarrassingly bad" (Urban Dictionary 2020). Yet many, if not most, people must clearly find dad jokes funny in some sense since they continue to share them and to seek them out. On Reddit.com, the community *r/DadJokes*, which is specifically dedicated to sharing dad jokes, has a staggering 3.4 million members. Similarly, Google Books lists no fewer than 300 books solely dedicated to compiling examples of the genre, and the website *Buzzfeed* alone has an equal number of articles that are just lists of dad jokes. An exemplary dad joke from one such article goes like this: "A duck walks into a pharmacy and says, 'Give me some lip balm—and put it on my bill'" (Bullock 2019). Are dad jokes like this funny, unfunny, or somehow both? To answer such questions and to get to the bottom of the phenomenon of dad jokes, we have to look closer at the deep roots of both dads and jokes.

Taking a long view like this will allow us to bypass such common misunderstandings as the idea that dad jokes are simply bad jokes and that dads have a bad sense of humor. Drawing on the work of the psychologists Peter McGraw and Caleb Warren, which posits that humor is an

evolved response to benign norm violations, I will here attempt to resolve in what sense dad jokes are funny and in what sense they are not. I argue that dad jokes have to be considered as functioning on at least three levels, namely as lame puns, as cases of anti-humor, and as cases of weaponized anti-humor. As puns, I propose that dad jokes are characterized by only violating a pragmatic norm and nothing else, which makes them lame and unfunny. Only violating a pragmatic norm and nothing else, however, is itself a violation of the norms of joke-telling, which makes dad jokes a type of anti-humor. Fathers (i.e., "dads") may in turn seek to embarrass and/or annoy their children by purposively violating the norms of joke-telling in this way, thus weaponizing the lame pun against their children as a type of good-natured teasing. While not funny as lame puns in themselves, it is thus in their context as anti-humor and as weaponized anti-humor that dad jokes become funny. It is in this last context as weaponized anti-humor, in turn, that the connection between dads and dad jokes is to be found. Given their distinct personality profile, I argue that it makes sense that fathers should be particularly prone to weaponize dad jokes teasingly against their children, with the phenomenon bearing an illuminating resemblance to the rough-and-tumble play that fathers have engaged their children in since before the dawn of our species.

## The Origins of Dads, Jokes, and Dad Jokes

To understand the nature of dad jokes, we first have to understand each of its constituent concepts: dads and jokes. Incidentally, the origin and nature of these two things, dads and jokes, are intimately tied together through their common link with rough-and-tumble play, which is the foundation from which humor has evolved. This requires some explication. Jokes are verbal or physical gestures meant to evoke the psychological response of humor, which is comprised of the positive emotion of amusement and the physiological tendency to laugh (Martin 2007). The humor response is a universal component in the human emotional repertoire, but what exactly is it about jokes that evokes this response in us? This question has been a source of debate among scholars for literally thousands of years, but a consensus seems to have emerged among contemporary humor scholars that humor at least requires the perception of "incongruity," something that is incongruous with our expectations or our normal mental patterns (see Morreall 2009). Many jokes, for instance, employ a setup/punchline-format wherein the "setup" *sets up* an expectation that the punchline then incongruously violates (Ritchie 1999). This so-called "incongruity theory," however, is far too broad to satisfactorily account for the humor response: Why, for instance, is slipping on a banana peel commonly considered humorous while winning the lottery or being unexpectedly diagnosed with cancer is not, despite all three scenarios being both incongruously unexpected and atypical? To answer such questions, a more precise model of humor is required.

### *Humor as an Evolved Response to Benign Violations*

The benign violation theory of humor, originally formulated by Thomas Veatch (1998) but significantly expanded upon by the psychologists Peter McGraw and Caleb Warren (2010), builds on the incongruity theory while offering much stricter conditions for the elicitation of humor. Firstly, the benign violation theory specifies that the violations necessary for humor must have a negative valence instead of simply departing incongruously from our expectations or our normal mental patterns; hence slipping on a banana peel is commonly considered humorous while winning the lottery is not. In other words, for something to be humorous it must violate not just our expectations of how things usually are but rather our normative sense of how they "ought" to be. In order for such a violation to

elicit humor instead of purely negative emotions, however, the benign violation theory further specifies that it must ultimately be appraised as benignly non-worrisome; hence being diagnosed with cancer is not typically considered humorous either. For something to be humorous according to the benign violation theory, it must thus simultaneously be appraised as a violation (i.e., wrong, bad, or threatening) and benign (i.e., normal, harmless, or okay). Revising the incongruity theory by narrowing the definition of a violation and including the condition of benignity allows the benign violation theory more accurately to distinguish that which is humorous from that which is not. In numerous experiments, Warren and McGraw (2016) have demonstrated this by showing the benign violation theory to be more accurate in predicting humor than any other prominent conceptualization of incongruity.

The benign violation theory is an ideal analytical tool for understanding the phenomenon of dad jokes. By offering both necessary and sufficient conditions for humor, it will allow us to establish in what sense dad jokes are funny and in what sense they are not. In order for something to be funny, it must hit the sweet spot of both eliciting a violation appraisal and a benign appraisal. When a joke is unfunny (i.e., fails to elicit humor), it is either because it does not strike its recipient as being enough of a violation or as being ultimately benign. People may differ in what they find funny by virtue of differing in what they judge to be a violation and what they judge to be benign. To a prudish person, for instance, someone farting in their presence is undoubtedly a violation, but they may fail to find it benignly humorous. Someone with a less prudish disposition, however, may find it very humorous by virtue of seeing the violation as ultimately benign. In this way, the benign violation theory will allow us to explain why dads should be predisposed to find dad jokes humorous while their children should only find them embarrassing or annoying by reference to the distinct temperamental and emotional dispositions of these two groups. Moreover, the benign violation theory is ideal for understanding dad jokes in that it illuminates the connection between humor and the rough-and-tumble play that fathers have been known to engage their children in since before the dawn of our species. Biologists have long known that humor likely evolved from rough-and-tumble play, but the benign violation theory highlights the marked continuity between the two.

Humorous laughter, biologists have argued, is likely to have originated as a "play signal" with an apparent antecedent manifested in the distinctly laugh-like panting vocalization that accompanies the play face of some of our closest related primates like chimpanzees (van Hoof 1972; Provine 2000; Polimeni and Reiss 2006). Many mammals, including primates like chimpanzees, form social bonds and learn vital skills through social play, which most often takes the form of play fighting (i.e., "rough-and-tumble play"). During such play, the participants will play at physically violating each other's boundaries by wrestling, chasing, biting, fleeing, and the like. Here, play signals like the play face and its accompanying panting serve to indicate that all physical violations are intended and construed as benign, thereby ensuring that no misunderstandings occur that could accidentally escalate the play fighting into actual violence (Gervais and Wilson 2005). The play face, moreover, is presumably accompanied by some kind of amusement-like positive affect that spurs on further play. The first violations to have elicited laughter and "proto-humor" are thus thought to have been the benign physical violations that constituted the rough-and-tumble play of early humans (McGraw and Warren 2010, 1142). In turn, the benign violation theory posits that during the course of our evolutionary trajectory the situations capable of eliciting humor were gradually expanded to include other kinds of violations, like linguistic norm violations (e.g., puns and wordplay), social norm violations (e.g.,

farting in public), and moral norm violations (e.g., black humor).

The link between humor and rough-and-tumble play is illuminating. Rough-and-tumble play is an avenue through which young primates learn vital physical skills that they will use later in life (Boyd 2004). By playing at fighting, chasing, fleeing, and the like, chimpanzees are better prepared to do so for real when the time comes. As an adult, failure at any of these tasks could be fatal. Rough-and-tumble play is also a vital part of childhood for members of our own species (Hart and Tannock 2018). By playing at physically violating the boundaries of others and by playfully having their own boundaries violated, children learn to handle aggression, they learn what their own bodies can endure, and they learn what actions they can perform on others without hurting them, among other things. But the physical skills associated with activities like fighting are far from sufficient to get by as a member of our species. Humans, as some evolutionary researchers have put it, occupy a "cultural niche" (Boyd, Richerson, and Henrich 2011). To get by as a *Homo sapiens*, we have to absorb an extensive set of culturally specific linguistic, social, and moral norms from the people around us. One way we do this is through humor. By playing at violating the linguistic, social, and moral norms of our culture, and by witnessing others playfully violate them, we gain acquaintance both with the norms themselves and with their exceptions, those cases in which their violations are thought harmless enough to laugh at (Simler and Hanson 2017, 129-48). In this respect, humor resembles its predecessor, rough-and-tumble play.

### *Dads as Playmates and Jokers*

Every individual human being has to internalize the extensive and intricate set of norms that constitutes their culture. That is part of the reason why we have such exceptionally long childhoods compared to other species (Fuentes 2017). We need time to master our culture, and we do this in part through play and humor. Of course, neither play nor humor is restricted to childhood, but a great part of childhood consists of playing and joking around. In fact, among contemporary nomadic hunter-gatherers, whose lifestyle is thought to resemble that of our ancestors for most of human history, children spend almost all of their time playing and joking around (Gray 2009). The fact that our childhoods are so exceptionally long, in turn, was a central driver behind the evolution of fatherhood in humans. Among the primates closest related to us, males are almost entirely uninvolved in the upbringing of their offspring—except, interestingly, when it comes to rough-and-tumble play. Chimpanzee fathers spend more time playing with their own offspring than they do with unrelated young (Lehmann, Fickenscher, and Boesch 2006; Murray et al. 2016). With this exception, however, they remain largely uninterested in their offspring (see Geary 2000). This is not the case with human fathers. Due to their slow maturation and extended childhood, human children impose a burden on their mothers so heavy that it makes investment from others necessary. The remarkable degree of paternal care in our species is a result (Bjorklund and Shackelford 1999; Hrdy 2009). Yet, human fathers still remain *less* involved than mothers on average in all aspects of child-rearing, with one very telling exception: rough-and-tumble play (Paquette 2004).

The distinct personality profile of fathers makes them ideally suited for engaging their children in rough-and-tumble play. Both fathers and mothers play with their children, but fathers are more physical and challenging in their play (Paquette et al. 2003). Fathers' play is typically more vigorous and unpredictable than mothers' play, and they tend to push their children to the limits of what they can handle, encouraging them to fight harder, run faster, climb higher, and the like (Bokony and Patrick 2009). This difference between fathers and mothers as playmates can be attributed to men's greater physical strength, their higher levels of physical

aggression and assertiveness, and their lower levels of agreeableness and neuroticism as compared to women (Costa, Terracciano, and McCrae 2001; McCrae et al. 2005; Weisberg, DeYoung, and Hirsh 2011; Björkqvist 2018). While men's greater physical strength, aggression, and assertiveness likely push fathers to be rougher and more challenging in their play, women's higher levels of agreeableness and neuroticism may in turn impede mothers in this regard for fear of accidentally hurting their child. Evolutionary researchers have suggested that all of these sex differences can be traced to women's greater investment in each offspring. Women's greater parental investment has been the source of intrasexual competition among men, which has likely selected for traits that are useful for conflict, including the physical kind—that is, physical strength, aggression, and assertiveness (Buss 2016, 290-314). On the other hand, women's greater parental investment has likely selected for nurturing traits in themselves—that is, agreeableness (empathic concern, consideration, kindness) and neuroticism (anxiety, worry, sensitivity to negative emotion), useful qualities for caring for a child and protecting it from potential harms (Campbell 2002; Weisberg, DeYoung, and Hirsh 2011).

The personality traits that cause fathers' more physical and aggressive style of play also give them a distinct style of joking with their children. Both fathers and mothers joke with their children, but fathers are more challenging and teasing in their humor (Paquette 2004). Teasing is perhaps the type of joking that most directly reflects the origins of humor in rough-and-tumble play. Instead of quasi-violent mock aggression, which is the basis of rough-and-tumble play, teasing is based on all kinds of mock aggression. Teasing often takes the form of playfully provocative verbal statements that are meant to benignly strike at the recipient's feelings (as distinct from bullying, where the purpose is primarily domination instead of affiliative humorous amusement [Keltner et al. 2001]). Yet, teasing need not be verbal, and teasing behaviors have been observed both in preverbal infants and in nonhuman primates (Eckert, Winkler, and Cartmill 2020). Nonverbal examples of teasing include offer and withdrawal (e.g., offering an object to someone and then quickly pulling it away as they reach for it) and playfully disrupting others' activities (e.g., taking an object from someone that they are engaging with). Just as men's higher levels of aggression and assertiveness spurs them to be more aggressive and provocative in their play, so too it is likely what spurs them to be more aggressive and provocative in their humor. On the other hand, women's higher levels of agreeableness and neuroticism, which impede them from being aggressive in their play from fear of hurting their child physically, is likely also what impedes them from teasing their children from fear of hurting them emotionally.

At first blush, fathers' style of play might seem harsh and unkind as compared to mothers', but that would be a misunderstanding. Children's pleasure in rough-and-tumble play is actually most intense when they play with fathers *because* they are rougher and wont to challenge them more (Paquette et al. 2003). Moreover, rough-and-tumble play with fathers has been shown to have numerous positive effects, supporting children's physical and cognitive development while teaching them to regulate their behaviors and emotions (Robinson, StGeorge, and Freeman 2021). Ideally, fathers' rougher style of joking fulfills a similar function: by teasingly striking at their children's egos and emotions without teetering over into bullying, fathers build their children's resilience and train them to withstand minor attacks and bouts of negative emotion without getting worked up or acting out, teaching them impulse control and emotional regulation (see Gray 2013). Moreover, the function of play and humor is not just education but also bonding (Gervais and Wilson 2005). Both play fighting and teasing are thus ways in which fathers bond with their children even as they push them to the limits of what they can handle. I contend that dad jokes are a

manifestation of fathers' impulse to teasingly challenge and provoke their children like this. That might sound counterintuitive since dad jokes, at their most basic level, are simply lame puns, seemingly the least provocative type of humor there is. Dad jokes, however, are much more than this. To understand how dad jokes constitute a type of teasing, in turn, we have to examine each of the levels on which they work as jokes.

## Dad Jokes as Lame Puns

Not all puns are dad jokes, but virtually all dad jokes are puns. This is acknowledged by everyone who has concerned themselves with the joke genre at length in popular magazine articles or the like (Fetters 2018; Geary 2018; Luu 2019; Zinoman 2019; Mitchell 2019). In order to understand how dad jokes work and why dads are predisposed to engage in them, we first have to understand what sets apart the puns that qualify as dad jokes from the puns that do not. Puns have long had a bad reputation as a low and unwitty form of humor (Redfern 2000), but the puns that qualify as dad jokes are distinguished by a specific quality that makes them particularly susceptible to accusations of badness, lameness, and unfunniness. It will not be necessary here to recapitulate the vast and extensive literature on the linguistic features of puns and their underlying mechanisms (for a review hereof, see Hempelmann and Miller 2017). For the purposes of this paper, it will be sufficient to note that puns are a type of verbal humor that exploit the fact that a sound sequence (e.g., a word or phrase) has two meanings. Consider the pun from the introduction to this paper: "A duck walks into a pharmacy and says, 'Give me some lip balm—and put it on my bill'" (Bullock 2019). Here, it is, of course, the deliberate double meaning of the phrase *my bill* that constitutes a pun. The pun requires its listener to realize the first possible meaning of the phrase, the second possible meaning, and the tension between the two (see Attardo and Raskin 1991).

What is it, exactly, that puns like this benignly violate to humorous effect? As Raskin and Attardo (1994) have argued, puns, like many kinds of verbal humor, violate the "cooperative principle" of conversational communication. As first documented by the linguist Paul Grice (1975), the cooperative principle refers to the implicit pragmatic norms that allow conversational communication to unfold effectively. In fact, Michael Tomasello (2010) has argued that these implicit norms were a prerequisite for human language to evolve in the first place. Specifically, puns violate the norm of conversational communication that prohibits intentional ambiguity (Aarons 2017, 81). To make sense of each other's contributions, it is essential for participants in normal human conversation to be able to trust that their partner will only ever say one thing at a time, with their words thus having a clear, unambiguous meaning. With a pun, the speaker violates this conversational norm by purposively saying at least two different things at the same time, with their words thus having multiple and sometimes contradictory meanings. Thus, puns violate the implicit contract that makes human communication possible. Typically, the speaker will signal that this violation is meant to be benignly playful through a shift in tone, through their facial expression (e.g., a sly smile), or through the use of discursive cues (e.g., "Have you heard the one about . . . ?"). Puns are thus a way of playing around with using language "wrongly" (Warren and McGraw 2016), benignly violating its rules of usage in conversational communication to humorous effect, at least in principle.

Yet, few people are strongly enough committed to the pragmatic norms of everyday conversation for their breach to register as much of a violation in itself; hence puns lack force as humorous stimuli and are typically considered a stale form of humor (Beck 2015). When people violate the pragmatic norm against ambiguity by employing a pun, it is consequently often in the service of benignly violating another norm of some kind that is capable of provoking more of

a response. For instance, social norms dictate what kind of language is appropriate when and where, prohibiting the use of certain "dirty" words pertaining to sexuality in polite company (Pinker 2008, 323-72). A sexual pun allows the speaker to violate these norms in one sense while in another sense benignly complying with them. Mel Brooks provides an example in his film *History of the World: Part 1* (1981), wherein he plays an ancient Roman who remarks that "we've got a god for everything. The only thing we don't have a god for is premature ejaculation . . . but I hear that it's coming quickly." In one sense, this is an innocuous remark about the fact that a god for premature ejaculation is about to join the Roman pantheon, but "coming quickly" can of course also be understood as an inappropriately crude way of referring to premature ejaculation itself. As a sexual pun, this is thus not just a violation of a pragmatic norm but also a social one. Similarly, dark puns like dead baby jokes violate the social norms that limit which sensitive subjects can be joked about (Dundes 1979). An example is the following pun, which plays on the ambiguity of the word *abort*: "I was going to tell a dead baby joke, but then I decided to abort" (Okafur 2019).

The distinguishing characteristic of dad jokes is that they are puns that are only puns—which is to say, they are puns that only violate the pragmatic norm against ambiguity and nothing else (see table 1). This is why they are often described as "wholesome" (*Merriam-Webster* 2019), "inoffensive" (Urban Dictionary 2020), "clean" (Kort 2020), or even "squeaky-clean" (Fetters 2018). The fact that dad jokes inoffensively shy away from violating anything other than the pragmatic norm against ambiguity is what allows

**TABLE 1.** There are countless books and articles solely dedicated to compiling examples of dad jokes. This table displays the very first example of a dad joke included in ten different such books or articles. As apparent from this selection, dad jokes are distinguished by being inoffensive puns that only violate the pragmatic norm against ambiguity and nothing else.

| Title of book or article | First included example of a dad joke |
|---|---|
| *Dad Jokes: The Cheesy Edition* (Dad Says Jokes 2020) | "My neighbor tiled my roof for free.<br>He said it was on the house." |
| *World's Greatest Dad Jokes* (Brueckner 2019) | "Did you hear the joke about paper? It's tear-able." |
| *The VERY Embarrassing Book of Dad Jokes* (Allen 2012) | "Why did the orange stop halfway up the hill?<br>He ran out of juice." |
| *The Essential Compendium of Dad Jokes* (Nowak 2020) | "In my career as a lumberjack, I've cut exactly 2,325 trees. Every time I chop one down, I keep a LOG." |
| *Dad Jokes! Good, Clean Fun for All Ages!* (Niro 2018) | "'Dad, will you hand me my sunglasses?'.<br>'As soon as you hand me my dadglasses, Son.'" |
| "63 Best Dad Jokes Guaranteed to Make You Giggle" (Donavan 2020) | "'Dad, did you get a haircut?'.<br>'No, I got them all cut!'" |
| "70 Best 'Dad Jokes' for 2020" (Athlon Sports 2020) | "What did the drummer call his twin daughters?<br>Anna one, Anna two!" |
| "105 Dad Jokes So Bad They're Actually Hilarious" (Larkin 2020) | "What do sprinters eat before a race?<br>Nothing, they fast!" |
| "Here are the 100 Best Corny Dad Jokes Ever!" (Pelzer 2020) | "Which bear is the most condescending?<br>A pan-duh!" |
| "The Big List of the Funniest Dad Jokes" (Webber 2020) | "To whoever stole my copy of ***Microsoft Office***, I will find you. You have my Word!" |

dads to tell them around children in a dinner table setting, but it is also what makes them so susceptible to accusations of badness, lameness, and unfunniness. As already noted, most people are not committed enough to the pragmatic norms of everyday conversation for their breach to strike them as enough of a violation to merit the humor response. However, this is different for young (preadolescent) children who are still getting acquainted with the rules governing language and conversational communication, for whom the violation of these rules may seem more pungent and therefore more humorous (Shultz and Horibe 1974; McGhee 1979; Semrud-Clikeman and Glass 2010). Thus, it seems plausible that dads start telling wholesome puns to their children while they are still young enough to earnestly enjoy them (peaking sometime during early middle childhood). However, there is no reason that fathers should be more predisposed towards doing this than mothers. As such, it is not here that the particular association between dads and dad jokes is to be found. Rather, this only comes about once the child matures and begins, like most people, to see wholesome puns as a lame type of humor.

## Dad Jokes as Anti-Humor

Despite the fact that dad jokes are stereotypically considered bad, lame, and unfunny by adults, many if not most must clearly still find them funny in some sense since they continue to seek them out, to share them, and even to laugh at them. One commentator describes dad jokes as jokes that you "hate [your]self for laughing at," jokes that "have no right to be as hilarious as they are" (Martinez 2020). There is an entire genre of viral video wherein two people (often celebrities) read dad jokes aloud to each other in a competition to see who can refrain from laughing. In these videos, the participants typically fail continually at holding back laughter even while chastising the jokes they are laughing at for being bad. For instance, the actors Will Ferrell and Mark Wahlberg, in a video from 2017 on the YouTube channel *All Def*, laugh themselves red-faced at the dad jokes they read to each other even while continually describing them as "bad," "stupid," and "terrible." Yet, their disparaging comments about the jokes they are laughing at only make them laugh harder. This points to the counterintuitive mechanism behind the appeal of dad jokes for adults: the fact that they are spectacularly unfunny is paradoxically what makes them funny. This makes dad jokes a type of anti-humor (Luu 2019). As the philosopher Warren Shibles defines the phenomenon, anti-humor "creates humor by not creating humor" (1997). To appreciate the appeal of dad jokes for adults, we thus have to consider them from a meta-perspective as humor that plays around with the norms surrounding humor itself.

In essence, anti-humor is humor derived from benignly violating the norms of humor production. As I have already recounted, verbal humor often relies on violating those foundational pragmatic norms governing everyday conversation that Paul Grice collectively dubbed "the cooperative principle." As Raskin (1992) has argued, however, a different set of pragmatic norms seem to govern humorous discourse. The principle norm is this: when we switch to the humorous mode of discourse, it is because we have something funny to say. Often, we signal our switch to the humorous mode of discourse through the gestures I have previously described—that is, through a shift in tone, a sly smile, or the use of discursive markers like "Have you heard the one about . . . ?" If these gestures are not followed by something sufficiently funny to warrant the switch, then that is a violation of the norms of humor production. This very violation, however, may itself evoke humor, thus paradoxically vindicating the switch to the humorous mode. One common form of anti-humor, for instance, are anti-jokes that follow the classic question/answer-format but without a humorous answer, for example, "What do you

call a joke that isn't funny? A sentence" (Larkin 2019). The letdown of the answer here, which is factual instead of funny, is itself what is supposed to be funny. This is also how dad jokes work: telling a lame pun that only violates the pragmatic norm against ambiguity and nothing else is itself a violation of the norms of joke-telling in that the lame pun is not sufficiently funny to warrant being told. Yet, this paradoxically makes it funny.

In principle, a dad joke can violate the norms of joke-telling to benignly humorous effect in this way even if that is not the intention of the joke teller. Sometimes, the figure of a cluelessly unfunny father is invoked in discussions of dad jokes, a clownish character who inadvertently evokes humor at his own expense by spectacularly failing in his earnest attempts at telling genuinely humorous jokes. Ian Allen is the author behind a popular series of books that compile examples of dad jokes, and the subtitles of all of his books reference this idea: "Because Your Dad Thinks He's Hilarious" (2012), "Because Dads Aren't as Funny as They Think They Are" (2013), and "Because Dads Don't Know When to Stop" (2015). According to this conception of the phenomenon, dad jokes would be akin to films that are "so-bad-they're-good" like Tommy Wiseau's iconically awful *The Room* (2003), a film where most audiences' enjoyment lies in appreciating how spectacularly its director has failed at living up to the norms of classical Hollywood cinema (Hye-Knudsen and Clasen 2019). In this case, the recipients of dad jokes would have to decouple empathically from the unfunny dad in order to find his earnest failure at humor production benignly humorous (Hye-Knudsen 2018). Presumably, the unfunny dad in question would not find his own failed attempt at humor funny—that is, unless he was so clueless as to not understand the fact that his audience is laughing at him instead of with him. The fact that fathers, at least traditionally, are expected to be stolid figures of patriarchal authority would only add to the humor here by making the loss of face even starker. However, there is good reason to doubt this idea of dads as clueless, unwilling fools. Instead, it would appear that they are very much in on the joke.

Not only do the dads that tell dad jokes seem to be aware that their jokes are bad, they even seem to revel in it. This is made explicit by Allen himself in his first compilation of dad jokes, which opens with these words: "Let's get one thing straight from the start. Dad jokes aren't meant to be funny" (2012). As the linguist Chi Luu puts it, "dad jokes seem to court failure" (2019). In effect, they are invitations for the audience to laugh not at the joke itself but rather at its badness and thus, by extension, at its teller. According to Allen, "The perfect dad joke should generate groans not guffaws . . . and pitying glances not affectionate smiles" (2012). This sentiment is mirrored by other compilers of dad jokes who almost invariably put words like "bad" (Norton 2020), "stupid" (Shifrin 2018), "embarrass[ing]" (Romas 2014), or "cringe" (Duran 2020) in their titles. In this sense, dad jokes require their teller to be willing to deliberately take on the role of the clown, to embarrass themselves for the sake of the humor this brings about. In theory, this might help explain why fathers should be more prone than mothers towards telling them since women's greater neuroticism could be thought to inhibit them from courting embarrassment in this sense. However, women in general do not seem any less prone to self-deprecating humor than men (Hofmann et al. 2020). As such, this explanation is less than satisfying. To understand why dads should be more prone towards making dad jokes and finding them funny, I propose that we have to look instead at who are wont to *not* find them funny, namely their children once they reach a certain age.

## Dad Jokes as Weaponized Anti-Humor

For a dad joke to be enjoyed as anti-humor, its central social violation of the norms of

joke-telling must ultimately be appraised as benignly non-worrisome. Its teller must be able to withstand the potential embarrassment and social judgement that comes from telling a bad joke—that is, the "groans" and the "pitying glances" it may inspire, as Allen has it (2012). Similarly, the audience of a dad joke has to be able to withstand the vicarious embarrassment of hearing a manifestly awful joke told with unbridled confidence if it is to find it humorous. This may be asking too much for one group in particular, namely children who are approaching or have entered that precarious stage of life termed adolescence. Adolescence is defined as the transitory stage between childhood and adulthood, lasting from the onset of puberty and until the achievement of relative self-sufficiency (Backes and Bonnie 2019). It is incumbent upon the adolescent to try to establish an identity for themselves as they navigate an increasingly complex social world, and accordingly it appears to be a particularly sensitive period for sociocultural processing (Blakemore and Mills 2014). Adolescents are famously sensitive to embarrassment, particularly vicarious embarrassment in relation to their parents, whom they are in the gradual process of decoupling from to establish an independent identity for themselves (Pickhardt 2013). As such, children go from being the prime audience for wholesome puns, when they are still young enough to earnestly enjoy them, to being likely instead to find them mortifyingly embarrassing as they approach adolescence (around ages nine to thirteen).

This, I contend, is the true explanation for the link between dads and dad jokes. Since their adolescent or near-adolescent children are wont to find them embarrassing instead of humorous, fathers can weaponize lame puns against their children as a type of gentle teasing, which fits in with their generally more aggressive and ribbing style of joking. Whereas both mothers and fathers are wont to tell wholesome puns to their children while they are still young enough to earnestly enjoy them, fathers are thus more likely to obstinately keep telling them once their children near adolescence and begin to find them intensely embarrassing. The child's embarrassment on hearing their father tell a bad joke is compounded by the insult of having a childishly lame joke directed at them. This is an especially salient insult for adolescent children, who are actively engaged in the process of shedding their childish identities. The fact that dads utilize dad jokes as a weapon to tease their children is referenced in the title of many of the books and articles that compile examples of the genre, e.g., "15 Stupid-Funny Dad Jokes You Can Use To Embarrass Your Kids" (Romas 2014), *Dad Jokes for New Dads: Embarrass Your Kids Early!* (Niro 2020), or *Dad Jokes: 60 Dad Jokes That Will Make Your Kids Cringe* (Duran 2020). The propensity for fathers to employ dad jokes teasingly in this way can be attributed to the same male personality traits that cause them to be rougher generally in both their play and humor as compared to mothers—that is, their greater aggression and assertiveness together with their lesser agreeableness and neuroticism. That the propensity for telling dad jokes is connected with the male psyche is attested to by the concept's analogues in other languages, which usually associate the phenomenon with men of a certain age if not with fathers directly (Luu 2019). The Japanese, for instance, have *oyaji gyagu* (old men's gags) and the Danish have *onkel humor* (uncle humor).

At first glance, the propensity of fathers to employ dad jokes teasingly against their children might seem cruel, in the same way that the male style of rougher play and humor in general can seem cruel to the uninitiated. Yet, this would be missing the point. Just as the harsh style of male rough-and-tumble play among humans and other primates serves to prepare children for the harsh world they will later face as adults, so too dad jokes can have a positively edifying effect on the very children that loathe them. As one dad perceptively puts it:

> I think it's important to embarrass your kids. Or, to be more specific, I think it's important

> to do things traditionally viewed as embarrassing until your kids are basically immune to the effects. After years and years of being exposed to eye-roll inducing humor, with a complete disregard for what anybody else thinks, kids will have nothing greater left to fear. They'll gradually build up a strong immunity to judgement and embarrassment, and actually feel empowered to be themselves. (Billingsley 2019)

This is a kind of intellectualizing explanation that few of the dads who employ dad jokes would be capable of formulating, but it fits with what we know of humor from an evolutionary perspective. Humor is a medium through which we acculturate ourselves and learn not only the norms of our culture but also their exceptions, when and in what circumstances they can be violated with impunity. Adolescents are infamously fearful of the embarrassment that can come from violating social norms. Through repeatedly exposing them to bouts of embarrassment with their dad jokes, dads can gradually tear away at this fear, teaching them not to take themselves so seriously. Instead of doing this by *directly* embarrassing their children, the dads who employ dad jokes only embarrass their children vicariously by first embarrassing themselves, which makes dad jokes a distinctly gentle type of fatherly teasing, perfectly tailored to the modern father figure, a softer and less domineering kind of patriarch than that of earlier eras. By teasingly playing the fool, fathers can thus teach their children a valuable lesson.

Neither the dads who make dad jokes nor the children who loathe them are wont to understand any of this, at least not explicitly. Fathers are simply moved by their characteristically male personality traits to tease and challenge their children, pushing against the limits of what they can handle when joking with them. In doing so, they are acting on the same impulse that has moved fathers to push and challenge their children in rough-and-tumble play since before the dawn of our species. Fathers' harsher rough-and-tumble play prepares children for the harsh physical challenges they will face later in life. Embarrassing dad jokes, in turn, prepare adolescent children for the social challenges they will face in adulthood, specifically the social challenge of being true to themselves and making confident, authentic choices despite the social judgement that can come from this. In contemporary Western culture, which rewards individualism over traditional conformity (Henrich 2020), the ability to withstand the embarrassment and social judgement that comes from violating social norms is a useful skill. As such, dad jokes are a form of fatherly teasing perfectly fitted to the age. This may not be appreciated by their children in the short term, but in time, perhaps when they themselves become fathers, they too will feel the impulse to tease those they love. In due time, they may thus come to appreciate that dad jokes are a manifestation of the fatherly love and care that is so peculiarly abundant in our species. As one commentator puts it, "Is a dad even a dad if he doesn't embarrass [his] kids?" (Daw 2018).

## Conclusion

While dad jokes themselves may not be an ancient phenomenon, they are the product of inclinations that go back millions of years. Taking an evolutionary view of cultural phenomena like dad jokes is valuable in allowing us to see how even such a peculiar trend as this has deep and revealing roots, stretching far back into human prehistory to when the ancestral fathers of our lineage first started challenging and pushing their children in rough-and-tumble play. A proper understanding of dad jokes must recognize both what it means to be a father in our species and what makes a joke successful or unsuccessful in evoking humor. Taking the evolutionary roots of joking and the personality profile of fathers into consideration allows us to bypass such common misunderstandings as the idea that dad jokes are simply bad jokes or that fathers simply have a bad sense of humor. While

only being lame puns on the surface level, dad jokes have to be considered as working on two additional levels beyond this, namely as anti-humor and as weaponized anti-humor. The particular association between dads and dad jokes is to be found in this last context of theirs as weaponized anti-humor, an aspect of the phenomenon that has so far been left out of most dictionary definitions of dad jokes. Moreover, an appreciation for the evolutionary origin and functions of humor and teasing allows us to see how dad jokes come from a place of fatherly love even when they are purposefully aimed at embarrassing their teller's children. Ideally, they might even serve a beneficial function in toughening up the joke-teller's adolescent children to the sensation of embarrassment. All of these insights are only made possible by taking dad jokes seriously in considering their deepest roots.

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# Angus Fletcher's Other Literary Darwinism

Joseph Carroll

## Abstract

Angus Fletcher pitches his book to general readers. Though it consists of literary criticism, it is designed as a psychological self-help manual—literature as therapy. His therapeutic program is presented as an alternative to the kind of literary Darwinism that identifies human nature as the basis for literature. Fletcher acknowledges the existence of human nature but aims at transcending it by promoting an Aquarian ethos of harmony and understanding. He has some gifts of style, but the dominant voice in his stylistic blend is that of the shill hawking a patent medicine. He presents himself as a modern sage who reveals an ancient but long-lost technique for using literature to boost happiness and well-being. Each of his 25 chapters identifies a distinct literary technique and uses popularized neuroscience to describe its supposedly beneficial psychological effects. Fletcher's chains of reasoning are habitually tenuous, and his exposition is littered with factual errors that betray ignorance of the books, genres, and periods he discusses. Despite its shortcomings, Fletcher's book has received encomiums from prestigious researchers, including the psychologist Martin Seligman and the neuroscientist Antonio Damasio. In evaluating Fletcher's rhetorical style, analytic categories, Aquarian ethos, historical self-narrative, pattern of reasoning, and literary scholarship, this review essay reaches a more negative judgment about the value of his book. As an alternative to Fletcher's book, I recommend a few evolutionary literary works for general readers.

**Keywords:** neuroscience, fictional narratives, self-help manuals, positive psychology, Age of Aquarius, literary Darwinism

## BOOK UNDER REVIEW

Fletcher, Angus. 2021. *Wonderworks: The 25 Most Powerful Inventions in the History of Literature.* New York: Simon and Schuster. xv, 3 b/w illustrations, 449 pages. Hardcover $30; Audiobook $23.99; eBook $14.99.

## Audience, Genre, and Style

Angus Fletcher pitches his book to general readers. He says he will describe bits of neuroscience, but he doesn't want his readers put off by "arcane terminologies and byzantine complexities," so he promises only to "fold in the highlights" and to do so "as colloquially as possible" (27). The source of these highlights must remain a mystery to his readers; he includes no bibliographic footnotes and no list of references—a choice highly unusual among even the most popular works of popular science. The book offers little purchase to scholars and scientists who might want to examine Fletcher's scientific sources to check how accurately he has reported them. (At the back of the book, Fletcher includes lists of "Translations, Sources, and Further Readings." These lists contain references chiefly to primary sources but also include a small handful of works in historical and literary scholarship.)

The genre in which Fletcher positions his book is that of the psychological self-help manual—"a little personal treasuring won't make you

anything other than your most vivid self" (339). Each of the chapters is designed to offer a small dose of advice on how to read literature so as to put its "health and happiness boosters back to work" (10). The dust jacket contains a blurb by Rita Charon, executive director of Columbia Narrative Medicine. She calls the book "a tour de force of knowledge, fantasy, and the desire to heal."

Fletcher's book is something of a novelty in the marketplace for self-help manuals. It consists mostly of literary criticism, and it displays some stylistic flair. Fletcher's style occupies a border territory where multiple stylistic regions meet and blend: seductive popular history featuring a colorful evocation of settings (geographical, historical, and architectural), enthusiastic promotional rhetoric for the Age of Aquarius, prosocial didacticism like that approved in children's books by intrusive adults, the catchphrase glibness of self-help merchants and sellers of patent medicines, and the orotund grandiloquence of oleaginous preachers like the Reverend Mr. Chadband in Dickens's *Bleak House*. When I cast about for a single term that might sum up this distinctive stylistic blend, a characterization from the Liberace biopic *Behind the Candelabra* (2013) comes to mind. Liberace describes the gaudy décor in his home as "palatial kitsch."

## The Aquarian Ethos

Fletcher's Aquarian ethos tracks closely with what Jonathan Haidt (2012) would describe as a purely "liberal" set of values. Within this set, values are sharply divided by positive and negative valence. Good values include satisfying individual desires, tolerating others who do the same, avoiding harm to others, and reciprocating kindness. Bad values include respecting authority, internalizing group norms, exercising negative moral judgment, avoiding contamination, and nurturing group emotions such as loyalty, pride, shame, and patriotism. Aquarianism consists in adopting this liberal ethos but adding to it the strong emphasis on feel-good sensations associated with positive psychology and self-help therapy. Forced to make the mythical choice of Hercules recounted by Xenophon, Aquarians would shrink in fear and distaste from the life of heroic hardships chosen by Hercules (1994, 38-42).

The Aquarian ethos is all-pervasive in Fletcher's book (10-11, 36, 53, 61-62, 79-80, 105-6, 153-65, 214-16, 232-36. 276-77, 314-25, 330-39, 389). In an article published in 2014, "Another Literary Darwinism," Fletcher explicitly presents this ethos as a guiding rationale for literary study and describes it as an alternative to the literary Darwinism that identifies human nature as the basis of literature. Unlike most contemporary literary scholars, Fletcher does not deny that human nature exists. His position is like that of Rose Sayer (Katherine Hepburn) in *The African Queen* (1951). Charlie Allnut (Humphrey Bogart) defends his drunkenness. "What are you being so mean for, Miss? A man takes a drop too much once in a while, it's only human nature." Rose, a Christian missionary, responds, "Nature, Mr. Allnut, is what we are put in this world to rise above." In similar fashion, Fletcher proposes that "literary form might liberate us from certain aspects of our evolved nature" (2014, 469). Which aspects? Our deplorable sympathy for "the fortunate victorious" might be replaced by "recognizing the worth of the marginal and defeated" (467). We might increase "our ethical range by inhibiting intolerant behaviors"; we could diminish "our emotional egoism" and increase "empathy for people of a different phenotype"; in general, we could find remedies for "the antipluralist outcomes of natural selection" (468). Fletcher provides concrete examples of how literary texts could be interpreted for such purposes:

> We might explore whether the *choroi* of *Antigone* can check the nepotistic bias that has

> been bred in us by the evolutionary pressures of kin selection; whether the poetry of *Gilgamesh* can soften the lust for social dominion that we carry from our primate ancestors; whether the style of *The Count of Monte Cristo* can modulate the revenge-seeking instincts of our amygdalae. And whether, in the future, other forms of literature can help us address the innate hostility to strangers that generates our fear of immigration or the god instinct that breeds religious absolutism. (469)

*Wonderworks* is designed to carry out this ideological program. Despite Fletcher's recognition that evolved human dispositions actually exist, the book remains safely within the ethos of an academic establishment that long ago located its *raison d'être* in liberationist ideology—the idea that literary study is worthwhile not because it provides knowledge of its subject matter but because it aids the cause of liberating individuals from oppressive power structures (Gottschall 2008).

As an exercise in literary Darwinism, *Wonderworks* is designed to operate like a vaccine, giving an innocuous dose of a virus that activates the immune system and renders the organism safe from further infection. The infection is a belief that literature is based on human nature. Though he grants the existence of human nature, Fletcher identifies no specific feature of the human adaptive complex beyond those moral characteristics that either conflict with the Aquarian ethos or converge with it. No reader need worry that he or she might, with no warning, encounter alarming intimations of evolved sex differences, pair-bonded dual parenting, or any of the other features of human nature that put pressure on a cultural constructivist mindset (Carroll 2018a, 2018b).

## Dr. Fletcher's Marvelous Elixir

The dominant voice in Fletcher's stylistic blend is that of the shill hawking a patent medicine. Fletcher tells us that his method of reading is designed "to alleviate depression, reduce anxiety, sharpen intelligence, increase mental energy, kindle creativity, inspire confidence, and enrich our days with myriad other psychological benefits" (11). His twenty-five chapters identify "twenty-five literary inventions that you can put to work right now" (26). Some of these inventions will relieve "common forms of mental distress: grief, grudges, pessimism, shame, heartbreak, rumination, reactive thoughts, self-doubt, numbness, loneliness" (26). Other inventions will "impart well-being boosters: courage, curiosity, belief, energy, imagination" (26). Still others will nurture "practical life skills: freethinking, problem solving, de-biasing, counterfactual speculating, cognitive flexing, relearning, introspecting" (27).

Consider the family resemblance between Fletcher's rhetoric and that in nineteenth-century ads for patent medicines such as Clark Stanley's Snake Oil Liniment (fig. 1).

Like Fletcher, Stanley lists a wonderful range of ailments his liniment will cure: rheumatism, neuralgia, sciatica, lame back, lumbago, contracted cords, toothache, sprains, swellings, frost bites, chill blains, bruises, sore throat, and bites of animals, insects, and reptiles. To be fair, Fletcher's claims for the marvelous powers of his elixir are a little more restrained than Stanley's. Stanley affirms that his snake-oil is "good for man and beast" and indeed "is good for everything a liniment ought to be good for." Fletcher, in contrast, issues a restrictive disclaimer. He warns that his elixir's powers are "by no means replacements for modern psychiatry. They're supplements" (27). Only supplements, like ginseng, mega-doses of vitamin C, or powdered rhino horn, but potent, all the same. Practice Dr. Fletcher's simple two-step method of literary criticism—a secret formula passed on from the Ancient Sage Aristotle through the mysterious portals of the East and the mystic Middle Ages—and you too can begin "unlocking secret power after secret power" (400).

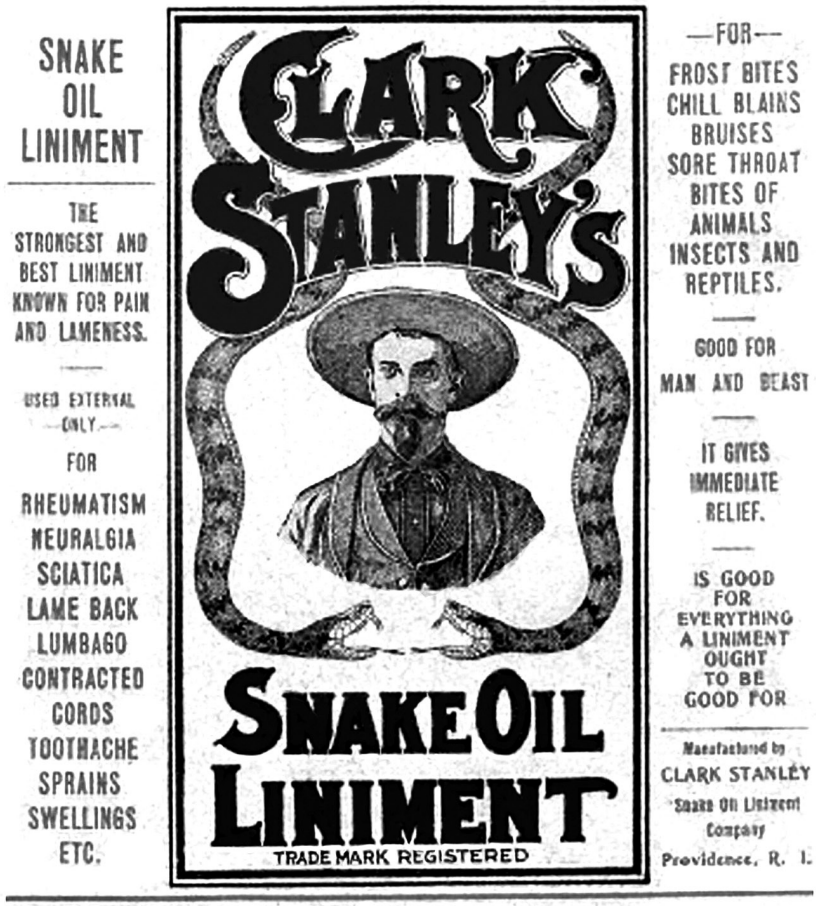


FIGURE 1. Texas cowboy Clark Stanley, born in 1854, was the self-styled "Rattlesnake King," who marketed snake oil as a patent medicine. Unlike many patented medicines of the time, it contained no dangerous substances, but it also didn't contain any snake oil and had no medicinal properties.

Caption from The Vintage News.Com. Image from Jim Griffin via Wikimedia Commons.

## A Modern Aristotle

Aristotle's two-step method, somehow left undiscerned for thousands of years, was to go beyond asking what literature means and to ask also what effects it has and how it works those effects (15, 399-400). This secret method was rediscovered in the mid-twentieth century by Ronald Crane and the other Chicago Aristotelians. Crane's textbook didn't catch on, but his efforts were not in vain. His "failed textbook inspired a few rogue academics, such as James Phelan and the scholars at the Ohio State thinktank Project Narrative (where I myself work)" (399). From Aristotle to Crane to Phelan and Fletcher—the historical sweep of this lineage would be awe-inspiring were it not also farcical. Perhaps some nagging suspicion about the ludicrous character of his historical self-narrative accounts for Fletcher's decision to place this narrative at the back of his book, labeling it a "coda" to the chapters that have deployed his interpretive techniques.

Unlike Clark Stanley's liniment, Fletcher's elixir does contain noxious ingredients. For readers who might have swallowed some and be feeling its ill effects, I can recommend an excellent antidote: M. H. Abrams's "Types and Orientations of Critical Theories" (1989; adapted from *The Mirror and the Lamp*, 1953). Abrams's dense and comprehensive historical survey will dispel any illusions that the "rogue" scholars at Ohio State are the first since Aristotle and Crane to have considered either the effects of literature or the way it achieves those effects.

## Methods

### *Categories*

In each of his chapters, Fletcher identifies some commonly recognized literary technique: exaggeration, point of view, metaphor, plot twists, anagnorisis, self-disclosure, suspense, irony, satire, allegory, free indirect discourse, stories within stories, stream of consciousness, soliloquy, defamiliarization, unreliable narrators, switching narrative perspectives, tragicomedy, counterfactual thinking, metafictionality, fantasy, deferred resolution, or some combination of such techniques. He looks around for some early instance of the technique or combination of techniques, calls each such instance an "invention" and a "technology," describes its supposedly beneficial or socially desirable effects, paraphrases some neuroscience that supposedly explains those effects, and gives a list of later literary works that supposedly deploy the same techniques.

Fletcher says his book does not require consecutive reading. The 25 chapters are individually wrapped packages, snack-sized, and can be read in any order (27-28). He presents that feature as a selling point for readers seeking literary therapy in one or another specific area of emotional concern. For scholars who might read his book, the lack of sequential argument underlines the randomness in his selection of categories and the absence of conceptual connection among them. The assortment of Fletcher's categories looks something like the classification of animals in a putative Chinese encyclopedia that includes, among other categories, trained ones, embalmed ones, those belonging to the emperor, those that from afar look like flies, and those that are drawn with a fine camel's hair brush (Borges 1999 [1942]). The categories have no rational criteria for selection and no meaningful organization. Borges presents this list as comedy and satire. Fletcher presents his as literary history.

The categories Fletcher illustrates with literary examples are common features of life, imagination, and language independent of literature. Categories like exaggeration, metaphor, self-disclosure, and fantasy are obvious parts of everyday life. But people also regularly experience plot twists (hearing about any surprising turn of events), anagnorisis (a sudden realization), suspense (anxious anticipation), irony (sarcasm is the simplest form), satire (mockery), allegory ("that man is greed and deceit

incarnate"), free indirect discourse (paraphrasing what someone else is thinking), stories within stories ("I met Jack, and he told me . . ."), stream of consciousness (mind-wandering), soliloquy (talking to oneself), defamiliarization (any unusual locution), unreliable narrators (most of us at times), point of view and switching narrative perspectives ("Theory of Mind"—basic to all human communication), tragicomedy (mingling the sad and funny), counterfactual thinking ("if only I hadn't done that!"), and deferred resolution (courtship, career development, and indeed, most other concerns in life). The one technique that might arguably be specific to literature or its oral antecedents is metafictionality—fiction that overtly declares its status as fiction and comments on its own fictional procedures. Treating all these forms of imagination and speech as "inventions" of specific literary authors is misleading. Jumbling together a random assortment of such "inventions" and calling them "technologies" adds nothing to our understanding of them.

### *Reasoning*

Navigating from some particular literary technique to some desirable effect on the reader often requires that Fletcher exercise a good deal of perverse ingenuity. Consider, for example, his treatment of satire. He says that satire that causes us to laugh at other people is not good for us, but that satire that causes us to laugh at ourselves is good for us (79). Now, it might seem a shame to put on the index of proscribed books the works of writers such as Aristophanes, Juvenal, Molière, Pope, Swift, Voltaire, Sterne, Fielding, Austen, Dickens, Thackeray, Eliot, Heine, Twain, Huxley, Orwell, Waugh, and Heller. Not to worry. Such works might have been "originally intended as satire, not as a means of Socratic elevation," but they "can still be repurposed to lift you into a peace above. Just find a satire that pokes fun at one of your own tendencies, and read away" (80).

Let us follow out the logic of this strategy. If you tend to be preoccupied with social status, *Vanity Fair* is just what the doctor ordered for you. However, unless you are a Soviet party apparatchik, it would probably be prudent to steer away from *Animal Farm.* Reading satire aimed at faults not your own might have deleterious "long-term effects." For example, "condescension and negative judgments of others" have been "correlated with increased anxiety and elevated blood pressure, boosting our risk of heart attacks and strokes" (79). Conversely, if you *do* happen to be a party apparatchik, definitely do read *Animal Farm.* It will make you laugh at yourself and thus release "feel-good neuro-opioids" that will drop your "blood level of cortisol, diminishing stress" (79). Altogether, laughing at ourselves "reduces anxiety, nurtures emotional resilience, and helps us bond with other people" (79). Too bad the Soviets did not know all this. Instead of banning Orwell, they could have distributed his books to all members of the party and thus have released mega-doses of feel-good neuro-opioids.

Fletcher sometimes offers bits of historical information or literary analysis that are potentially valuable, but his habitual practice of tenuous reasoning compromises that value. To give just one example, Fletcher offers some interesting observations about the history and structure of allegory, but his commentary on his chief example, Dante's *Inferno*, is corrupted by his effort to bring Dante into alignment with an ethos that valorizes "free thinking" and thus discountenances "the god instinct that breeds religious absolutism" (2014, 469). Fletcher describes a passage in which Medusa appears in one of the circles of hell. Observing that a pagan myth is an anomaly in a Christian cosmos, Fletcher argues that anomalies activate threat detection mechanisms, creating paranoia, and that readers therefore become suspicious of Dante, a suspicion enhanced by the presence of Virgil as Dante's guide to hell. That suspicion makes readers so "paranoid" that they begin to wonder if his focus on punishment conflicts with

Christian charity (104). Reacting to this wonder with still greater paranoia, readers become so skeptical that they spontaneously activate their capacity for freethinking. The poem "has triggered our paranoid vigilance, shaking us out of our old mental torpor and liberating us to think for ourselves" (105). The medieval Catholic authorities mistakenly thought that Dante's poem was an affirmation of Christian orthodoxy, but in reality, Fletcher tells us, it was a great instrument of skepticism and enlightenment, stimulating freethinking in authors all the way from Chaucer and Luther to Marx, Borges, and Beckett (106).

Fletcher's claim for how Dante's poem has worked, historically, is simply wrong. Moreover, the method for converting Dante's poem to his own purpose of boosting freethinking is a Rube Goldbergian contraption much too clumsy and awkward for therapeutic use. A simpler method for stimulating freethinking would be to read Voltaire. In parallel with his treatment of satire, Fletcher's method destroys Dante in order to save him. Most of Fletcher's 25 chapters display similar forms of reasoning—rickety chains of causation leading to some effect he considers psychologically or socially desirable.

### *Knowledge*

Fletcher puts on display enough references to literary works from diverse historical cultures to give an appearance of literary erudition almost as vast as that of Northrop Frye. This appearance is a carefully crafted illusion—the product of combining a modicum of firsthand literary knowledge with facility in reading summaries of plots, periods, and genres, paraphrasing them and pronouncing judgments on them in such a way as to suggest that his learning is deep and broad. That method is risky. To give one detailed example of the kind of risk involved, Fletcher evidently failed to read the plot summary of Jane Austen's *Emma* with adequate care. He says that "Harriet's romance with Mr. Elton collapses, leading Emma to suspect that Harriet will be happy only if she marries Mr. Knightley" (181). What actually happens in the novel is that, after the Elton fiasco, Emma mistakenly thinks Harriet is interested in Frank Churchill. She doesn't dream that Harriet would aspire to Knightley until the very end of the novel, and then it is a horrible shock for her. It jolts her into realizing she wants Knightley for herself. Fletcher argues, erroneously, that after the Elton episode, Emma assumes Harriet must love Knightley because Emma herself loves Knightley, and Emma cannot imagine her friend feeling differently from herself. (If that had been true, Emma would never have tried to contrive a match between Harriet and Mr. Elton, whom Emma does not like or respect.)

On the basis of his erroneous account of the novel's plot, Fletcher draws a large interpretive conclusion. He says that when Emma finds out that Harriet does not love Knightley but rather Robert Martin, Emma learns the valuable moral lesson that she can be fond of her friend without sharing her friend's tastes in men. What actually happens is that Harriet abandons her infatuation with Knightley and returns to Robert Martin only after Emma has claimed Knightley as her own. Emma had tried to raise Harriet to her own social level, but after Harriet returns to Robert Martin, a farmer, Emma feels that it would violate the norms of the class system to continue her intimate social relationship with Harriet.

For a novel so widely known and so frequently adapted to film, it is surprising to see a literary scholar misrepresent the basic facts of the plot. One would think an editor or peer reviewer would have caught such glaring errors before Fletcher's book went to press. But then, Fletcher's book is a commercial publication. The vetting procedures might well have been different from those used for scholarly publication.

Conscientious peer-reviewing might also have informed Fletcher that exaggeration or "*stretch*" is not the basis for everything in literature from plot twists, metaphors, and the depiction of heroism to immersion, anagnorisis, and role reversal (17-18, 22-24, 351); that the main

function of the dance in Greek drama was not to get audiences to move their eyes back and forth so as to trigger a mechanical neurochemical event (21); that in *Pride and Prejudice* the cool and ironic third-person summary describing the scene of Darcy's second proposal is not "perhaps the most devastatingly potent love scene in literature" (55); that before the Babylonian captivity the Hebrews did not enjoy a "life of nonviolence" in "days of harmony" (59); that most readers have not felt a great surge of pity for Richard III when he is defeated at Bosworth (67); that Hamlet's altercation with Laertes at Ophelia's grave is not "the play's great turning point" in which Hamlet's "lonely guilt vanishes" and he undergoes a morally uplifting surge of empathy (136); that free indirect discourse is not a device that produces tonally blended romance and satire (177); that Austen did not discover a brand-new technique that makes it possible for us to love characters "for who they are, not for what we want them to be" (180); that George Eliot did not believe that all novels before her own "gave short shrift to one of our mind's essential faculties: gratitude" (235); that Dorothea Brooke in *Middlemarch* is not "very much like Father Goriot" in Balzac's novel (236); that children playing games do not always "make up their own rules" (276); that awareness of "our self as a distinct entity, separate from the world" is not absent "most of the time" (292); that Hamlet does not assault his mother (296); that *To Kill a Mockingbird,* though revered by high school English teachers, is not a work of consummate literary sophistication deploying hitherto unheard of techniques in point of view (298-300); that Swift's Gulliver is not simply a "spectacularly misguided" narrator designed to make readers suspend all moral judgment (321); that *King Lear* was not the only tragicomedy to appear between the works of Euripides and *Waiting for Godot* (342); that Cervantes was not the first author to use embedded stories that occupy the same realistic story world as the framing story (354); and that the New Critics did not treat literary works as "instructional homilies" (398).

In his penultimate chapter, Fletcher gives extended attention to analyzing scenes from the TV sitcom *30 Rock*, using them to illustrate counterfactual thinking. He tells us that "the author of this excellent chapter has himself watched *30 Rock* dozens of times" and has "thusly become a grandmaster of counterfactual thinking" (365). Some of the time Fletcher spent watching TV sitcoms might have been more profitably employed in reading the canonical literary works he ventures to interpret and on which he bases his generalizations about literary history.

## Conclusion

Three characteristics might be necessary for readers to admire and enjoy Fletcher's book: sympathy with his Aquarian ethos, an ignorance of literature sufficiently deep to forestall skepticism about his specious reasoning and sham erudition, and an ear for language too unsophisticated to feel repugnance at the cheesy opulence of his style. The blurbs on the dust jacket of his book include seriously misjudged encomiums. Psychologist Martin Seligman, director of the Penn Positive Psychology Center, describes Fletcher as a "polymath" who possesses a "profound knowledge of world literature," of "modern psychology," and of "neuroscience." In addition to his supposed erudition, Seligman says, Fletcher displays the gifts of "worldly wisdom" and "an enchanting prose style." Literary scholar Blakey Vermeule calls the book "an epic, a masterpiece" and a "magisterial synthesis." Like Seligman, she credits Fletcher with a "deep" knowledge of "contemporary neuroscience." Neuroscientist Antonio Damasio appraises Fletcher's neuroscientific expertise more modestly. He says only that Fletcher has "some help from contemporary neuroscience." But he takes Fletcher's historical self-narrative at face value. "Aristotle's *Poetics* was new and brave

but was left incomplete. Angus Fletcher finishes it in *Wonderworks.*" He credits Fletcher with "an abundance of penetrating analyses."

Readers less credulous than those cited on Fletcher's dust jacket might soon become wary about taking at face value from Fletcher even those bits of information or observation that seem legitimate. Trust is fragile, and Fletcher repeatedly violates his readers' trust. Many readers might feel it not worth their trouble to sift through his meretricious prose in hopes of discovering this or that small nugget of genuine value.

Writing couched in a "popular" style for a general audience need not mean writing that is silly, vulgar, and fraudulent. In the past few decades, dozens of good and serious works for general readers have been published in the evolutionary social sciences. Fewer books of any kind have been published in evolutionary literary study than in evolutionary psychology and anthropology, but readers looking for popular works in evolutionary literary study do have options. When students or general readers ask me to suggest a first book to read on literary Darwinism, I tell them that Jonathan Gottschall's *The Storytelling Animal* (2012) is relatively short and highly accessible, that it is written in an engaging manner for general readers but is nonetheless well informed, cogent, and gives a strong, clear sense of why Darwinists think human nature is the basis of literature. For students who have a taste for horror, I strongly recommend Mathias Clasen's *Why Horror Seduces* (2017). Like Gottschall, Clasen has a special gift for writing engaging, accessible prose that both appeals to general readers and elicits respect from serious scholars. Judith Saunders pitches her writing more decisively to an academic literary audience than Gottschall and Clasen, but her style is lucid and incisive. It is not "academic" in the bad sense—the sense meaning ponderously self-involved, opaque, and dull. Students or general readers who are especially interested in canonical American literature would take pleasure in her *American Classics: An Evolutionary Perspective* (2018). Most of my own books and essays have been pitched toward a professional academic audience, but there is one essay that is designed as an introductory guide to evolutionary literary criticism (2012). It's written in a colloquial manner and might serve as a short example of the kind of literary Darwinism for which Fletcher aspires to offer an alternative.

None of the works I've described as readable introductions to literary Darwinism can claim to cure chill blains, relieve common forms of mental distress, impart well-being boosters, or nurture practical life skills. Still, they won't make you sick, or foolish. They contain real information and honest thinking, and they might help clear your head.

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# *Homo Paedens?* Did Kids Invent the Human Species?

Melvin Konner

## Abstract

The evolution of development ("evo-devo") has become a central concern in both evolutionary and developmental research, and human immaturity is no less a proper focus for evolutionary analysis than that of other species—if anything, it is more so. Two new books by David F. Bjorklund, a founder of evolutionary developmental psychology, summarize what we know now and propose that children invented our species. Due to the new phenomenon of partly heritable epigenetic modification of genes and the old one of the Baldwin Effect (by which plasticity leads to new selective forces on genes), this claim must be at least partly true. The inherent plasticity of children's behavior, including play, accelerated the evolution of humanity as instantiated in the human brain. Evolution cannot be understood without extensive reference to development, and nothing in childhood makes sense except in the light of evolution.

**Keywords:** evolution, development, "evo-devo," immaturity, plasticity, play, life history theory, adaptation, evolutionary developmental psychology, David F. Bjorklund

## BOOKS UNDER REVIEW:

Bjorklund, David F. 2020. *Child Development in Evolutionary Perspective*. Cambridge: Cambridge University Press. 94 pages. Paperback $20; Kindle edition $20.

———. 2021. *How Children Invented Humanity: The Role of Development in Human Evolution*. Oxford: Oxford University Press. 392 pages. Hardcover $35; Kindle edition $29.99.

I've been interested in the evolution of childhood since the 1960s, that is, more than half a century. Back then, developmental psychologists were going younger and younger with their research subjects, hoping to find in infants or even neonates the origins of mind. Many anthropologists, meanwhile, were growing obsessed with hunter-gatherers—fully modern humans in their biology and psychology, but still living a way of life characteristic of our ancestors. This, it was hoped, would shed light on the origins of humanity. So in the late '60s, in graduate school, I was preparing myself for doctoral research on infants among hunter-gatherers of Botswana. I would study the origins of the origins.

Under the wing of my anthropological mentor Irven DeVore, with the generous help of infant psychologist Jerome Kagan—who passed away two weeks ago at this writing—I was able to turn myself into an evolutionary anthropologist with one foot in developmental psychology. In Botswana from 1969-71 and again in 1975, I began a lifelong fascination with childhood in an evolutionary perspective, which I hoped would benefit both evolutionary and psychological science. My lifelong fascination, at least, has continued (Konner 1972, 2010, 2016, [in press]).

At that time, in the late '60s and '70s, the most prominent use of evolutionary thought in child development was by psychoanalyst John Bowlby, whose three-volume work on attachment (Bowlby 1969, 1973, 1980) was greatly influenced by ethology and placed an evolutionary hypothesis—avoidance of predation—at

the core of his explanation for this highly motivated, intense, and autonomous behavioral complex tying human and other primate infants to primary caregivers, usually mothers. But even the psychologists who were experimentally operationalizing Bowlby's theory were interested in it as a developmental phenomenon, not as a product of evolution.

Daniel Freedman, who began his work on neonatal behavior in the 1960s, took an evolutionary perspective on infancy (Freedman 1974), but his work was primarily in behavior genetics (Freedman and Freedman 1969, Freedman and Keller 1963). Jerome Bruner, in his 1972 presidential address to the American Psychological Association, "The Nature and Uses of Immaturity," also advocated generally for an evolutionary perspective on development (Bruner 1972), but this was more of a programmatic statement than a research agenda.

So, as far as I know, the first credentialed and practicing experimental child psychologist to begin writing about evolutionary developmental psychology as a new subdiscipline was David Bjorklund. When Bjorklund took up this work, in the early 1990s, evolutionary psychology was a rapidly emerging field, but it was mainly concerned with cognitive and social psychology, especially the evolutionary psychology of sex differences. Bjorklund, who had a well-established reputation for research on perceptual and cognitive development (Bjorklund, Ornstein, and Haig 1977, Bjorklund 1978, 1987), was well positioned to take a leadership role in drawing attention to the explanatory potential of evolutionary thinking in developmental psychology.

A 1992 paper "The Adaptive Uses of Cognitive Immaturity" (Bjorklund and Green 1992) laid the foundation for decades of thinking about how immaturity might be an evolutionary advantage; and together with Anthony Pellegrini, Bruce Ellis, and others, he developed a broad intellectual program for applying evolutionary thinking in many aspects of development, parenting, and education (Bjorklund and Pellegrini 2000, 2002, Ellis and Bjorklund 2005).

Now Bjorklund offers two new books that I might call a capstone to decades of investigating and thinking about childhood from an evolutionary perspective, except that I hope and trust he will continue with his research program. Both books are valuable, but *Child Development in Evolutionary Perspective* (part of the Cambridge Elements Series) is a short summary that would add a very valuable dimension to any course on child development (Bjorklund 2020), while *How Children Invented Humanity: The Role of Development in Human Evolution* is a major theoretical and integrative contribution that can and should be read by any serious student of this subject (Bjorklund 2021).

For full disclosure, I must say that Bjorklund favorably reviewed my 963-page treatise *The Evolution of Childhood* and cites it favorably in these two books (Bjorklund 2010, Konner 2010). However, that was over a decade ago, and Bjorklund's much more tractable book focuses more on cognitive development, even while ably summarizing the evolutionary developmental psychology of social cognition and parenting. Among his central points that I strongly agree with:

1. There is no evolution of adult traits, only evolution of developmental pathways. Natural selection has preserved genes that altered those pathways to create a uniquely human version of primate behavioral adaptations. Therefore the only way to understand human evolution is to understand the evolution of childhood.
2. Children must be adapted to develop into adults that will survive and reproduce, but in order to get there they must be adapted to survive every stage of immaturity first. This means, among other things, having the cognitive skills to avoid injury even while taking risks and learning, and the social skills

to recruit care and education from parents and other adults.

3. Life history theory is a branch of evolutionary thought that shows how organisms allocate limited life energy to the vital tasks of survival, growth, and reproduction. Natural selection has allowed for contingent life histories (facultative adaptations), such that developmental programs are partly open, so that different early environments can result in different developmental paths, each adapted to the circumstances.
4. Immaturity generally, but human immaturity in particular, is also characterized by a more general openness of programming, so that learning must play a very large role. This allows for great cultural variety in many aspects of psychological development, including subsistence knowledge and skills vital for survival and social knowledge and skills vital for reproductive success.
5. Despite this, it would not do to leave all aspects of development to the vagaries of learning environments. Key aspects of survival and reproduction are common to all cultures, and so children come into the world prepared and equipped with genetic programs. These do not wane in influence in proportion to time since conception, but on the contrary operate at every stage of the developmental program throughout life.
6. Nothing in childhood makes sense except in the light of evolution.

There is too much richness in *How Children Invented Humanity* for me to do justice to it here. There is little I disagree with, but there are differences in emphasis. Being a card-carrying evolutionary anthropologist rather than a card-carrying psychologist, I place much more emphasis on sex, aggression, selfishness, and fear, which I see as easily swamping our great human cognitive functions in many situations of kinds that were pivotal during our evolution. These are times when we behave in ways that seem maladaptive, but that are or at least were adaptive in evolutionary terms. I see reproductive success as the goal of natural selection, and survival merely as a means to that end.

Implicitly, Bjorklund accepts this to some extent when he cites the work of Bruce Ellis, Jay Belsky, and others on life history contingencies. In certain circumstances, it may make adaptive sense for girls to reach puberty sooner and have an earlier sexual debut, to escape an unstable environment and begin reproducing with less delay. This does not mean we have to accept it morally, but if we want to change it we had better understand the evolutionary pressures involved. Moralizing is empty without that understanding.

Like Bjorklund, I see many mismatches between the experience of children in our kind of culture and those among hunter-gatherers like those I studied, but I don't yet see clear evidence that these mismatches must result in bad outcomes. I agree that limiting screen time is desirable when it interferes with real-world social experience, exercise, and other kinds of play. I also think that screen literacy is as essential to the generation growing up today as reading, writing, and arithmetic. What children are doing on their screens matters as well. Bjorklund is no dogmatist, however, and he understands that these can be difficult choices for parents and educators.

What of the exciting promise of his title? Did children invent humanity? Here is how they kind of did.

Humans are immature much longer than other species, and we have greater plasticity during that phase of life. Two processes related to that plasticity are relevant to the question. First, a new process that partly revives an old one long thought dead: epigenetic inheritance. The old, supposedly dead process is Lamarckian evolution, or the inheritance of acquired characteristics. Many of us are old enough to remember when Lamarck was set up in our high school biology classes as the dullard Darwin defeated.

Evolution by natural selection was based on genes, period, and genes were a stream of molecular history unaffected by experience.

Unfortunately for simplicity, we learned two or three decades ago that molecular markers on genes—methylation of DNA, for example, or histone modification—are significantly altered by experience, and that some (probably small) percentage of these modifications can be carried forward to the next generation. These markers are collectively called epigenetic. Several lines of research now suggest that acquired behavioral characteristics, such as avoidance of an odor or a tendency to obesity, can be transmitted epigenetically to subsequent generations, at least in experimental animals (Wang, Liu, and Sun 2017).

One consequence of this is that the advantages of experience in an individual life cycle are not completely lost. The epigenetic results of plasticity transgenerationally are in a sense just more grist for natural selection's mill, but they also have the potential to accelerate it. Human brain evolution boasts of being one of the fastest phylogenetic changes in the whole fossil record, and epigenetic inheritance may have contributed. Thus the plasticity of immaturity, greater in human children than in juveniles of other species, may have significantly boosted the evolution of human uniqueness.

The same is true of the second process, the Baldwin effect, part of neo-Darwinian theory for over a century (Baldwin 1896). Similar to what is today called niche construction, it looks at first glance like a type of Lamarckian evolution, but is not that at all. It is a process by which plasticity leads populations into changed environments, or changes the environments by manipulation, with the result that subsequent generations will be subject to different selection pressures *on gene frequencies.* Thus "behavior is the pacemaker of evolution" (Mayr 1988, 408) and plasticity in behavior is natural selection's leading edge. This model has been persuasively applied to the impact of human-initiated environmental change on the evolution of the human brain (Stiner and Kuhn 2016). Again, the behavioral plasticity of immature humans could have greatly accelerated (probably more so than epigenetic inheritance) the evolution of the human brain, which is the seat of human uniqueness.

So yes, in these ways, children did invent humanity. It's worth pointing out as well (as Bjorklund does) that play is part and parcel of plasticity, since it involves trial and error of a great many "wasted" attempts before arriving developmentally at an adaptive behavioral solution. The young of all mammals and birds play, but we humans are rare in extending play through reproductive maturity and even throughout life. This has led to the suggestion that we should be designated *Homo ludens* rather than *Homo sapiens* (Huizinga 1955). Then too, it is clear that no species does nearly as much teaching as ours does (Kruger and Tomasello 1996), and some have thought an appropriate name for us would be *Homo docens* (Barnett 1968, 1994).

Since these two all-important tendencies converge in the extremely long period of immaturity in humans, and since to some extent children did invent humanity, perhaps *Homo paedens* would be our most appropriate name. In any case, we can agree with a statement of Bjorklund's in a landmark paper of the same name that led to *How Children Invented Humanity*: "I conclude by acknowledging that not all developmentalists have adopted an evolutionary perspective, but that we are approaching a time when an evolutionary perspective will be implicit in the thinking of all psychologists" (Bjorklund 2018, 1462). Nothing in childhood makes sense except in the light of evolution.

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Hardcover $119.00; Kindle edition $113.05.

Tom Dolack

In Brett Cooke's last book *Human Nature in Utopia: Zamyatin's* We, he quite elegantly explained the features of an entire genre—the dystopian novel—in terms of our evolutionary heritage. Briefly: dystopian worlds are the opposite of our environment of evolutionary adaptedness. Along the way, he gave some original readings of one of the most-read Russian novels of the twentieth century. Cooke's latest book *Tolstoy's Family Prototypes in* War and Peace has a similar approach, applying the concept of kin altruism to Tolstoy's handling of prototypes in what is perhaps the world's most most famous novel. The stakes are much higher here, as Cooke is really addressing nothing less than how a writer's biography influences the characters they create, a topic at the heart of much literary criticism. The results are laudable, and Cooke cannot be blamed if he falls a bit short in shooting at such a distant target. The proof of an approach is always in the quality of the observations it produces, and the volume is larded with wonderful insights about *War and Peace* and Russian literature more generally. The chance to read about the details of Tolstoy's turbulent personal life is always worth the price of admission by itself.

Tolstoy once claimed, perhaps not usefully, that his hero was "Truth" (cited in Kaufman 13). Isaiah Berlin noted that little in Tolstoy is not autobiographical (48). How to combine these opposing forces? Cooke may have found a way by showing how species-wide proclivities drive Tolstoy to form his individual identity by grafting the different branches of his family tree.

Cooke's study seems aimed at two rarely overlapping groups, that is, Tolstoy scholars and evolutionary psychologists, or at least those interested viewing the arts from an evolutionary perspective. This is little cause for worry because in order to break new ground you have to go where few have tread. The risk, however, is that you "sit between two chairs," as the Russians say. And this raises one caveat about the book: the Tolstoy scholar may skip some of the finer discussions of homozygosity, while the psychologist may find themselves speedreading passages about the Russian court. But both are certain to learn new things.

The first chapters of the book lay out the basics: the logic behind kin altruism (we treat family better), the tangled soap opera of Tolstoy's biography, and Cooke's basic premise, which is that due to kin altruism Tolstoy treats the characters based on family members better than the characters based on non-kin, a process he calls "fictional altruism" (51). He points out how many of the characters had the names of their prototypes through even the latest drafts, and points to Tolstoy's contacts with living family prototypes, as well as his contacts with the sources about deceased prototypes. We can see Cooke's attention to detail and his footwork on Tolstoy's estate as he points out the portraits that hung the novelist's desk, or that one prototype lived on the other side of his office wall. Indeed, this volume is now the best guide to Tolstoy's familial relations in English, perhaps even the best single guide period.

Cooke is careful early on not to push his methodology too far, which was wise, given the

complexities involved with Tolstoy's novel in particular. It would have been only too easy to force the characters into neat patterns—there are enough of them, and they do enough things over 1200 pages that cherry-picking would be no problem. But Cooke admits when some characters work better than others. The Old Prince Bolkonsky, for instance, is certainly a negative character, but Cooke argues he is still an improvement over the original; Natasha Rostova, one of the most beloved characters in Russian literature, is actually a combination of Tolstoy's wife Sonya and sister-in-law Tanya, which has led some to conclude that the writer was actually more in love with Tanya.

Beginning with chapter 8, the book focuses on different levels of relatedness vis à vis Tolstoy. Particular attention is paid to the primary villains of the novel, the Kuragins, who are not based on any relations of Tolstoy. Interestingly, they are based on the Galitsyns, who *almost* married into the family through Tolstoy's mother's grandfather. Cooke focuses on the rumored incestuous relations in the Galitsyn family and their reflection in the Kuragins. Cooke does not use a Freudian Ouija board here—the clues are clearly placed in the text and were, in fact, toned down over the course of the drafts. Cooke thinks that Tolstoy was specifically pondering "what if" his grandfather had married into such a family instead. The approach leads to quite a few interesting observations about some of the lesser-studied characters in the novel.

We then move through "distant relatives," grandparents, and parents. We spend a fair amount of time (chapters 11-14) on the relationship of the characters based on Tolstoy's parents, Nikolai Rostov and Maria Bolkonskaya, and the character Nikolai (and Tolstoy's father) almost married, Sonya, of whom we get an interesting reading. Sonya, as is often noted, is not treated well by Tolstoy, even though her prototype lived with Tolstoy well beyond the death of his parents at a young age and he cared for her deeply. At the beginning of the novel, the young, propertyless Sonya and Nikolai are informally engaged. Cooke notes that they are *too* engaged. Chekhov's proverbial rifle should be placed on the back wall, not brandished on the proscenium. Nikolai falls out of love with her, merely holding on because he gave his word. The family finances get worse and worse, requiring him to marry an heiress, and he meets the recently well-to-do Mary when he saves her from a peasant revolt as French forces begin to roll in. Cooke argues that Mary and Nikolai *must* marry because they *must* give birth to Tolstoy himself. He even points out that if the events of the novel match up with reality Mary would be pregnant with Tolstoy's stand-in in the first epilogue. This treatment of the characters fits with his thesis: the novelist's father, a bit of a cad, is treated better, but Sonya, based on a beloved unrelated member of the family, is treated much worse.

Cooke ties things up by returning to more general concerns. He brings back kin altruism, but in the context of incest avoidance. After a review of the diminishing levels of relatedness, he discusses the Westermarck effect, whereby children raised together do not find each other sexually attractive. The discussion perhaps comes a bit late, but it leads to an important observation: "It appears that the Westermarck effect may help explain why Sonya and Nicholas do not, in the end, marry—nor does the reader expect or want them to" (259). Sonya and Nikolai are of course fictional characters; they can do whatever Tolstoy wants them to. The key is that we expect them to follow our own natural tendencies, even if we are not consciously aware that those tendencies exist. It is part of Cooke's broader project to show how narrative follows these guidelines written into our heritage, and how artists often intuited them before psychologists and anthropologists (Westermarck published his research twenty-some years after *War and Peace*).

Of course, nobody is more closely related to Tolstoy than Tolstoy himself, and with this in mind Cooke makes some sense out of the narrative choices of the novel. Once the pieces are placed, the characters based on Tolstoy's parents must meet and have children, so that Tolstoy can

be born, even if after the events of the novel. This explains why Sonya and Nikolai can't marry; why Andrew, Mary's brother, must die so he can't marry Natasha (the Church wouldn't allow Nikolai to marry his sister-in-law); why the Rostov's finances had to decline, forcing Nikolai to marry an heiress; and so on.

The book ends on a refreshingly humble note. Cooke does not try to make universalist claims about his theory: "a vast novel like *War and Peace*, even when we take into consideration its vast hinterland of sketches and drafts, cannot constitute a substantial demonstration of a pan-species proclivity like kin altruism. Nevertheless, Tolstoy's masterpiece can test it" (277). This gets at the strengths and limitations of Cooke's approach. All said and done, I believe Cooke has very adeptly proved his thesis about *War and Peace*. But it is a single test case. As the statisticians would say, this is n=1. In the humanities we deal with n of 1 all the time, but my worry is that the further we get from this work the less this thesis will hold. Even in other Tolstoy works I think it would be less applicable the further in his career we go. *Anna Karenina* certainly works with the relationship between him and Sonya, as well as his brothers, but there isn't the obsession with his family, the way there is in *War and Peace*, and his later works get increasingly less self-centered. Different authors can offer other test cases, but nobody as good. You can find writers like Dostoevsky or Babel who use family members as prototypes, but finding another author who uses parents, siblings, uncles, and cousins and even great grandparents, great-aunts, and great-uncles will be harder to do.

Cooke has written a valuable contribution to Tolstoy studies, and to evolutionary approaches to literature. Multiple audiences will find things of use. The detail of the readings, and the research done on Tolstoy's family are wonderful. They betray a true love of the writer and of Russian culture, as well as a decades-long dedication to evolutionary approaches to literature. The insights gleaned from the drafts alone make this a useful work.

Evolutionary explanations have the advantage of being *matryoshki*, or Russian nesting dolls, where one level of explanation fits neatly within another, leading to deeper and deeper questions. This is an issue literary criticism often faces, where the "why" questions can only go so deep. But Cooke's argument can go deeper than usual. Why is Sonya treated so horribly? Her prototype isn't related to Tolstoy. Why should that matter? Kin altruism says we treat close relatives better than distant relatives, and distant relatives better than others. Why is that the case? Because our genes try to get copies of themselves into the next generation, and the closer the relation, the more genes are shared.

The biggest issues are not what's here, but what isn't, and those sorts of complaints are often not fair since they assume a book different from the one the author intended. The issue of kin altruism is made clear, but what is the exact connection between artistic production and kin altruism? I would argue that reputation is key. It was clear to many that the characters of *War and Peace* were based on Tolstoy's family members (the Russian *beau monde* was not very large), and by placing them in a good light he was actually benefiting himself and his progeny. Perhaps. I'm sure some will take issue with the fact that evolutionary psychology is being used at all, although kin altruism should be the least controversial topic within the field. By his own admission, Cooke focuses exclusively on family and ignores the war of *War and Peace*, but Tolstoy is such well-trodden ground that scholars must have a very narrow focus. This volume won't replace such classics as Kathryn Feuer's *Tolstoy and the Genesis of* War and Peace, but it definitely adds to our understanding of the formation of arguably the world's greatest novel.

At the end of the day, Cooke has done something immensely useful. He has left us with a concrete, testable hypothesis that can be applied to other writers, and these are hard to come by in the humanities. A gauntlet has been thrown down. It should be picked up.

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**DeSilva, Jeremy, ed. 2021. *A Most Interesting Interesting Problem: What Darwin's Descent of Man Got Wrong and Right about Human Evolution.***
Princeton: Princeton University Press. xxv, 258 pages, 19 b/w illustrations.
Hardcover $27.95; Kindle edition $15.37.

Bernard Wood

On 24 February 1871, Charles Darwin's two-volume *The Descent of Man, and Selection in Relation to Sex* went on sale at, among other places, Hatchards bookshop, next to Fortnum and Mason, on London's Piccadilly. The book was even more controversial than the *Origin of Species*. Darwin's longtime publisher, John Murray, had ordered an initial print run of 2,500 copies, yet it was reprinted at least twice that year, with minor textual changes, and by publication day arrangements were far advanced for five foreign-language translations. In 1874, Darwin added forty pages to the text, reorganized the book into three parts—"The Descent or Origin of Man," "Sexual Selection," and "Sexual Selection in Relation to Man and Apes"—added a preface and a table listing additions and corrections, and appended Thomas Henry Huxley's "Note on the Resemblances and Differences in the Structure and Development of the Brain in Man and Apes" as the conclusion of part 1.

All of this was shoehorned into a second edition that was published as a single volume in November 1874 for the bargain price of nine shillings; the 2000 copy print run was soon sold out. The 1877 reprint also included Darwin's essay on "Sexual Selection in Relation to Monkeys" that had been published in *Nature i*n 1876. The final version to incorporate Darwin's changes was the 1879 reprint, and this is the version published by Penguin Classics, along with an extensive introduction and other helpful complementary material prepared by James Moore and Adrian Desmond.

One hundred and fifty years after the publication of the first edition, Jeremy DeSilva has assembled a series of essays that focus on some of the topics covered by Darwin. Most of the essays provide the reader with the updated evidence that would have been available to Darwin if he was writing *The Descent of Man* today; a few are also "report cards" on some of Darwin's most controversial interpretations and proposals. The title, *A Most Interesting Problem*, is extracted from a letter Darwin wrote to Alfred Russel Wallace in 1857, in which he refers to human origins as "the highest and most interesting problem for the naturalist." Nonetheless, while the title of Darwin's book is routinely shortened to *The Descent of Man* and six of the eight chapters in *A Most Interesting Problem* focus on human origins, in the second edition of *The Descent of Man* more than two-thirds of the text and 13 of the 21 chapters are devoted to sexual selection.

The book opens with an introduction by Janet Browne, the doyenne of the many scholars who have tackled the herculean task of trying to understand Darwin's personal and intellectual journey. Her contribution sets out the background to the *Descent of Man*, its social context, and the evolution of Darwin's thinking about the role sexual selection played in human evolution and in evolution writ large. Browne emphasizes that Darwin's book is something "of a period piece in the style of argument, the use of evidence, and the conclusions put forward" (23). Most of the first part of the second edition of the *Descent of Man*, titled "The Descent or Origin

of Man," is devoted to physical and behavioral evidence that Darwin adduced to support his argument that there was continuity between modern humans and the rest of the animal kingdom, most notably with the primates, and uniquely with the apes.

The first two chapters in *A Most Interesting Problem*, by Alice Roberts and Suzana Herculano-Houzel, provide excellent updates on the lines of evidence relating to development and neuroscience, respectively, and in the sixth chapter John Hawks traces the history of ideas about the relationships between modern humans and other living primates, and how those ideas have evolved since 1871. In the introduction to the second edition of the *Descent of* Man, Darwin explains that he takes the "high antiquity of man" for granted, which is why in the book he did not dwell on what little human fossil evidence was available. Much has changed since then in terms of what the fossil record can tell us about human evolution, and in the fourth chapter Yohannes Haile-Selassie, a distinguished paleoanthropologist renowned for his fossil discoveries, provides a clear and comprehensive summary of the relevant fossil evidence for human evolution.

In the third and fourth chapters of the *Descent of Man*, Darwin compares the "mental powers" of "Man" with those of the "Lower Animals." Brian Hare was an inspired choice to tackle this topic, for his expertise with both bonobos and dogs allows him an unusually broad comparative context to assess Darwin's achievements in these two chapters. Hare admits he is humbled by Darwin's anticipation of "most major elements of modern theories of human sociality, cooperation and morality" (81). That reads like an A grade to me.

The fifth chapter of the *Descent of Man*, entitled "On the Development of the Intellectual and Moral Faculties during Primeval and Civilised Times," takes us into altogether choppier waters. In the fifth chapter of *A Most Interesting Problem*, Kristina Killgrove concludes that because of Darwin's use of "patriarchal language, his conflation of religion with morality, and his uncritical naturalizing of the Western European and colonist way of life, it is relatively easy to poke holes in Darwin's explanation of cultural evolution and civilization" (315). I am not sure that Darwin was trying to "explain" cultural evolution. My sense is that this chapter is Darwin's attempt to make sense of the different manifestations of modern humanity he observed during the Beagle voyage. He seems genuinely puzzled and perplexed by what he saw, and did his best to come up with explanations for the differences he encountered.

The final chapter in part 1 of the second edition of the *Descent of Man*, titled "On the Races of Man," takes us even further in the direction of the eye of the storm. Fortunately, Agustin Fuentes's seamanship is up to the task, and in the seventh chapter of *A Most Interesting Problem* he helps the reader navigate Darwin's observations on the nature and implications of what in the book the Victorian (see below) refers to as racial differences. It is worth buying the book for the final two-page section of Fuentes's chapter, titled "Was Darwin Racist?" Fuentes argues that Darwin was a good man, with many socially progressive views and instincts. Yet, according to Fuentes, Darwin's discussion of race in *Descent of Man* demonstrates "overt bias in regard to the mental, moral, and social capacities of human from the continent of Africa, Afro-descendant populations, and indigenous peoples of the Americas" (160)—which made Darwin, along with many of us, "at the least, a little bit racist" (161).

The eighth and ninth chapters of *A Most Interesting Problem* are the only ones that focus on sexual selection. Michael Ryan's chapter is a general introduction to sexual selection. I confess I have struggled with understanding the "nuts and bolts" of sexual selection, but after reading Michael Ryan's admirably clear explanation I feel more confident. Ryan reminds us that Darwin's theory of sexual selection "lay dormant for 100 years" until the 1970s when Robert Trivers introduced his theory of parental investment.

According to Ryan, sexual selection explains how "elaborate, sexually dimorphic traits used in courtship could evolve, despite being maladaptive for survival" (181). He also provides a lucid explanation of female mate choice.

If Darwin's views on race are today the equivalent of storm-force winds, then his conviction—as set out in chapters nineteen and twenty of the *Descent of Man*—that physical and behavioral differences between men and women driven by sexual selection predetermined their suitability for gender roles in Victorian society (e.g., "Man is more courageous, pugnacious, and energetic than woman, and has a more inventive genius"), is the equivalent of a category 5 hurricane. I imagine this is one of the sections of the book that prompted Browne to suggest that the *Descent of Man* "shows Darwin at his most Victorian" (2). In the final formal chapter, Holly Dunsworth makes the point that Darwin's views about women likely had a significant effect on their ability to enter higher education and that this barrier resulted in male bias and prejudice infusing research and scholarship into the evolution of modern human behavior.

The subtitle of *A Most Interesting Problem*, "What Darwin's *Descent of Man* Got Right and Wrong about Human Evolution," is provocatively historicist. It suggests that, in 2021, we are in possession of the truth. This is not the case. Yes, we are in possession of more knowledge than was available to Darwin, and some of this, such as the discovery of DNA, stresses continuity and communality among living modern humans, and not the differences that were emphasized in the *Descent of Man.* Yet, 150 years hence, it is likely that our interpretations will look at least as quaint, dated, and wrongheaded as some of Darwin's ideas do today. Overall, given the social milieu in which it was written, Darwin has little to fear from a close reading of the *Descent of Man.*

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**Fernández-Armesto, Felipe. 2019. *Out of Our Minds: What We Think and How We Came to Think It.***
Berkeley and Los Angeles: University of California Press. 464 pages.
Hardcover $16.13; Paperback $19.95; Kindle edition $14,99.

Gregory Hanlon

This is an ambitious book, written by a seasoned historian who employs a neo-Darwinian framework to show that humans have been cognitive animals for a long time. Fernández-Armesto claims that "ideas are the starting point of everything else in history," and that many of these first principles (he does not specify which ones) were first elaborated in prehistory. Animals of many species have culture, but only humans create civilizations, the products of our fertile imaginations. This *outillage mental* derives in part from our poor memories which give rise to unintended creativity, and our keen anticipation of the world that might be aided by language. The human capacity for producing ideas, the book argues, is the chief cause of change and volatility in human ways of life.

Fernández-Armesto proceeds in chronological order from prehistory to agriculture, to the first literate civilizations. The thinkers and sages of late Antiquity anticipated and influenced the way we think now, and we have added little to their thoughts. They identified problems of human nature that still preoccupy us. These ideas are largely Eurasian, developed out of Europe, India, and China. The chapters on the emergence of the great religions focus on Christianity, Islam, and Taoism, leavened with references to other philosophies emergent in this part of the world.

The second half of the text greatly resembles an old-fashioned history of Western philosophy, with a few references to China which serve to underline how attractive European ideas were. Philosophy is key to understanding the rise and stability of the Spanish Empire and the conversion of the masses to proper religious doctrines. This widened the perspective of humankind far beyond the "Old Continent." The Enlightenment added ideas of equality, of human rights, and of democracy, but the Enlightenment, Fernández-Armesto concludes, was a failure even in Europe, overturned by philosophers who claimed that feelings were as good as thought. Philosophical debates and the dominant intellectual themes of the nineteenth and twentieth century follow in due course, where science eventually gives way to chaos. Even the best-educated populations are not immunized against barbarism and science has done nothing to make people good. Refugees from pluralism and complexity today embrace ignorance and fundamentalist fanaticism. If you are one of those people who think of philosophy as the "Queen of Sciences," then you will probably admire the account given here.

*Out of Our Minds* contains some humanist fallacies, such as the belief that people come to reasoned conclusions as a result of weighing pros and cons. Research by psychologists like Jonathan Haidt strongly suggests that we adhere to propositions in an instant and then seek justifications for our prejudices in an ad hoc manner. Fernández-Armesto also relies on some unexamined assumptions about the influence of "Great Books." It may not be especially difficult to determine what an author meant to say, but famous philosophical arguments undergo astonishing metamorphoses almost from the time of their assertion. In Fernández-Armesto's telling,

first we had imagination, then we had civilization—articulated by select philosophers and sages and scientists—as if the human prefrontal cortex gradually liberated itself from the reptilian brain. Throughout the book, however, the author continually reminds us of the shortcomings of peoples too obtuse to assent to the dominant philosophies. He does not examine why those people might resist the ratiocinations of intellectuals.

In fact, the philosopher who has changed the way humans behave has not yet been born. The behavioral repertoire of humans has been remarkably stable over the long term—from a hardwired propensity to emphasize the virtue of our own actions and diminish those of our competitors, to social relations, and from the most local interests to geopolitics on a planetary scale. The author never once uses the term *tribalism,* although issues related to tribalism arise in virtually every chapter. Rather than claim in the manner of an intellectual historian that ideas are the driving force of history, an even more ambitious book might have dwelled upon the universal human behavioral repertoire, so much of it tacit and inarticulate, and why it is so resistant to change. He might begin by reviewing Donald Brown's portrait of "Universal People" in his pioneering book *Human Universals* (1991).

Felipe Fernández-Armesto is a virtuoso of verbs and nouns; few writers are capable of such vivid prose sustained over hundreds of pages. The prose also bears witness to the author's vast erudition in the realm of the history of religion, of philosophy, and of science, which is truly prodigious. His reading reveals his fluency with Latin, Spanish, French, and German, making him a paragon of an educated scholar. But the book does not live up to the claim in the title: to summarize what we think and why we think it. So far, philosophical arguments have not put a dent in the hard shell of deep human reasoning.

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**Helvert, Paul van and John van Wyhe. 2021. *Darwin: A Companion*.**
Singapore: World Scientific Publishing. 466 pages, 350 halftones.
Hardcover $78; Paperback $38.00; Kindle edition $29.95.

Tim M. Berra

To say that this book is a revision of Freeman's extraordinarily useful 1978 *Charles Darwin: A Companion* is a vast understatement. This new version is Freeman on amphetamines—during a tornado! Freeman's book had 100,000 words on 309 pages whereas the current edition has 235,000 densely packed words on 466 pages. His original cast of characters, places, and things related to Darwin are present with corrections and increased details plus new topics. Don't expect to see contemporary subjects such as evo-devo, epigenesis, or CRISPR. This book is about Darwin and his time. The audience for this material is the professional scholar, scientist, and historian.

Reviewing this book is a bit like trying to review the *Encyclopedia Britannica*. I will attempt to be helpful in locating various topics and include some useful references not presented by the compliers. Bold face type indicated entries in the book followed by page number.

The lengthy iconography (list of portraits) assembled by John van Wyhe is a great resource, perhaps the largest ever compiled for a scientist, including over 1000 works portraying Charles Darwin. Freeman (1978) listed 50 depictions of CD. Van Wyhe included paintings, drawings, all known photographs, portraits, engravings, caricatures, stained glass, and three-dimensional works such as statues and medallions. Dates and artists are assigned to the works. Representatives of 300 of the most interesting illustrations are included. For example, on page 136 is a 1948 pastel on paper by Russian artist Viktor Mikhailovich Evstafiev (1916-1989) of CD learning taxidermy from freed slave **Edmonston, John** (244) in Edinburgh. But this is no coffee-table book. Most of the black-and-white figures are the size of postage stamps. In fact, some *are* postage stamps. Iconographies of HMS ***Beagle*** (16), CD's wife **Wedgwood, Emma** (439), and **Down House** (227) are also included. Some very clever **Caricatures** (183) appeared soon after the publication of **Descent** (219) depicting CD as some manner of nonhuman primate. He appreciated the irony. The iconographies alone establish John van Wyhe as the CEO of the **Darwin industry** (212) not to mention his involvement with *Darwin Online*.

The other coauthor of *Darwin: A Companion*, Paul van Helvert, is an expert on knowledge valorization at Wageningen University & Research in the Netherlands. His expertise is in history and evolution. This book is the "poster child" of, and excuse for, using the word "valorization," worth 24 Scrabble points.

The location of 136 pages of iconography intrudes into the alphabetical lists of other topics and people and makes it difficult to find subjects unless you already know where to look. There is no index, but under **Darwin, Charles Robert** (69) there is a list of 35 topics that are included alphabetically before other Darwins appear on page 205. For example, CD's daughter, **Darwin, Annie** (67), and son, **Darwin, Charles Waring** (206) (the next child alphabetically), are separated by the iconography. A summary of the lives and accomplishments of the 10 Darwin children can be found between two covers in Berra (2013a), but it is not cited, yet a book on

Darwin's **Dogs** (221) is. See also ***Notebook of observations on the Darwin children*** (349) for anecdotes of several Darwin children.

I wish the iconographies had been gathered in a separate section at the end of the book. It would make the book easier to use. Another design suggestion would be to have a thumb index or page edge markings to indicate where new alphabetical headings begin. The entries in boldface type contain many abbreviations and omit the indentations found in Freeman (1978). Lists are in smaller type and some are in two-column format.

Darwin/Wedgwood pedigrees are found under **Darwin, family of** (64). A comprehensive Darwin/Wedgwood Dynasty Pedigree constructed for inbreeding analysis is not referenced but is available from Berra, Alvarez, and Ceballos (2010). There is no mention of the extensive Galton-Darwin-Wedgwood Pedigree produced by H. H. Laughlin and displayed at the American Museum of Natural History in 1932 during the Third International Congress of Eugenics. Also on display at the conference was a poster of Darwin family photographs arranged by **Darwin, Leonard** (213). Both displays are shown by Berra, Alvarez, and Shannon (2010).

Darwin's books are first listed under **Darwin: Books by CD** (72). There is also a separate entry for each title listed alphabetically by key words, such as ***Coral reefs*** (59), ***Earthworms*** (243), ***Orchids, Fertilisation of*** (351), and so forth. Books are linked to Freeman's (1977) *Bibliographic Handlist*. CD's **Big book** (26), his unpublished manuscript interrupted by the urgency of Wallace's 1858 letter, should be read in tandem with ***Natural selection*** (344).

**Darwin: Appearance** (70) is described as about six feet tall, 150 lbs. with blue-gray eyes. He was right-handed. Some major biographies of CD are included under **Darwin: Books, biographies** (75). CD's alcohol preferences, mostly wine and beer, are mentioned under **Darwin: Alcohol** (108), and his **Tobacco** (109) use consisted mostly of snuff and the occasional cigarette. **Stokes, John Lort** (408), CD's ***Beagle*** (19) shipmate, reported that his favorite expressions were "by the Lord Harry" and "beyond belief." This book is a mighty source of Darwin trivia that would humiliate the most knowledgeable *Jeopardy!* fan.

Darwin was a meticulous recordkeeper in his science and this penchant for exactitude also applied to his **Finances** (104). Due to gifts and inheritances from Charles's medical doctor father, **Darwin, Robert Waring** (214), and the pottery family of wife **Wedgwood, Emma** (439), the Darwins were very wealthy people. Investments in railways and government bonds were largely managed by banker son **Darwin, William Erasmus** (215). This allowed Charles the freedom to do his scientific work without consideration of earning a living.

During his youth and while exploring South America, CD was a competent horseman. Under **Darwin: Hobbies and pastimes** (104) we learn that he fell from his horse Tommy and was rolled on in 1869, bruising himself badly. There is a photograph of CD mounted on Tommy taken by Leonard Darwin (about 1866) in **Darwin: Photographs** (163-64). **Tommy** (421) gets his own entry where more information is presented. Despite the fall, CD continued to ride until at least 1870. One topic in three places could really benefit from an index, but that would be a massive undertaking, requiring a computer program, for a book of this complexity.

CD's location on various dates in his life is under **Darwin: Itinerary** (190). This double column list extends into nine pages from his birth in 1809 until death in 1882. The location of HMS ***Beagle:*** **Summary** (19) during its second voyage fills in the blanks for CD's whereabouts from 1831-1836.

There is a list of 284 **Places named after CD** (96). Somehow, the largest place, Darwin, capital of Northern Territory, Australia, in not included. It can be found under ***Beagle:*** **1837-1843 third surveying voyage (**21). The name

was bestowed by **Wickham, John Clements** (454), CD's favorite officer on the **1831-1836 second surveying voyage** (18), now captain of the third voyage when the harbor was spotted by John Lort Stokes in 1839. Be advised, finding some topics in this book that you know *must* be there can be frustrating. There are at least 523 **Animals named after CD** (81). The large, flightless bird, *Rhea darwinii*, named by **Gould, John** (271) in 1837 has been synonymized with *R. pennata* as stated in ***Rhea*** (381). There are at least 221 **Plants named after CD** (99), and 73 eponymous ***Institutions*** (89) including Charles Darwin University in Darwin, NT, Australia. **Monuments** (91) number 132 worldwide and include "HMS Beagle Ship Bell Chime" by Anton Hasell in Civic Park near the library in Darwin, NT, Australia (fig. 1). Hasell's accompanying bronze bust of CD is pictured and listed in **Three dimensions** (124-25).

Darwin's health has been catnip for Darwinophiles. This topic **Darwin: Health** (110) includes 38 hypothetical diagnoses supplied by Australian pathologist John Hayman. The compilers mention Hayman's hypothesis that CD suffered from a mitochondrial disease, but do not cite his paper (Hayman et al 2017). A related entry is **Health diary** (281)

The Fundamentalist's myth of a deathbed conversion by CD appears under **Darwin: Religion** (201) and **Hope, Lady** (289). The two entries are not cross referenced. If you only see Religion, you will not learn that it was Lady Hope who perpetrated this fraud unless you read the references cited under Religion.

**Down House** (223-36), CD's home from 1842 until his death, encompasses subheadings such as **Alterations to land**, **Hot-house & greenhouse**, **Furnishings**, **Household expenditure**, **Iconography**, **Staff**, **History**, and

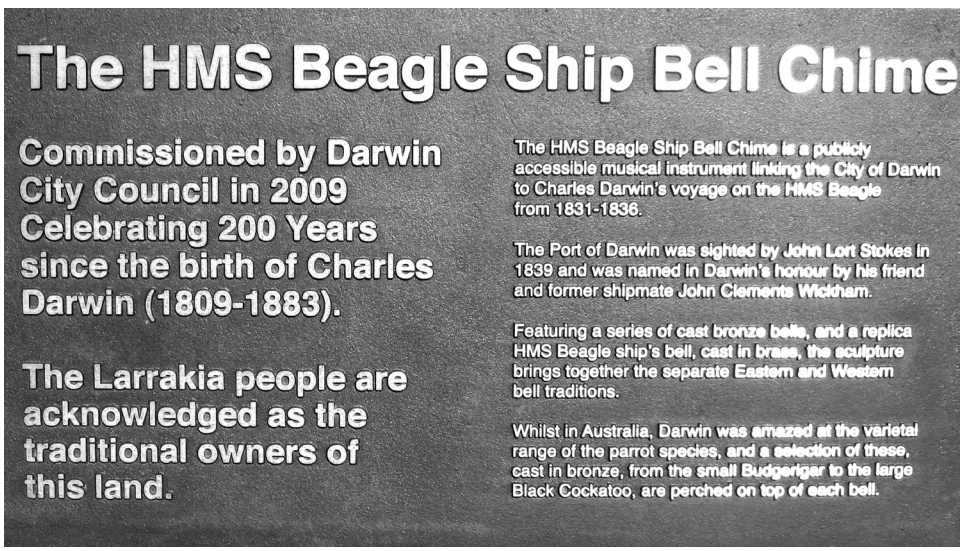


FIGURE 1. Plaque at the HMS Beagle Ship Bell Chime. This monument of 11 cast bronze bells is tuned over two octaves and arranged in a semicircle from smallest to largest in Darwin's Civic Center. They chime a different tune several times every day. Each bell is crowned with a species of Australian parrot. A central bell is a replica of HMS *Beagle's* bell. A bronze bust of a young Charles Darwin oversees the monument. This artwork was created by Dr. Anton Hasell of Australian Bell Pty. Ltd. Photograph: Tim M. Berra.

**Visitors**. Despite the telegraphic style, it provides a surprisingly intimate portrait of Darwin's domestic life.

**Freshwater, Isle of Wight** (261) was a summer vacation destination for CD and while there he was visited by poets **Longfellow, Henry Wadsworth** (317) and **Tennyson, Alfred Lord** (416) and photographed by **Cameron, Julia Margaret** (42) in 1868. Some of these photos are reproduced under **Darwin: Iconography** (167).

An example of augmentation of a preexisting entry occurs at the **Gourmet Club** (271). The new book includes a menu of owl, hawk, and bittern not mentioned in Freeman (1978). A new entry is **Jordan, David Starr** (301), an American ichthyologist and the first president of Stanford University. He is also mentioned in **Parslow, Joseph** (363), Darwin's long-serving, venerable butler, and friend. The new entry of **Macdonell, Anne, née Lumb** (324) recounts how a smelly specimen of toco-toco (a small, chattering South American burrowing rodent of genus *Ctenomys*) left by CD with her parents was discarded by her mother during CD's absence on an expedition around Buenos Aires. Upon return, CD commented, "I will forgive Mrs. Lumb, for she is nearly as beautiful as the touca-touca." The only man CD loathed, **Owen, Sir Richard** (356), paleontologist and anonymous reviewer of ***Origin*** (352), receives expanded coverage of CD's reaction to Owen's spiteful envy.

CD added a **"Historical Sketch"** (286) to the third edition of ***Origin*** (354) to acknowledge his predecessors who expressed some concept of natural selection or at least did not endorse special creation (Berra 2015). This sketch evolved through various editions of ***Origin*** and has grown into a book of its own (Johnson 2020).

On page 392 there is a drawing of Darwin's fox (*Lycalopex fulvipes*) collected by CD from **Chiloe Island** (50) and a sheephead grunt (Haemulidae) collected by Darwin in the **Galapagos Islands** (263). They appear out of nowhere, and it is not immediately obvious why they are shown under "S" between **Sanskrit** and **Santa Fé**. However, upon further digging, I learned that Darwin's fox was collected on San Pedro Island (off Chiloé) and the fish was taken off San Cristó Island (in the Galapagos). Perhaps the "San" heading is missing in the entries?

The **Spencer, Herbert** (404) entry does not include his phrase **"Survival of the Fittest"** (411) and likewise for **Malthus, Rev. Thomas Robert** (327) and his **"Struggle for existence"** (409). The **Wedgwood** (437) entries number 100, exceeding even "Darwin" entries.

*Darwin: A Companion* begins with a deferential quote from Wallace about CD's primacy for the concept of natural selection. Van Wyhe is an expert on the life of **Wallace, Alfred Russel** (431) as well as CD, and so the Wallace's entry is replete with citations to which I will add my two cents (Berra 2013b).

I could go on and on, but I think I have made the point. Whatever you want to know about Darwin is probably somewhere in this book, if you can locate the entry. This is a reference book and, at first glance, seems unsuitable for pleasure reading. However, it can be quite enjoyable in small bites, say five pages daily. In about three months, you will be much wiser about Darwin. Anyone who writes about Darwin needs this book at their fingertips.

In a letter to **Cooke, Robert Francis** (57), partner of Darwin's publisher, **Murray, John** (342), CD wrote, "I sometimes think a man is a fool who writes books" (**Quotations** [70]).

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Berra, Tim M., Gonzalo Álvarez, and Francisco C. Ceballos. 2010. "Was the Darwin/Wedgwood Dynasty Adversely Affected by Consanguinity?" *BioScience* 60 (5): 376-83. https://doi.org/10.1525/bio.2010.60.5.7.

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Johnson, Curtis N. 2020. *Darwin's "Historical Sketch": An Examination of the "Preface" to the Origin of Species*. New York: Oxford University Press.

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**Renn, Jürgen. 2020. *The Evolution of Knowledge: Rethinking Science for the Anthropocene.***
New Jersey: Princeton University Press. 584 pages.
Hardcover $35.00; eBook $19.25.

Thomas Morgan

The mere existence of the history of science as a field of study tempts one to imagine that science can be cleaved off from other human endeavors and usefully studied in isolation; that the scientific revolution created a fundamentally different kind of process than what came before. This position is anathema to the rich and expansive viewpoint offered by Renn: not only is science commensurable with other methods of knowledge acquisition, but it is also deeply connected with other features of the society in which it is practiced. The overarching goal of *The Evolution of Knowledge*, then, is to show how we can grapple with such a wide-ranging notion of science to produce new insights about the human past and future. When it works, the reader gets a sense of distance and perspective, a mental zooming out revealing science as part of an evolving organism that is replete with beliefs, habits, and needs. However, too often the book is weighed down by its own ambitions: theory can become unfocussed, new terminology is defined so broadly as to risk becoming meaningless, and while examples illustrate some key points they fail to live up to the aims of the text. Nonetheless, attempts to link science with other human processes are worthy, and I was left with a great deal of sympathy for many details of Renn's position; I suspect he may be right, but work remains to be done.

Removing the barrier between science and the rest of humanity entails several steps that are the focus of parts two through five of *The Evolution of Knowledge* (part one effectively being an extended introduction). The second part deals with what knowledge is, and it is here that Renn links theoretical knowledge produced through the scientific process with other kinds of knowledge; things like the intuitive and practical knowledge that have shaped human behavior for hundreds of thousands of years. The critical distinction between theoretical knowledge and other knowledge, Renn argues, is abstraction and reflection; for instance, while many societies knew how to solve various engineering problems posed by large construction projects, the solutions were often algorithmic in the sense that there was typically little understanding of general principles that explains why these solutions worked. Only rarely did such knowledge evolve, and later Renn provides the examples of classical Greece and the Mohist school in China.

The different kinds of knowledge accumulated by a society constitute a "system of knowledge," a large aggregate composed of mental models, conceptual frameworks, social practices, and material artefacts. While mental models are well explained and feature throughout the book, the same cannot be said for all the other constituent parts. As such, while the role of mental models in knowledge evolution is quite clear, how this scales up to the evolution of entire knowledge systems remains a little woolly. Nonetheless, the chapter on scientific revolutions is excellent; arguing against Kuhnian paradigm shifts, Renn favors a gradualist (i.e. evolutionary) model in which problematic observations or competing explanations across disciplines prompt the steady development of new theories. As Renn shows, the outcome is

unpredictable. While new theories often start as small, isolated stubs, they can grow into larger frameworks, sometimes persisting as epistemic islands (as is the case for quantum mechanics); at other times, they turn on existing knowledge and fundamentally reshape it, as relativity did to the concepts of space and time.

The next concept to be introduced is the "knowledge economy," a critical notion that Renn uses to integrate science with other social processes, and the focus of part three. Broadly speaking, the knowledge economy is the set of institutions, norms and niches that regulate how science functions. Things like funding bodies, government policies and priorities, the structure of research institutions, and so on. That much is hinted at in the introduction, but Renn goes into much more detail in a dedicated theory chapter. Despite this detail, I gained little understanding beyond the introductory summary of precisely what a knowledge economy is. The extended discussion is simply too vague to be helpful and the reader is left with the frustrating sense that knowledge economies can do and be virtually anything. They are driving forces behind, or obstacles to, innovation; sources of social stability or instability; repositories of knowledge, as well as notions of what counts as knowledge; critical factors in the dissemination of knowledge, but also its sequestration within epistemic communities. Such expansive terminology is perhaps necessary given the goals of the book, but without clear definitions the theory risks being too nebulous for others to build on. Renn offers an example, the construction of the dome of the cathedral of Florence, which helps give a sense of knowledge economy in action: we see the different contributions of architects, scientists, craftspeople, city councils, and patrons. But what is not clear is how important these contributions are (would things have turned out differently if the social structure was different?) or what alternative ways there are of understanding this process—that is, what Renn is arguing against. For instance, are there theories of science that deny a role to wider social structures? The latter limitation, in particular, is present throughout the book; while Renn presents his theory as a means to understand human history it is not clear how it disagrees with (or exceeds) other competing theories. Without this comparison, the benefit of Renn's expansive view is unstated and often unclear.

Part four deals with the spread of knowledge and knowledge evolution as a cross-cultural, global process, rather than a feature of Western societies. While many examples of knowledge spread are provided, the theory runs into the same problems described above. The dynamics of information transfer are described in such open-ended terms that it is not clear if anything is off the table, or which are the general principles the reader should be attending to in particular. While Renn is no doubt right to acknowledge the complexity of the process, it would help readers if additional structure could be provided. The final part of the book departs from traditional history of science and instead veers towards contemporary meta-science in that it asks how and why we should consider changing our own knowledge economies to protect and secure a future for humanity. The problems with the current knowledge economy are vividly described, especially, the hole in the ozone layer that would have been orders of magnitude worse had chance historical factors not led to the use of CFCs instead of their much more harmful bromine counterparts. However, the treatment of possible solutions feels a little shallow. The sustainable knowledge economy of Tokugawa Japan is discussed in detail before it is mentioned that it also involved state mandated infanticide and nonetheless resulted in devastating famines. Renn's suggested way forward is effectively a more successful system for public outreach: the products of our knowledge economy need to be communicated to society with sufficient efficacy that there is little scope for bad actors or vested interests to distort public debate. A revised internet is seen as central to

this, but Renn's description of it sounds very much like the Panglossian visions of the founders of the current internet. While one can't blame Renn for wanting to end on a positive note, I'd prefer a clear, stark warning over a vague promise.

Throughout, the biggest strength of *The Evolution of Knowledge* is the analogy it draws between biological evolution and knowledge change (although, as a cultural evolutionist, I guess I would say so). Most critically, the population-level thinking central to biological evolution, in which only populations and not individuals can be said to evolve, is integral to Renn's notion of gradual change in science. Such a position is well argued, with even the work of critical figures such as Einstein being shown to emerge slowly and through repeated interactions with other individuals; the golden age of general relativity not arising until after his death, for instance. We also see examples of convergence, divergence, and complex path dependence. It is widely understood in biology that the endless contingencies of biological systems means that, even while selection relentlessly favors those who survive and reproduce, the eventual outcome is sufficiently unpredictable that rewinding the clock to let evolution play out again would continually produce different end states. Renn suggests the same complexity is true of knowledge. For instance, both ancient Greece and the Mohist school of ancient China converged on abstract theories of mechanics in response to peculiar phenomena, like the force-enhancing action of a lever. However, while such theories were successful and persisted in Greece, in part due to cultural norms that valued public disputation of paradoxes, they were abandoned in China, suppressed by a centralized political system. Lastly, Renn identifies a positive feedback loop within science, whereby new degrees of reflection and abstraction bring into view new puzzling phenomena that prompt further reflection, that has also been argued for human, biological evolution, in which the evolution of increasingly sophisticated cognition permits ever more cognitively demanding behaviors that redouble selection on cognition (Dennett 2003; Morgan 2016).

As a whole, the book persuades that the evolutionary model of science is a good one. Nonetheless, Renn is not the first to suggest this. Indeed, in the introduction he refers to the field of cultural evolution wherein tools developed for studying biological change have been applied to culture, knowledge, and science for over 40 years (Boyd and Richerson 1985; Cavalli-Sforza and Feldman 1981). Drawing on population genetics, economics, anthropology, and psychology, cultural evolution is a heavily quantitative field replete with arcane mathematical theory. As such, it is understandable that Renn takes a different approach. Nonetheless, given that Renn is clearly aware of the field and accepts the analogy with biological evolution, I would have liked to know why: Does the mathematical approach of cultural evolution have limitations that Renn's more qualitative approach can fill? This reflects the broader issue with the book, mentioned above, which is that while Renn is happy to describe his own view he stops short of arguing why the reader should favor his theory over others.

The largest drawback of the work, however, is its readability, which suffers due to excessive length and the segregation of theory and example. New terms, such as "knowledge economy" and "system of knowledge" are given dedicated theory chapters where their varied possible forms are discussed at great length. Given that this is done largely in the absence of clarifying examples the mental load upon the reader is extreme and after reading them I typically felt my understanding was little better than following the sentence length definitions provided in the introduction. While the subsequent examples do help clarify what these terms look like in practice, their separation from the theory means that they largely stand on their own as opposed to illuminating the wider

framework. This structure is appropriate for the more developed examples, whose length demands some separation; however, many of the examples are much shorter and could easily be studded throughout the theory chapters to clarify key points as they arise.

As a theory of science, *The Evolution of Knowledge* is unique in its ambition to draw in virtually the entirety of human practice from the present day back into deep human history, as well as looking towards the human future. This breadth is laudable and, ultimately, quite convincing. Nonetheless, the format of the book struggles to bear the weight of everything the theory touches upon, and this challenge is passed on to the reader as well. As Renn himself would argue, beyond being accurate or useful, for knowledge to survive it must be transmitted to and adopted by other individuals. While Renn's theory is comprehensive, rich, and rewarding, the unwieldiness and intransmissability of its key concepts may turn out to be its biggest drawback.

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# Audiovisual Media

Jens Kjeldgaard-Christiansen

## Introduction

So far, 2021 has not seen many evolutionarily minded treatments of audiovisual media. Consequently, only one article appears in this review: Coltan Scrivner's survey-based study of the potentially adaptive use of horrific media during the COVID-19 pandemic. Following my review of this article, I discuss why such a focus on the benefits of horrific media use has been so long neglected in the social scientific literature.

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Scrivner, Coltan. 2021. "An Infectious Curiosity: Morbid Curiosity and Media Preferences during a Pandemic." Forthcoming in *Evolutionary Studies in Imaginative Culture* 5 (1). Available open access at https://esiculture.com/an-infectious-curiosity-morbid-curiosity-and-media-preferences-during-a-pandemic.

This survey-based study links morbid curiosity—the personality trait of being interested in unpleasant and morbid phenomena—with specific media preferences during the 2020-2021 COVID-19 pandemic. Based on the assumption that morbid curiosity promotes adaptive learning about dangerous situations, Scrivner asked his 125 participants to report on their interest, "compared to usual," in "1) factual information about Coronavirus that was specifically morbid, 2) general factual information about Coronavirus, 3) pandemic and virus genres of films and TV shows, and 4) genres of film and TV shows that center around threat more broadly." Morbidly curious individuals reported increased interest in pandemic and virus genres, as well as in morbid information about the virus. These results suggest that "morbid curiosity may reflect an adaptive predisposition in some individuals toward learning about the dangerous and disgusting aspects of a threat."

Scrivner believes that engagement with horrific media promotes adaptive psychological coping with threatening situations in real life. There is as yet not much empirical evidence to support this view. But this absence of evidence does not tell us much, since psychologists have only really looked for the potential dangers of exposure to horror media (Clasen 2021, chapter 3). Their basic assumption has been that insofar as these media affect us, they could only do so in undesirable ways—such as by reducing empathy or increasing aggressiveness.

The assumption that horror could only be bad for you can be traced, I believe, to the widespread adoption of Albert Bandura's social learning theory (1977) in media psychology. In explaining human behavior, social learning theory strongly emphasizes vicarious learning and mimicry. The approach is often illustrated by means of the famous "Bobo doll" experiment (Bandura, Ross, and Ross 1961), in which young children were found to model an adult stranger's aggression toward a large clown-faced doll. The theory supposes that this finding generalizes: people mimic what they see others do.

To be fair, there is more to Bandura's theory than "human see, human do," but one would not know that from witnessing the incautious application of the theory in many highly publicized studies. For example, according Anderson and Bushman (2001, 355), playing a violent video game is tantamount to the "learning, rehearsal, and reinforcement of aggression-

related knowledge structures," leading directly to an increase in "aggressive personality," and ultimately to violent behavior in the real world. Children, as learners par excellence, are thought to be especially vulnerable to violent and horrific media, which stage "a cumulative learning process in which the child's observation of violence eventually leads the child to employ more aggressive scripts for behavior" (Huesmann 1986, 130).

It is easy to see how a media psychology that emphasizes mindless mimicry can make certain fictional genres seem threatening and immoral. Appositely, horror is about malicious agents attacking and often killing others. That would not be a good thing for anybody to model. But since social learning theory gives us theoretical reasons to suspect that audiences will model the on-screen action, we had better look for any sign that the audience has internalized something of the killer's nastiness. Hence, the pervasive focus on the potential negative effects of using horror media.

I do not think that this parrotistic media psychology survives an evolutionary reality check, and that is a judgment I share with an increasing number of the field's practitioners (Ferguson 2010; Henninghausen and Schwab 2015). Humans evolved not as passive receptacles for environmental stimuli but as selective and enterprising exploiters of their environments. Our modern environments happen to contain media that explore danger, fear, despair, violence, death, and other themes of the human experience that fall under the rubric of "horror." Media users engage these media actively, thoughtfully, and often critically, and they may adjust in desirable and adaptive ways as a result.

That is indeed what Scrivner takes his results to suggest. He found further support for this idea in another recent study, which showed that fans of horror and "prepper" genres, such as alien invasion, apocalyptic, and zombie films, felt better equipped to cope psychologically and behaviorally with the COVID-19 pandemic. Thus, the authors concluded, "experiencing negative emotions in a safe setting, such as during a horror film, might help individuals hone strategies for dealing with fear and more calmly deal with fear-eliciting situations in real life" (Scrivner et al. 2021, 5; see also Clasen 2017).

I know of no other formal studies that bear directly on the issue, but, anecdotally, many people feel that their use of horror media helps them to understand, control, and even overcome their fears (Clasen 2021, chapter 3). These people could be simply mistaken, of course, or they could be trying to justify time spent on a genre that is often seen as vulgar or even immoral. But they could also be right. At least for some people, horror might work on principles similar to those of cognitive behavioral therapy, whereby phobias are actively confronted in controlled circumstances and thereby gradually overcome. There are obvious parallels to the horror genre, which stages threats that the media user is challenged to process and overcome, such as by avoiding detection in a survival-horror video game or managing their fear when watching a horror film. If horror plausibly works like this, then researchers would have good reason to look for positive outcomes of horror media use. They might start by adopting an evolutionary perspective and thereby blocking the simplistic parrotism of the media psychological tradition.

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# Cultural Theory

Oleg Sobchuk

## Introduction

This article reviews research focused on very general mechanisms of culture—mechanisms that are potentially relevant to scholars from various disciplines. Also, I discuss research on more specific cultural-evolutionary findings in areas that are too young to have their own disciplinary boundaries (e.g., cultural evolution of arts). Of course, many exciting articles in the field of cultural theory have been published over the last half year, in addition to the ones discussed below. Still, I hope that this short list can be useful as a starting point for someone interested in the recent progress of cultural evolution theory.

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Lindenfors, Patrik, Andreas Wartel, and Johan Lind. 2021. "'Dunbar's Number' Deconstructed." *Biology Letters* 17:20210158. doi:10.1098/rsbl.2021.0158.

Normally, evolutionary theory doesn't produce memes. The word "meme" itself, of course, is a rare exception. Another exception is the famous "Dunbar's number." First presented by the anthropologist Robin Dunbar (1992), it quickly became a hero of popular culture. Dunbar's hunch was that there exists a correlation between the size of the neocortex in various primate species and the average size of the groups in which they live. The cognitive upper limit on the size of human groups (or, to be more precise, groups with meaningful connections) was claimed to be 150: hence, "Dunbar's number." In this paper, the authors assemble a variety of datasets on the sizes of primate groups and brains (measured in various dimensions) and analyze them with modern statistical methods. Interestingly, different datasets and different statistical models produce strikingly different results—in particular when it comes to confidence intervals—not giving much evidence for a reliable upper bound of human group size. The authors conclude, forcefully: "It is our hope, though perhaps futile, that this study will put an end to the use of 'Dunbar's number' within science and in popular media. 'Dunbar's number' is a concept with limited theoretical foundation lacking empirical support" (3). Time will tell . . .

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Olivier Morin, Pierre Olivier Jacquet, Krist Vaesen, and Alberto Acerbi. 2021. "Social Information Use and Social Information Waste." *Philosophical Transactions of the Royal Society B* 376:20200052. doi:10.1098/rstb.2020.0052.

Over the last half year, two notable themed journal issues on cultural evolution have appeared. The first one, "Foundations of Cultural Evolution" (edited by Eva Boon, Lucas Molleman, Pieter van den Berg, and Franz J. Weissing), was an issue of *Philosophical Transactions of the Royal Society B*. That whole issue deserves attention, but I will single out this piece, which poses an interesting problem: Why do humans tend to discount social information? (Social information is any information obtained from other people, in contrast to information learned individually.) The paper reviews numerous experimental studies—by social psychologists, experimental economists, and cultural evolutionists—revealing that, more

often than not, we believe our own opinion on a subject, not the opinion of others: the phenomenon known as "egocentric discounting." From my personal experience, this isn't a controversial idea. However, egocentric discounting is a scientific puzzle. Why does it exist? One possible answer: Humans have access to their own reasoning, and don't have access to the reasoning of others; that's why the knowledge obtained from others—social information—seems less convincing. What does egocentric discounting mean for large-scale cultural evolutionary processes, and how does it interplay with other mechanisms of social transmission of information—most importantly, with its evil doppelgänger: conformity bias? The article contains more questions than answers, but that's exactly what makes it interesting.

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Mesoudi, Alex. 2021. "Blind and Incremental or Directed and Disruptive? On the Nature of Novel Variation in Human Cultural Evolution." *American Philosophical Quarterly* 58 (1): 7–20. doi:10.2307/48600682.

This article belongs to the second recently published thematic collection "Cultural Evolution and Generalized Darwinism: Theory and Applications" (edited by Daniel Dennett). Historically, cultural evolution began as an application of Darwin's theory of natural selection to culture, but more recently it migrated into a broader area: the study of general principles of cultural dynamics, both Darwinian and not. This collection draws attention to the Darwinian aspects of cultural evolution. In this particular article, Alex Mesoudi reviews one of the lesser-studied problems in cultural evolution research: What is the nature of innovations in culture? Are innovations "random" (or "blind")—like mutations in Darwin's biological evolution? Or are they "directed" (a view that is sometimes called Lamarckian)? Over this question, many academic spears were cast, yet it remains a confusing, foggy area on the map of cultural evolution theory. Mesoudi reviews the existing evidence on both sides. Some research, in particular that coming from the theory of cultural attraction, suggests that innovations are nonrandom (Claidière et al. 2014); at the same time, other research stresses that innovations are blind and happen without proper understanding of the causal mechanisms behind the artefacts invented (Derex et al. 2019). In this debate, Mesoudi takes the middle ground: "A simplistic 'blind vs directed' dichotomy is unhelpful. . . . The reality is somewhere in between" (17). This middle ground may be a good launch pad for further research into how exactly cultural innovations happen.

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Tran, N.-Han, Timothy Waring, Silke Atmaca, and Bret A. Beheim. 2021. "Entropy Trade-Offs in Artistic Design: A Case Study of Tamil *Kolam*." *Evolutionary Human Sciences* 3:e23. doi:10.1017/ehs.2021.14.

Cultural evolution of art is still a young branch of cultural evolution research (see Sobchuk 2018; Granito et al. 2019; Miton et al. 2020). A better understanding of what art is and how it evolves is one of the future frontiers of cultural evolution—a border zone between the social sciences and humanities. In this paper, scholars apply various information-theoretic measures (entropy, richness, evenness) to a database of *kolam*—that is, traditional drawings produced by women in southern India. Kolam is particularly suitable for quantitative analysis, because all the drawings are made of simple, standardized elements. And yet, these simple elements can be combined into beautiful, complex patterns. This study finds that most kolam drawings exhibit roughly the same degree of entropy, resulting from trade-offs between various aspects of the drawings. It's almost as if there exists some "sweet spot" of complexity for images. These drawings tend to

be neither very complex nor very simple—they balance between the extremes. This paper's finding aligns well with the broader intuition about what good art is: complex, but not too complex. A simple artwork may be boring, a complex artwork may be incomprehensible. Is this trade-off a broader principle of the cultural evolution of art, not limited to kolam? Certainly, a question for further research on artistic evolution.

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## Life Narratives

Henry R. Cowan

Perlin, Joshua D., and Robyn Fivush. 2021. "Revising Redemption: A Life Span Developmental Account of the Functions of Narrative Redemption." *Human Development* 65 (1): 23-42. doi:10.1159/000514357.

Redemption—movement in an autobiographical story from suffering toward freedom, growth, or self-enhancement—is one of the bedrock themes of narrative identity research, particularly in the context of American culture (McAdams et al. 1997; McAdams 2013). Perlin and Fivush argue for an expanded definition of redemption, encompassing a return to stability as well as the emergence of change; and encompassing stability or change in situations as well as in identity. The authors argue (rightly) that this broader model of redemption is likely to be more broadly applicable outside the context of midlife American adults, whose life stories have formed the prototype for redemptive stories in much previous research. The authors' theoretical expansion of a basic narrative theme has the potential to generate substantial new applications and insights into redemptive imagery in life narratives.

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Turner, Ariana F., Henry R. Cowan, Rembrandt Otto-Meyer, and Dan P. McAdams. 2021. "The Power of Narrative: The Emotional Impact of the Life Story Interview." Forthcoming in *Narrative Inquiry*. doi:10.1075/ni.19109.tur.

Turner and colleagues set out to answer a simple question: What does it feel like to narrative a life story? The classic interview used in narrative research, the Life Story Interview (McAdams 2008), lasts for one to two hours and asks the respondent to narrate life chapters; key scenes such as high and low points; personal challenges, failures, and regrets; expectations for the future; and themes connecting various life experiences. On balance, the content of the interview is difficult or challenging, and the interview is typically carried out with a stranger. Nevertheless, Turner and colleagues found that respondents tended to enjoy the experience (indicated by positive changes in self-reported emotions from before to after the interview). But not everyone enjoyed the experience. The authors also found that participants who narrated their lives with less autobiographical reasoning (for instance, telling a sequence of isolated stories without tying them together into a broader life story) enjoyed the experience less. These data speak to a larger question: Does everyone have narrative identity? Strawson (Strawson 2004; 2018) and others have argued that some people are fundamentally *episodic* and do not understand themselves as authors of a life story. Turner and colleagues, in finding a small subgroup of people for whom autobiographical reasoning did not come easily and was not enjoyable, may have found preliminary empirical evidence for episodic identity.

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# Literature

Mads Larsen

## Introduction

Could the evolutionary field's prosocial turn be motivating more literary scholars to apply Darwinian insights in their criticisms? In the prestigious journal *Daedalus*, an English professor from Yale uses Darwin to predict how the novel format will evolve in the twenty-first century. Wai Chee Dimock suggests that "the unfit" will be able to survive future turmoil through cooperation with human and nonhuman entities. Such extended prosociality, Dimock believes, will be expressed more fully in the novel than anywhere else. In *Textual Practice*, a leading journal for "radical literary studies," Chris Danta explores evolutionary futurism in an 1872 novel that argues against Darwin's biocentrism to advocate man-machine cooperation and merger. In *Women's Writing*, Helena Goodwyn finds that an 1856 proto-Darwinian novel recodes masculinity by rewarding not competition but cooperation between men. In *World Futures*, Mads Larsen argues that the founding decalogy of Nordic noir crime fiction promotes evolutionary universals for cooperation. Tom Dolack argues that Dostoevsky understands that the function of confession is to enhance group functionality.

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Goodwyn, Helena. 2021. "A Woman's Thoughts About Men: Malthus and Middle-Class Masculinity in Dinah Mulock Craik's *John Halifax, Gentleman*." *Women's Writing* 28 (2): 231–49. doi:10.1080/09699082.2021.1879437.

In the proto-Darwinian mood of the 1850s, Dinah Mulock Craik published *John Halifax, Gentleman* (1856). Her protagonist-narrator, Phineas, is of good lineage but invalid. To secure his own future, he initiates a symbiotic relationship with a talented orphan, the protagonist-hero, John. The bestseller has been read as middle-class propaganda for capitalist industriousness, and as portraying an intense homoerotic friendship. Helena Goodwyn reads the novel to be engaging its era's debates on evolutionary biology and Malthusian population control. She makes a compelling case for Craik dramatizing the mid-century's two competing camps of evolutionary politics. *John Halifax, Gentleman* goes against the Malthusian view on individual struggle as a means for progressive social evolution. The protagonists' successful symbiosis aligns with Lamarckian emphasis on social cohesion as a means for subordinating individual interests to those of the group. While other critics accuse Phineas of acting out feminine instincts, Goodwyn finds him to represent a recoded masculinity, one not of competition but cooperation. Craik uses proto-Darwinian ideas to propose an alternative kinship model that aligns with our present era's focus on the prosocial aspects of human evolution. Ultimately, the novel rewards not John, the biologically fittest "captain of industry," but Phineas, the innovative cooperator.

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Dimock, Wai Chee. 2021. "The Survival of the Unfit." *Daedalus* 150 (1): 134–46. doi:10.1162/daed_a_01838.

Wai Chee Dimock reinterprets Darwin to predict the evolution of the twenty-first-century novel. In a future of environmental and other turmoil, the novel can no longer impose a stable human world while ignoring nonhuman forces. Dimock predicts more catastrophic narratives in which human inventiveness will be crucial for survival. Instead of fitness being vested in single individuals, or even at a human group level, she envisions fitness as a mutuality between the human and the nonhuman. Dimock reads Barbara Kingsolver's *The Poisonwood Bible* (1998) and Richard Powers's *The Overstory* (2018) to make this case for "assisted survival." Darwin intuited that human evolution depends on cooperation with nonhuman entities, she writes, but the twenty-first-century novel will give such extended prosociality its fullest expression. She builds on critics who have pointed out the overlaps between Darwinian evolution and narrative fiction, comparing literary observations about humans to scientific observations about the nonhuman. The novel format can thus be viewed as an analytical tool that transforms as it adapts to its changing environment.

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Danta, Chris. 2021. "Panpsychism and Speculative Evolutionary Aesthetics in Samuel Butler's 'The Book of the Machines.'" *Textual Practice* 35 (2): 285–304. doi:10.1080/0950236X.2019.1652679.

Samuel Butler's *Erewhon* (1872) speculated that machines could evolve similarly to biology and supplant humans. Butler wrote to Darwin that he was being ironic, but Chris Danta suggests that the author was not. Danta reads Butler to enlist panpsychicism, that all organic and inorganic matter have consciousness, to argue against Darwin's biocentrism. If machines can be sentient, Butler envisions two possible outcomes: an apocalyptic one, in which humans go extinct, and a utopian one, in which humans merge with machines. Danta terms this approach "speculative evolutionary aesthetics," which are meant to mitigate human exceptionalism. He views Butler as an important figure of evolutionary futurism, the first prophet of a cyborg future. Butler portrays a man-machine utopia to be possible, but only if humans are willing to renounce anthropocentrism.

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Larsen, Mads. 2021. "Nordic Noir's Exemplary Microcosm: Promoting Core Design Principles for Group Efficacy." *World Futures*: online first. doi:10.1080/02604027.2021.1899576.

Maj Sjöwall and Per Wahlöö's *The Story of a Crime* (1965–1975) reinvented the detective genre. Nordic noir's originating decalogy proposed that Scandinavian social democracy was a capitalist ploy, and that only Marxism can cure social dysfunction. Larsen reads the novels through the lens of Elinor Ostrom's eight Core Design Principles (CDPs). The 2009 Nobel winner in economics showed how adherence to these evolutionary universals for group efficacy can solve the tragedy of the commons. In a 2010s research project, the Evolution Institute argued that social democracy is successful because Nordic countries organize according to CDPs. Larsen argues that the author-couple created compelling and socially relevant fiction because they had internalized these universals. Their decalogy constructs a ten-novel arch of increasing dysfunction along all CDPs, thus identifying threats to Swedish efficacy in an era of great change. *The Story of a Crime* sold over 10 million books and inspired debate across the political spectrum. The authors interpreted this reception to support Marxism, but their ideology is dysfunctional precisely because it breaks with the CDPs that underpin their decalogy. Larsen's reading supports the Evolution Institute's conclusion that social democracy succeeds because such governance adheres more closely to evolutionary universals

for cooperation than liberalism, socialism, and fascism do.

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Dolack, Tom. 2020. "Dostoevsky, Confession, and the Evolutionary Origins of Conscience." *Evolutionary Studies in Imaginative Fiction* 4 (2): 19–32. doi:10.26613/esic/4.2.187.

Tom Dolack argues that Fyodor Dostoevsky understood the social function of confession in a manner that aligns with modern research. Our conscience evolved to make us obey group norms. Confession should therefore not be directed at individuals but groups. Critics have often read Dostoevskian confessions to be directed at God. Dolack shows how Raskolnikov in *Crime and Punishment* (1866) and characters in *The Brothers Karamazov* (1880) confess socially. Michael Tomasello's framework of "second-person morality" versus "objective morality" illuminates how the transition toward the latter empowered our species. Groups that view norm breaking as a crime against the entire group make members internalize norms more strongly. Following rules—or confessing socially when one has broken rules—should feel good. Dolack shows how Dostoevsky, in spite of being antagonistic toward Darwin, intuited this aspect of our evolved psychology. Raskolnikov feels "pleasure and joy" when he confesses, even when this action leads to his incarceration in Siberia.

## Conclusion

The evolutionary field's increased focus on cooperation could be softening entrenched views in scholarly milieus that have viewed Darwinian perspectives as ideological apologetics for selfishness. These five articles explore how our evolved minds rely not primarily on brute competition for survival, but on cooperation. If more literary scholars come to view evolutionary perspectives as suitable for promoting altruism and social cohesion, evo criticism could grow as a field. In an era that seems committed to developing more egalitarian and sustainable solutions to the challenges of human sociality and progress, Darwin offers tools that are more likely to produce solutions that align with actual human nature than many other scholarly frameworks do.

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# Evolutionary Perspectives on Music

Nicholas Bannan

## Introduction

During the period of Covid-19 and its consequences for the regularity and timetabling of publication, as well as the limitation of academic exchange to remote digital media, the field of music has continued to experience a flow of investigations into the origins and evolutionary purpose of the medium. On the grapevine, the impression is increasingly evident that the suppression of live singing and music therapy has been receiving considerable attention, not least in terms of the interruption of coordinated behavior and the inhibition of multisensory perception due to latency problems in computer communication. Research reports on these features exposed by or related to the effects of Covid-19 can be anticipated. For the moment, this review summarizes the contribution of four studies that provide an essentially pre-Covid perspective on musical interaction.

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Podlipniak, Piotr. 2021. "The Role of Canalization and Plasticity in the Evolution of Musical Creativity." *Frontiers in Neuroscience* 15 (267). doi:10.3389/fnins.2021.607887.

Podlipniak's paper proposes "that musical creativity has become an indispensable part of the gene-culture coevolution of our musicality." Research in the evolution of music and music psychology more generally has encountered the apparent problem that inherited musical capacities range from "tone-deafness" to the abilities of the "musical savant" (Thompson and Olsen 2021). Podlipniak proposes, characterizes, and explores the features of *canalization* and *plasticity* that he suggests acted upon existing vocal behaviors to open up the potential for musical creativity. Podlipniak proposes four levels of constraint that indicate gene-culture coevolution working on the nature of music: "(1) inherited perceptive and behavioral biases which influence the existence of musical universals; (2) enculturated (culturally inherited) biases which consists of implicitly learned elements of a musical system such as culture-specific pitch intervals and rhythm ratios; (3) limitations of creativity which are related to the efficiency of the brain, restricted for instance, by the capacity of working memory; (4) social selective pressures which act as feedback able to modify former constraints in the long run."

Plasticity relates to the way all cultural traits have to compete in order to reproduce. Canalization, by contrast, represents the robust features of a genotype that "can be viewed as a safety-valve based on evolutionary 'memory.'" Podlipniak draws on the implications of these properties in describing the development of pitch salience once control of F0 (Voice Fundamental Frequency) became liberated from the emotional-stereotypical calls of our hominin ancestors: "while the vocal learning biases became the canalized roots of music and speech development, the establishment of the basic discrete units of speech and music—e.g., phonemes of a particular language and discrete pitches of culture-specific musical system—represents the scope of plasticity. . . . Only after a persistent use of F0 as a culturally learned distinctive clue for the recognition of song units did the perceptive bias in favor of musical pitch appear." Podlipniak argues that such achievement

of pitch centricity permitted pitch syntax to become a stable musical feature. In generative combination with a similarly evolved hierarchy for rhythmic movement, "musical creativity did not only appear in the course of hominin evolution but also became a driving force of the gene-culture coevolution of human musicality."

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Ravignani, Andrea, and Bart De Boer. 2021. "Joint Origins of Speech and Music: Testing Evolutionary Hypotheses on Modern Humans." *Semiotica* 2021 (239): 169-176. doi:10.1515/sem-2019-0048.

Ravigniani and De Boer draw on recent experimental studies to explore the contribution these have made to the tradition traceable back to "Darwin's musical protolanguage hypothesis" (Fitch 2013). They focus on the attempt by Ma et al. (2019) to model a potential for separating vowel-like vocalizations into those that are more involved in referring to objects (related to the purpose of speech) and those that convey emotion (related to language). A parallel attempt to separate these productive and perceptual streams, outside the auditory medium, evaluates the ways in which, in deaf sign, a similar capacity to convey information exists, possibly consistent with a gestural origin for language (Nespor and Sandler 1999). One feature of music-like communication is that it lends itself more clearly to simultaneous production, and this is present both in human music and in the coordinated signing that parallels choral singing for the hearing impaired. Ma et al. (2019) indicate that, if speech and music had two distinct evolutionary paths, some cognitive mechanism must have kept them apart.

A candidate difference between a high proportion of normal musical behavior and conventional language is turn-taking. Pika et al. (2018) propose this as the temporal and cognitive Rubicon that separates the kind of stereotypical calling by which animals express alarm or identity from the generative nature of symbolic speech, the crossing of which set the course for grammar and syntactic meaning. Ravignani and De Boer predict and encourage further experimental research on the lines of the studies they cite that promises to illuminate the purpose and origins of the human capacity for both language and music.

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Salakka, Ilja, Anni Pitkäniemi, Emmi Pentikäinen, Kari Mikkonen, Pasi Saari, Petri Toiviainen, and Teppo Särkämö. 2021. "What Makes Music Memorable? Relationships Between Acoustic Musical Features and Music-Evoked Emotions and Memories in Older Adults." *PloS one* 16 (5): e0251692. doi:10.1371/journal.pone.0251692. eCollection 2021.

Salakka et al. focus upon a component implied in the study of Ma et al. (2019): the emotional nature of musical memory. Subjects aged 60-86 listened to and rated selections from a corpus of folk and popular music drawn within their culture from the decades of their youth and middle age. Their responses to the songs elicited data for five domains measuring the experience of emotion (valence, arousal, emotional intensity) and memory (familiarity, autobiographical salience). These ratings were then correlated with digital analysis of the features of the corpora employing the music information retrieval software MIRToolbox 1.7, which codes the musical parameters of timber, tonality, rhythmic periodicity, novelty, and energy.

In line with preceding studies, this research found a strong correlation between the intensities of emotions and the memories evoked by music. The authors speculated on further research that might influence the selection of appropriate music as therapy for those with degenerative neurological conditions.

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Sievers, Beau, and Thalia Wheatley. 2021. "Rapid Dissonant Grunting, or, But Why Does Music Sound the Way it Does?" *PsyArXiv Preprints.* doi:10.31234/osf.io/89d2h.

This article by Severs and Wheatley presents a commentary on Mehr et al. (2020) and Savage et al. (2020). These two articles from the same issue of *Behavioral and Brain Sciences* presented functionally divergent accounts of the origin of music: Mehr et al.'s on the nature of credible signaling, and Savage et al.'s on the bonding properties of musical coordination. Severs and Wheatley question whether either succeeds in elucidating "the central mystery of why music sounds the way it does." They suggest that "the cognitive capacity for domain-general compositional thinking may have played an important role."

Severs and Wheatley imply that the credible signaling and social bonding models evoke different kinds of music, each of which deserves individual explanation. Proposing the acoustic features that such musical communication may have relied upon should be attempted "even at the cost of weakening the claim that music has a singular function," they ask: "why is music so elaborate, such a parade of semantic excess?" The authors propose a capacity for elaboration reliant on the potential of interoperability and symbolic representation that represents the link between the constraints on musical behavior of the signaling and chorusing roles and the "deeply affecting, complex and semantically rich music humans enjoy."

## Conclusion

There is interesting common ground between these four articles selected from those published during the first half of 2021. Podlipniak's sketch of complementary generative mechanisms for the inception of musical creativity presents the kinds of evidence for "why music sounds the way it does" that Sievers and Wheatley fail to find in recent accounts of music's origins and purpose. Further work on these lines could well be fruitful, and may also illuminate the relationships between vowel sounds and pitch organization that Ravignani and De Boer consider as the divergent paths of human vocalization that underpin, respectively, music-like and language-like conditions. The factors that render music emotionally salient and memorable studied by Salakka et al. provide a further insight into the ways in which capacities with common evolutionary origins have branched to present humans with the two channels of communication, music and speech, that permit meaningful self-expression to convey a generative spectrum that spans both factual content and emotional exchange.

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Mehr, Samuel A., Max M. Krasnow, Gregory A. Bryant, and Edward H. Hagen. 2020. "Origins of Music in Credible Signaling." *Behavioral and Brain Sciences:* 1-41. doi:10.1017/S0140525X20000345.

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Pika, Simone, Ray Wilkinson, Kobin H. Kendrick, and Sonja C. Vernes. 2018. "Taking Turns: Bridging the Gap Between Human and Animal Communication." *Proceedings of the Royal Society B: Biological Sciences* 285 (1880): 0598. doi:10.1098/rspb.2018.0598.

Savage, Patrick E., Psyche Loui, Bronwyn Tarr, Adena Schachner, Luke Glowacki, Steven Mithen, and W. Tecumseh Fitch. 2020. "Music as a Coevolved System for Social Bonding." *Behavioral and Brain Sciences:* 1-42. doi:10.1017/S0140525X20000333.

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# Paleoaesthetics

Dahlia W. Zaidel

## Introduction

Physical evidence of the earliest visual art does not correspond to the emergence date of *Homo sapiens* in Africa. There was a substantial delay of tens of thousands of years before art was expressed. But once art was launched as a cultural practice, in paintings, drawings, and etchings, it became ubiquitous worldwide. Archaeologists have recently made new discoveries across several continents that attest to the cultural value humans have come to place on visual art. The earliest new finding is from Indonesia, followed by Australia, and, finally, South America.

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Brumm, Adam, Adhi Agus Oktaviana, Basran Burhan, Budianto Hakim, Rustan Lebe, Jian-xin Zhao, Priyatno Hadi Sulistyarto, Marlon Ririmasse, Shinatria Adhityatama, Iwan Sumantri, and Maxime Aubert. 2021. "Oldest Cave Art Found in Sulawesi." *Science Advances* 7 (3): eabd4648. doi:10.1126/sciadv.abd4648.

For over the past 100 years, the European representational cave paintings were considered the earliest expressions of visual art created by *Homo sapiens*. However, a recent discovery in the Leang Tedongnge cave, Sulawesi, Indonesia, revealed that the earliest, a painting of the local warty pig, is ~45,500 years old, making it the oldest representational art. Another painting of this animal—also recently discovered in Salawesi, in the Leang Balangajia cave—was dated to be ~32,000 years old, overlapping timewise with the European art. Both figures were painted in dark-red ochre pigment. Based on the arrangement of additional pig figures (undated) in the first cave, Brumm et al. suggest that the artistic intent was to depict a narrative scene, although the actual depiction is that of static figures. None of the paintings discovered in Indonesia so far depict the animals in the surrounding nature as richly, vibrantly, and realistically as in the European caves, but the very fact that early humans artistically represented local animals on their cave walls signifies the value they placed on art.

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Finch, Damien, Andrew Gleadow, Janet Hergt, Pauline Heaney, Helen Green, Cecilia Myers, Peter Veth, Sam Harper, Sven Ouzman, and Vladimir A. Levchenko. 2021. "Ages for Australia's Oldest Rock Paintings." *Nature Human Behaviour* 5 (3): 310-18. doi:10.1038/s41562-020-01041-0.

Further away, in the Kimberly region of northern Australia, the painted figure of a kangaroo was recently dated to be ~17,500–17,100 years old, the earliest representational painting on the continent so far. The characteristic style is similar to the Salawesi warty pig figure, namely a line drawing filled in with semi-straight lines, not with blobs of color, using ochre-based pigment. This supports the notion that early people who populated Australia could have crossed over from the islands of Indonesia bringing along their artistic cultural traditions.

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Morcote-Ríos, Gaspar, Francisco Javier Aceituno, José Iriarte, Mark Robinson, and Jeison L. Chaparro-Cárdenas. 2021. "Colonisation and Early Peopling of the Colombian Amazon during the Late Pleistocene and the Early Holocene: New Evidence from La Serranía La Lindosa." *Quaternary International* 578:5-19. https://doi.org/10.1016/j.quaint.2020.04.026.

Rock shelter art hidden by forest overgrowth in the Amazon region of the northwest part of Colombia was uncovered recently to reveal a rich, impressive array of both representational depictions, pictographs, and symbolic geometrical designs, all painted in red-pigmented ochre. The array is dated to ~12,000 years ago. The realistic figures are of now extinct animals as well as of local plants, vegetables, mammals, birds, and fish. Archaeologists uncovered at the foot of the extensive rock shelter remnants of animal bones and vegetables resembling the painted pictographs. They suggest that the array captures the inhabitants' multiple connections to their local bountiful nature.

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May, T. 2020. "2,000-Year-Old Cat Etching Found at Nazca Lines Site in Peru." *New York Times*, October 19, 2020. https://www.nytimes.com/2020/10/19/world/americas/peru-cat-nazca-lines-nasca.html.

Silverman, Helaine, and David Browne. 1991. "New Evidence for the Date of the Nazca lines." *Antiquity* 65 (247): 208-20. doi:0.1017/S0003598X00079667.

There has always been a mystery regarding the purpose of the giant hillside drawings (geoglyphs) in the desert region of Nazca in Peru (Silverman and Browne 1991). They were not painted with pigments but, rather, by systematically removing the oxidized top rocky soil to reveal the light sand underneath. Now, a new giant-size Nazca Line figure has been discovered in that desert region, about 250 miles southwest of Lima (May 2020). The figure appears to be of a cat (or another feline) and dated to be ~2,100 years old. Scholars have proposed that the figures were created to serve as geographical landmarks. Regardless of the intent, this and other such creations required visuo-spatial cognition skills, working from a small diagram to imagining in the mind's eye the appearance of the figure from a distance or from the air. Extraordinary skill, talent, imagination, and cognition went into creating these giant-sized figures.

## Conclusion

Humans dispersed away from Africa around 60,000 years ago to successfully populate the rest of the world. However, it was tens of thousands of years afterwards that they turned to visual art for depicting their new environments, expressing their struggles, thoughts, and new survival strategies, whether on rock walls or desert hillsides. Visual art became a useful tool and a cultural tradition.

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# Popular Culture

Catherine Salmon and Rebecca L. Burch

## Introduction

Evolution is a valuable (if not necessary) framework for the study of human culture in general and of popular culture in particular. When examined under the lens of evolutionary psychology even seemingly disparate areas of cultural research reveal consistent themes, as seen in the reviewed publications below, and an evolutionary framework helps us make sense of these themes.

In the following articles we see depictions of female mating preferences to sell cultural products (books), female competition strategies as detailed by Jane Austen in her classic works, how evolution as a process can be used to write a more compelling story, and the fitness stories that may be told by tattoos. While each article examines different aspects of storytelling, evolutionary themes can be seen throughout the case studies.

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Fisher, Maryanne, and Meredith, Tami. 2021. "Evolutionary and Sociocultural Themes in Cover Art on Harlequin Romance Novels: A Temporal Analysis." *Evolutionary Behavioral Sciences.* Advance online publication. doi:10.1037/ebs0000258.

Fisher and Meredith add another chapter to Fisher's continued work on women's preferences and romance novels, this time examining the cover art on nearly 500 Harlequin Romance book covers. Cover art is not merely an opportunity to display a title or plot points, but a carefully researched and crafted strategy to sell books—and a culturally relevant piece of art on its own. Fisher and Meredith examine covers over a sixty-year period and find that, over time, covers focus more specifically on the lead couples themselves and shift to more reclining poses, physical interactions, and eye gazing between lead couples. Male height, attractiveness, and testosterone markers align with female preferences, and this increasing eroticism between the lead characters reflects a shift toward more permissive female attitudes toward sex beginning in the 1990s.

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Grant, Ania. (2020). "'Sneering Civility': Female Intrasexual Competition for Mates in Jane Austen's Novels." *EvoS Journal: The Journal of the Evolutionary Studies Consortium* 11 (1): 15-33.

Grant describes the motivations and strategies of female intrasexual competition in Jane Austen's novels in great detail. For those not familiar with Austen's works, each is introduced so that readers are well prepared for the examples to follow. Grant incorporates quotes and phrases from Austen throughout as she reviews the literature on female competition and provides ample examples from Austen's six novels and their extensive adaptations. Self-promotion, competitor derogation, and competitor and mate manipulation are all described using examples from Austen's work. Of particular note is the spotlight on Lucy Steele from *Sense and Sensibility*, who even without any schooling proves to be a cunning competitor on the romantic field. Grant also makes sure to examine how Austen's portrayals of these women, both

heroines and villainesses, are crafted to play on the reader's affections; this balancing of competition and likeability is a strategy in itself. All of this creates a multilayered examination of the often overlooked topic of female competition in literature.

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Delatorre, Pablo, Carlos Leon, and Alberto S. Hidalgo. 2021. "Improving the Fitness Function of an Evolutionary Suspense Generator through Sentiment Analysis." *IEEE Access* 9:39626-39635. doi:10.1109/access.2021.3064242.

Delatorre, Leon, and Hidalgo examine the mechanics of storytelling; essentially how to tell a story in a compelling way by increasing suspense using an evolution-based model. This model uses elements in the story as "genes" and measures emotional responses as "fitness," then programs in "mutations" to create a more suspenseful and emotional story without altering the overall plot. This approach, which uses evolution as a model to improve storytelling itself, is very different from how evolutionary psychologists are used to examining literature. The study finds that changing particular features—those specific to emotions, personality traits, and threat appearance—increases suspense in all participants (with no differences in gender or age range).

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Osu, Tinisha, Julia Lechler-Lombardi, Amy Butler, Miles Newman, Karolina Miłkowska, Andrzej Galbarczyk, and Gareth Richards. 2021. "Fluctuating Asymmetry of Finger Lengths, Digit Ratio (2D: 4D), and Tattoos: A Pre-Registered Replication and Extension of Koziel et al. (2010)." *Early Human Development* 152:105273. doi:10.1016/j.earlhumdev.2020.105273.

Osu and colleagues consider the possibility that tattoos may function as fitness indicators by examining finger length fluctuating asymmetry as well as digit ratio as predictors of adult tattoo prevalence. Tattoos have become popular across a broad proportion of the Western population in recent years, in addition to having a long history in many cultures. A number of researchers have suggested that tattoos may serve a function in the domain of mate attraction or have honest signaling functions. This paper replicated findings from other studies indicating that tattooed males are more symmetrical than nontattooed males, though this effect was not found in females, raising the possibility that it might serve a fitness signaling function only in males.

## Conclusions

The reviewed studies span the gamut of storytelling, from the cover of a novel to the portrayal of human behavior within; from what makes the story compelling to its emotional impact on the consumer. Fisher and Meredith illustrate the important point that book covers constitute their own art form: they are chosen for their memetic reproductive value, that is, how well they can sell the book they advertise. Grant shows how classic works can display timeless female mating strategies and how particular images are used to win over readers; and Delatorre and colleagues use the evolutionary process itself to determine how to write a compelling story. This selection of works tells a story in itself; every aspect of storytelling can be examined using an evolutionary approach. Even Osu et al., examine the stories that tattoos tell about the bodies upon which they are displayed.

Each study also highlights the potential for future work. Fisher and Meredith show that covers deserve singular analysis; a complementary analysis of covers of books that cater to a male readership would be very interesting. There are, for instance, several long-running series of western and spy thrillers with their own characteristic covers which could profitably be studied from an evolutionary perspective. Grant shows that observations of female competition

strategies have existed for centuries in popular novels, and why the novels themselves became popular. Researchers should follow her lead and examine other classics. The work of Delatorre and colleagues takes a different approach in showing how an evolutionary computational model can help determine which aspects of a story create a stronger emotional response in readers. This article shows immense promise for future research. Imagine using evolutionary models to create evolutionarily salient and impactful stories. Finally, Osu and colleagues show that there is much to be done on the examination of tattoos and other body art, particularly from the perspective that what they signal differs by sex.

Overall, these studies help us realize what is possible in the domain of evolutionary studies of popular culture and suggest future directions in the study of popular culture as an artifact of human evolution. Each highlights areas of research that would benefit greatly from more adaptationist approaches, as well as a wider range of artifacts that can serve as data for the study of human nature.

# Contributors

**Anna Abraham** is the E. Paul Torrance Professor at the Mary Frances Early College of Education in the University of Georgia, USA. She investigates the psychological and brain mechanisms underlying creativity and other aspects of the human imagination, including the reality-fiction distinction, mental time travel, and mental state reasoning. Her recent works include *The Neuroscience of Creativity* (Cambridge University Press, 2018), and the edited volume *The Cambridge Handbook of the Imagination* (2020).

**Donna Rose Addis** is the Canada 150 Research Chair in Cognitive Neuroscience of Aging and Memory, a senior scientist at the Rotman Research Institute, Baycrest Health Sciences, and a professor of psychology at the University of Toronto. She combines neuroimaging and cognitive methods to investigate memory, imagination, and the self, and has published over 100 papers. She has received prestigious early career awards, and is the youngest-ever fellow of the Royal Society of New Zealand.

**Stephen Asma** is a professor of philosophy at Columbia College Chicago, and cofounder of the Research Group in Mind, Science and Culture. He is the author of ten books, including *The Emotional Mind* (Harvard University Press, 2019), *The Evolution of Imagination* (University of Chicago Press, 2017), and *On Monsters* (Oxford University Press, 2009). He writes regularly for the *New York Times* and *Aeon* magazine. He has lived and taught in Phnom Penh (Cambodia) as well as Beijing and Shanghai (China).

**Nicholas Bannan** was a chorister at Canterbury Cathedral and studied music at the University of Cambridge. He is a prizewinning composer and has taught at secondary and university level in England and Australia. With an initial research interest in children's musical creativity and its relationship to vocalization, he has played a leading part in research into the purpose and origins of human musicality. The two fields come together in his 2019 book *Every Child a Composer.*

**Tim M. Berra** is an academy professor and a professor emeritus in the Department of Evolution, Ecology and Organismal Biology at The Ohio State University, and a university professorial fellow at Charles Darwin University in Darwin, NT, Australia. He is a three-time recipient of Fulbright Fellowships to Australia. He has authored nine books on evolution, Australia, fish distribution, Darwin, Darwin's children, and bourbon, as well over as eight-five scientific articles on fish and the life of Darwin.

**Rebecca L. Burch** is a professor in human development at the State University of New York at Oswego. She has published on domestic violence, semen chemistry, genital morphology, and more recently on feminism and evolutionary psychology. She also has great interest in examining comic books, television, and film through an evolutionary lens. She has a particular interest in the representation of women in all of these realms, from comics to evolutionary psychology textbooks.

**Joseph Carroll** is Curators' Distinguished Professor Emeritus at the University of Missouri, St. Louis. In addition to monographs on Matthew Arnold and Wallace Stevens, his books include *Evolution and Literary Theory*

(1995), *Literary Darwinism* (2004), *Reading Human Nature* (2011), and (coauthored) *Graphing Jane Austen: The Evolutionary Basis of Literary Meaning* (2012). He produced an annotated edition of Darwin's *Origin of Species* (2003). Coedited volumes include *Evolution, Literature, and Film: A Reader* (2010), *Darwin's Bridge* (2016), and *Evolutionary Perspectives on Imaginative Culture* (2020). He is editor in chief of the journal *Evolutionary Studies in Imaginative Culture.*

**Henry R. Cowan** is a clinical psychology PhD candidate at Northwestern University, currently completing his predoctoral internship at The Ohio State University School of Medicine. He focuses on personality, self-concept, and narrative identity in the general population and among individuals with psychotic disorders. His dissertation combines cognitive neuroscience and life narrative methods to understand self-referential processing at multiple levels of analysis in youth at clinical high risk for psychosis.

**Tom Dolack** has a PhD in comparative literature from the University of Oregon. He has taught at the University of Chicago and the University of Pennsylvania, and is currently a visiting Assistant professor of Russian at Wheaton College in Norton, MA. His research interests include translation studies, theories of imitation, poetry, and cognitive approaches to culture. He is currently working on a book on imitation and the evolution of Russian literature.

**Fatima M. Felisberti** received PhDs in neuroscience (USP, São Paulo) and biological cybernetics (MPI, Tübingen). She was a research fellow at Nottingham, City, and Royal Holloway universities. She is an associate professor and has publications on several topics, from extra-ocular photoreception and long-range brain interactions to visual perception and emotion processing. Her current work focuses on mental visual imagery and hedonic experiences in neurotypical and cognitively and physically impaired adults and children.

**Gregory Hanlon** is a French-trained historian of Italian and French society of the early modern era. His eight books all draw inspiration from various branches of the behavioral sciences, and two of them, *Human Nature in Rural Tuscany* (2007) and *Italy 1636: Cemetery of Armies* (2016), are rooted in neo-Darwinian research. In addition to an imminent book on routine infanticide in the West, he is preparing another on display in northern Italy during the baroque era.

**Geoffrey Galt Harpham** is a senior fellow at the Kenan Institute for Ethics at Duke University. His most recent books are *The Humanities and the Dream of America*, *What Do You Think, Mr. Ramirez?: The American Revolution in Education*, and *Scholarship and Freedom*. From 2003-15, he was director of the National Humanities Center.

**Marc Hye-Knudsen** is a research assistant in the Department of English, Aarhus University. His research focuses on the cognitive and evolutionary underpinnings of humor and its various manifestations in film, television, and literature.

**Henrik Høgh-Olesen** is a professor of social and personality psychology at the Institute of Psychology and Behavioural Sciences, University of Aarhus. He has published fourteen academic books, most recently *The Aesthetic Animal* (Oxford University Press, 2019), and more than 130 articles. He has also published fiction and drama. His fields of interest are ethology, comparative psychology, behavioral and evolutionary psychology, cognitive archaeology, and prehistoric art, and he has studied the behavior of humans, apes, and monkeys in naturalistic and experimental settings.

**Jeppe Sinding Jensen**, DPhil, is a senior lecturer emeritus at Aarhus University. He hold degrees

in classical Arabic and Islamic studies, and in the history of religions. Recent research interests are culture and psychology; religion, evolution, and cognition; normative cognition and philosophy of science for the humanities. His publications range from method and theory in the comparative study of religion to philosophy of language in the study of religion (on myth and narrative) to cultural aspects in recent cognitive science of religion.

**Robert King** has a PhD in psychology from Birkbeck (University of London). He is a lecturer at the University College Cork where he teaches research methods, history, and philosophy of science, and extensively on the masters in mental health which he co-runs. He is a research associate at LSE. He tends to publish on areas of human behavior seen through an evolutionary lens and recently he obtained an Erdős number of five.

**Jens Kjeldgaard-Christiansen** is a postdoctoral researcher in the Department of English at Aarhus University, Denmark. His research is mainly concerned with the heroes and villains of popular culture. He applies evolutionary and cognitive perspectives to these characters to investigate their psychological functions and appeal. For more information, including contact information, detailed research interests, and a full list of publications, see http://au.dk/en/jkc@cc.

**Melvin Konner**, PhD/MD (Harvard), teaches biological anthropology at Emory. He did research among hunter-gatherers in Botswana. His twelve books include *The Tangled Wing*, *Becoming a Doctor*; and *The Evolution of Childhood*. He has published in *Nature*, *Science*, *Child Development*, *The New England Journal of Medicine*, the *New York Times*, and the *Wall Street Journal.* He is a fellow of the American Association for the Advancement of Science and the American Academy of Arts and Sciences.

**Mads Larsen** is a PhD student at the University of California, Los Angeles, from which he also has an MFA in screenwriting. Twenty-two of his papers have been accepted for publication in ranked journals. His dissertation "Evolution Toward Social Democracy in a Millennium of Nordic Fiction" illustrates the cultural origins of Scandinavian egalitarianism and shows the mechanisms through which fiction can help humanity adapt to the Fourth Industrial Revolution.

**Thomas Morgan** is an assistant professor of evolutionary anthropology at Arizona State University. His research uses theoretical and experimental approaches to understand how gene-culture dynamics have shaped the evolution of human cognition, and how human cognition, in turn, shapes the evolution of culture. For more on his research, visit his lab website www.eccolab.org.

**Valerie van Mulukom** is a research fellow at Coventry University, United Kingdom. Valerie completed her PhD in the cognitive neuroscience of imagination at the University of Auckland, New Zealand, after which she held postdoctoral positions at Aarhus University and the University of Oxford, doing research in the cognitive science of religion and memory. Currently, she combines her backgrounds to do research on the cognitive science and evolution of imagination, memory, and belief at Coventry University.

**Keith Oatley** is a professor emeritus at the University of Toronto. He is a cognitive psychologist and novelist. He is a fellow of the Royal Society of Canada and of the Association for Psychological Science. His most recent book of psychology is *Our Minds, Our Selves: A Brief History of Psychology* (Princeton University Press). His most recent novel is *Therefore Choose* (Goose Lane Press). He has also published a novella in seven parts, *The Passionate Muse: Exploring Emotions in Stories* (Oxford University Press),

with each part accompanied by a psychological commentary on what you may or may not feel as you read the text.

**Catherine Salmon** is a professor of psychology at the University of Redlands in California. She is the coauthor of *Warrior Lovers: Erotic Fiction, Evolution and Female Sexuality* and ***The Secret Power of Middle Children***. She has written chapters in numerous books, including the *Handbook of Evolutionary Psychology*, *The Literary Animal*, and ***Darwin****'s Bridge*. Her research interests include birth order and family dynamics, eating disorders and reproductive suppression, and sexuality and popular culture. She is also the editor of the journal *Evolutionary Behavioral Sciences.*

**Oleg Sobchuk** is a researcher at the Max Planck Institute for the Science of Human History (Jena, Germany). He studies large-scale patterns in the evolution of literature, film, and arts with computational methods. He is the author of the PhD thesis "Charting Artistic Evolution: An Essay in Theory" and articles in *Evolutionary Human Sciences*, *New Left Review*, *Journal of Cognition and Culture*, and other journals.

**Andrey Vyshedskiy**, PhD, is a neuroscientist at Boston University. He has authored over 100 scientific publications that have appeared in the *New England Journal of Medicine*, *Journal of Autism and Developmental Disorders*, *Thorax*, *Chest*, *Journal of Neuroscience*, and other journals. His research focuses on the neurological basis of imagination, the evolution of language, and child development. He has founded multiple successful companies and directed the development of several FDA approved medical devices. Based on his research, ImagiRation designed a therapy application for children with autism (MITA) that has been demonstrated to significantly improve their language abilities.

**Rob Watson** is a distinguished professor of English at UCLA and author of books on Shakespeare, Ben Jonson, the fear of death, the Renaissance roots of modern environmentalism, Japanese cinema, various scholarly editions, and (most recently) *Cultural Evolution and Its Discontents: Cognitive Overload, Parasitic Culture, and the Humanistic Cure*. Educated at Yale and Stanford, he spent six years as a professor at Harvard and recent terms at Trinity College, Cambridge and Christ Church, Oxford.

**Micia de Wet** is a practitioner-researcher currently completing her PhD in theatre studies at Coventry University, United Kingdom. She is researching intuition within the framework of enactive cognition, acting training, and somatic practice. She is also a performing artist and lecturer who specializes in both drama and film.

**Bernard Wood**, who is the University Professor of Human Origins at George Washington University, has been interested in paleoanthropology since taking part in Richard Leakey's first expedition to Lake Turkana, Kenya, in 1968. He is the author or coauthor of several books, ranging from a 1991 monograph on the hominid cranial remains from Koobi Fora to the nontechnical *Human Evolution: A Very Short Introduction*, as well as refereed scientific articles and book chapters. His research interests are taxonomy, phylogeny reconstruction, and comparative morphology.

**Dahlia Zaidel** conducts research at the University of California, Los Angeles. Her subjects include the brain's underpinning of behavior in neuropsychology, hemispheric specialization, face and beauty, and art. The elusiveness of art's neural basis has driven her current research and writing. She combines findings from neurology, neuropsychology, archaeology, anthropology, biology, and evolution.