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PERSPECTIVE

Imagination: A New Foundation for the Science of Mind

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Abstract
After a long hiatus, psychology and philosophy are returning to formal study of imagination. While excellent work is being done in the current environment, this article argues for a stronger thesis than usually adopted. Imagination is not just a peripheral feature of cognition or a domain for aesthetic research. It is instead the core operating system or cognitive capacity for humans and has epistemic and therapeutic functions that ground all our sense-making activities. A sketch of imagination as embodied cognition is offered, followed by suggestions of how to organize imagination studies into a more rigorous science–humanities research area.

Keywords Affective neuroscience · Cognition · Creativity · Embodied cognition · Evolutionary psychology · Imagination · Mythopoetic · Philosophy of mind · Therapeutics

Beyond Bias

In the same way that Daniel Kahneman and Amos Tversky (2000) revealed the hidden unconscious biases of our minds and indirectly ushered in a field of bias studies, so too it is time to acknowledge the vast mythopoetic or imaginative aspects of mind that shape our thinking and sense-making processes. And it's also time to create a field of imagination studies or *phantasia science* that can unify the Two Cultures divide (Snow [1959]2001), rescuing the humanities from its now totalizing interest in identity, and bringing some humility to the sciences.

The literal, logical, scientific mind is the outlier—the weird exceptional mode of cognition. It is not, I would argue, the paradigm of human sense-making activity. From the time of Freud and Jung and to our present *System 1* theory (i.e., fast, intuitive cognition), psychology has acknowledged and explored the submerged irrational aspects of mind. Philosophy too has had its champions of the irrational or prerational mind, including Hume, Schopenhauer, Nietzsche, William James, and more, but analytic philosophy (the dominant Anglo-American approach) has treated the mind as a linguistic or propositional meaning machine. The analytic school failed to see that nonlinguistic experiences like emotions could be intentional (i.e., have *aboutness*). This prejudice of linguistic semantics and semiotics expunged image-based and bodily-based forms of knowledge until finally a welcome backlash of embodied and enactive cognition emerged in the last decade or so (Shapiro 2011). Indeed, we should not talk of the affective and associational processes as "irrational" at all since these somatic systems actually tilt, nudge, and otherwise influence rational thought. Rather, we're on safer territory simply recognizing a flexible bifurcation between intuitive and rational thought, and the thalamus may be the neural switching station between these more and less embodied forms of thinking (Wolff et al. 2021). Imagination studies is uniquely poised to serve as a hub for several spokes of 4E cognition (embodied, enactive, embedded, and extended), as well as evolutionary and cultural psychology. This is because the imagination sits at the border between intuitive and rational thought and action.

All of this is good news and yet a whiff of illegitimacy still surrounds the academic study of imagination. Perhaps "illegitimacy" is too strong, rather imagination is relegated to a branch of *aesthetics* where it can stay segregated from the "serious" business of epistemology, metaphysics, philosophy of mind, and cognitive psychology. There are excellent exceptions as psychologists explore the breakdown of

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imagination in various populations with conditions like Alzheimer's disease, depression, and Parkinson's disease (see Addis et al. 2008, 2009; Hach et al. 2014). But imagination remains a niche interest. I would argue instead that imagination needs to be moved from the periphery to the center.

Sense Making: Between Concepts and Conditioning

Tracking the affective or emotional springs of mind (Panksepp 1998; Solms et al. 2002; Panksepp and Biven 2012; Asma and Gabriel 2019) has been crucial, as has the recent work on affordances (Withagen et al. 2012; Jensen and Bro Pedersen 2016; Gabriel 2021), but the huge middle layer of cognition is missing. Linguistic philosophers and computationalists have been moving from the top down, while affective neuroscience has been moving from the bottom up. But the middle layer is the *imagination*—the layer between the lower conditioned associational mind and the upper symbolic representational mind. The imagination is where our cognitive architecture of imitation (e.g., mirror neuron simulations, and matching sensory vertical associations; Gallese 2005; Heyes 2010) is structured by narrative and image-based templates (ontogenetically developed). These templates are sense-making tools that are *imperatively* (rather than *indicatively*) oriented—that is to say, they are action-oriented representations (AORs) (see Gallagher 2008). As such, these root templates of imagination are hard to see and examine. They are active in involuntary imaginings in dreams and mind wandering (wherein agency and executive control are low), but they are also deeply embedded in the cultural forms we produce and consume (e.g., folklore, religion, literature, film, etc.).

This submerged mythopoetic cognition is, in my view, the engine of mind, pulsing through many other forms of cognition including perception below and reasoning above. Humans shape reality through image and story schemas (Bruner 1986; Hutto 2008, 2016; Asma 2009), but I have argued (Asma 2021) that these schemas are so deeply embodied that they cannot be derived from literal descriptive sense-making, and must precede concerns of verisimilitude (truth conditionals). 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? 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 (Barsalou 2009). 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. What's true here of language is even more true of visual images, dance, music (Asma 2020), and storytelling.

Since imaginative works reactivate the embodied pathways directly, they do not stand like a digital code or map of experience—they are part of experience itself. Imagining 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 have foundered on the question of how the word (symbol) tethers to the *referent*—always deferring the verification. On my view of imagination (and language) as embodied map, the semantic content of the word "apple" (or Cezanne's painting of an apple) just *is* the embodied pathway (affective states, memories, internal imagery, affordances). Addis (2020) claims 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. I think this is correct and the bio-semantic view that I'm suggesting underlies and makes possible such adaptive sense making.

Some of this was grasped and articulated in the postwar period before disappearing again, buried under the successes of experimental behaviorism and then computationalism. For archaeologists like Henri and Henriette Frankfort (1946) 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'" (1946, p. 12). Philosophers like Cassirer (1975) and psychologists like Jung (1953) focused on the ritual, or visual symbol (rather than literal language) as a way of enacting meaning. Images, objects, and rituals of mythopoetic cognition are not *indicative*. They do not just represent an historic event long ago. Nor are they symbolic in the way that math signifies concepts. And they are not even like words that signify through denotative reference to people, places, things, events. Rather, they are *imperative* enactive symbols, demanding attention and action of us, or otherwise intervening in a causal fashion.

This brief historical spark of serious thinking about imagination could not catch fire, but we now have the neuroscience and evolutionary sophistication to reignite it. Evolutionary psychology, once it emerged, should have been excited to take up imagination and it eventually did (see the journal *Evolutionary Studies in Imaginative Culture*), but it has been slow to explore the causal mechanisms that tether adaptive stories (e.g., cautionary monster stories, love stories, big-man take-down stories, norm violation narratives, etc.) to hereditary transmission. I believe the hereditary transmission and the horizontal cultural transmission of successful imaginative meme-complexes is facilitated by the embodied simulation system (at work in both involuntary and voluntary imagination), and this is made possible by genetically inherited bio-semantic capacities.

A Conserved Imperative Mind

The imperative hot cognition approach to life is ancient, predating the rise of language, logic, and even the expanded neocortex. It is closer to 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 (or more broadly, homeostasis). The mind tries to maximize positive affect and reduce negative affect.

In my view this is also the core of sense-making or meaning-making activity, and once recognized we can see that imaginative work like storytelling, image making, song, dance. and so on are some of the earliest and continually powerful forms of knowledge. An epistemology that cannot recognize this and pushes imagination to the peripheral territory of aesthetics has failed to understand the biological mind. The cognitive sciences that followed a propositional view of epistemology (e.g., David Rumelhart's approach to cognition followed the Boolean formal linguistic approach) produced great AI, but no understanding of real biological sense-making. Subsequently the imagination has remained terra incognita for algorithmic sciences.

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* our embodied imaginative interaction with the social world—this is true phylogenetically and ontogenetically.

The mind is awash in stories and images, but we are also seeing our "real life" largely through imaginative constructions that are rarely acknowledged. 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, but phenomenologically they are combined in present experience. Occasionally this leads to epistemic slippage and confusion (e.g., conspiracy thinking, ideologically driven misperceptions, etc.), but usually imagination makes humans more awake to the potentials and affordances in a lived experience.

A Natural Taxonomy?

How then should we proceed to make a new interdisciplinary phantasia science? I wish to propose two foundational research programs and describe some empirical and philosophical methods within those. First, we need a much more precise *taxonomy* of imaginative processes. We're still using Aristotle to categorize and analyze narrative arc, and this shows how brilliant the Stagirite was but also how lazy we've been. As it stands now, we also carve up our investigation along arbitrary recognitions of the *products* of imaginative activity (e.g., literature is treated separately from painting, and film, and dance, but the underlying *processes* for some of these are very similar). It may be convenient to carve poetry from painting, but we may be missing the *natural kinds* of imagination because we are distracted by conventional classifications.

In terms of understanding imagination we are in a pre-Linnaean phase. Recall that Carl Linnaeus (1707–1778) unified natural history by creating a universal binomial nomenclature and patiently applying it to flora and fauna until we had a table of agreed upon terminology, based on essential characters or traits. Linnaean taxonomy is not the best or most accurate system and it sometimes conflicts with phylogenetic, cladistic, phenetic, molecular, and other forms of useful taxonomy. But before Linnaeus it was impossible to know when naturalists from various nations were even talking about the same animal.

We need a common nomenclature but we also need to decide on a physiological, or a morphological, or an evolutionary criterion for "essential" character ("essential" here is envisioned like a Wittgensteinian concept of family resemblances, not fixed essentialism). In the case of imagination, should our taxonomy try to capture the sets of phenomenological feelings of creativity, or the underlying neurological

systems, or the adaptational advantages of such activity? Imagination will be as difficult or more difficult than categorizing species because it is very challenging to demarcate our cognitive processes into natural kinds. We're not even sure how imagination is different from memory (Addis 2020; Michaelian 2021). The splitting and the lumping of our emotions, representations, affordances, and so on will depend in part on the methodologies we adopt (see Loaiza 2020), so we will need to organize the organizing.

This seems daunting but the situation was arguably worse in 18th century biology, and yet things started snowballing rapidly once names were agreed upon. We are currently at the stage of folk taxonomy for imagination. After we generate a provisional serviceable natural classification we can submit it to phylogenetic or evolutionary analysis (reinforcing and destroying some of our kinds), and then move toward more fine-grained natural kinds—refining taxonomy and theory together in light of each other. This is starting to happen now but it is early days. For example, researchers are slowly zeroing in on the importance of the Default Mode Network (DMN) as a possible neurological system of imagination or some significant aspect of imagination (Buckner and DiNicola 2019; Carroll 2020). The DMN is a mind-wandering brain state involving the medial prefrontal cortex, the posterior cingulate cortex, and the angular gyrus. And a promising taxonomy of stories (Hogan 2011) breaks them into universal (cross-cultural) patterns that reflect specific emotional trajectories. The typical romantic plot—found all over the world—is a narrative expression of the LUST system described by affective neuroscience. Here I follow Jaak Panksepp's convention of capitalizing LUST, etc., as a way of signaling the evolutionarily conserved brain-based and behavioral roots of affect, rather than the purely psychological categories of emotions found in human reflection. FEAR, for example, is not just a phenomenological feeling, but also a flight or freeze behavior underwritten by a neural activation from the medial amygdala and hypothalamus to the dorsal periaqueductal gray. 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, but these affective systems are natural kinds (see Panksepp 1998; Panksepp et al. 2014; Berridge 2018; Damasio 2018; and for a dissenting view see Barrett 2017).

I understand that breaking emotions and imagination into natural kinds is very controversial, especially in our current era of constructivism, but I do not think it is naive to press forward in that direction despite pitfalls and skepticism. Recent theories of emotional constructivism (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 labeling language to do this organizing of internal affective states, because those inner states are too vague and underdetermine behavioral responses.

I am not convinced by this view of emotions and the mind generally (see Asma and Gabriel 2019). Constructivists like Barrett (2017) point to atypical emotional responses in some individuals' self-report and atypical neural patterning in fMRI studies and dubiously conclude that the emotions are not universal natural kinds, but relative matters of cognitive taste and idiosyncratic labeling. Exceptions, however, prove the rule and are not anomalies that unravel the biological paradigm of emotions. The brain is plastic enough to account for neural diversity without having to throw out the biology of emotions. The reason why we classify a handful of behaviors, expressions, and feelings as "anger" is because an identifiable physiological pattern underlies them, and such patterns evolved in mammal brains to aid their survival. Brain scans reveal 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, 2018; Davidson 2012; Berridge 2018; Knutson and Srirangarajan 2019; Burgdorf 2020).

It is true that when we get to high-level human emotions (like existential angst) and eventually idiosyncratic imaginative thinking, there will be a large conceptual component and constructivism makes more sense at this level. A major problem with characterizing the mind, emotions, and imagination as primarily conceptual is that it constitutes a kind of questionable speciesism. The idea that emotion and imagination depend on higher conceptual cognition, the understanding of cultural context, and language, means that nonhuman animals and even babies don't have emotions and imagination. The clear implication of Barrett's conceptual act theory of emotions, for example, is that animals and babies are not having emotions because they lack language. This seems remarkably inconsistent with evidence from animal studies, developmental psychology, and neuroscience.

My own view is that conceptual thinking emerges at the end (phylogenetically and ontogenetically) of cognitive development, not at the beginning. The imagination is an earlier form of thinking and relating to the environment. It is a form of animal *prospection*—the ability to envision the future—and seems comprised of simulation, prediction, intention, and planning (Szpunar et al. 2014), but not necessarily high-level representation like concepts. It 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). As a form of embodied cognition the imagination is preconceptual first and then plays a constitutive role in the emergence of conceptual thinking. For these reasons—the biology of imagination and emotions—I remain optimistic that we can have natural kind taxonomies, albeit informed by Darwinian population thinking, not traditional essentialism.

Constraints on Imagination

The second major research program I suggest is the search for and articulation of the *constraints* on imagination. Many imaginative thinkers submit themselves to rule-based constraints (e.g., alternative physics, etc.) or even materials constraints to force novel creativity, and that is a worthy area for future study (Stuart 2020). But we need a better understanding of the limits, boundaries, and failures of the whole operating system that we call imagination. Imagination is multimodal—operating in many types of human activity—and it is seemingly infinite in its ability to generate possibilities. But where does it break down, fail, diminish, run dry? Where do the Venn diagrams of imagination and, say, critical thinking overlap, if both are forms of sense making?

It's very challenging to study the myriad forms of subject-generated imaginative frames because they are historically, culturally, and individually idiosyncratic. Because of neural neoteny (based brain development ex utero) *Homo sapiens* has a unique ability to soft-wire story formats and imaginative templates into its individuals' early consciousness. Ontogenetic programming in childhood development is very diverse and the developing human mind is a sponge of various informational streams, resulting in a staggering profusion of possible mythopoetic templates. But presumably there's a limit.

Just as psychology learned significant facts about typical minds by studying pathology (e.g., face perception became clearer in the study of prosopagnosia), imagination could come into clearer focus by looking at places where imagination fails to develop in individuals and groups. There is no normative judgment here, but a clear-eyed look at neural diversity including cases where people do not appear to access imagination. Some of this work is starting to happen, for example, in the recent studies of aphantasia, a neural atypicality in which the subject does not form visual imagery in the mind's eye (see Zeman et al. 2015; Keogh and Pearson 2018).

Aphantasia may well be a genetic variant, but cultural inculcation plays a huge role in imaginative development. One way to study constraint and actualization of imagination via inculcation is to do empirical work on subjects who have had ostensibly high imagination-based educations (e.g., Montessori and Waldorf systems) versus rote memorization systems, and all points in between.

Drawing Upon More Disciplines

Finally, it would be valuable to encourage greater emphasis on the following areas of study, as these will be especially promising for imagination science:

(A) More phenomenology of creative experience is needed. More thick description by artists and imaginative practitioners would be very valuable. We need participant observers who are willing and able to do phenomenology, rather than facile reductions to tired theories. Anecdotally, it is remarkable how many people do academic work on creativity or imagination but do not themselves make anything. This skews the research in unhelpful directions. For example, if one thinks of imagination as autobiographical creativity like mind wandering and this is facilitated by the DMN, then one is surprised when flow-state improvisation (a paradigm of creativity) is also facilitated by the DMN but has little to no autobiographical awareness (Limb and Braun 2008; Donnay et al. 2014).

Autobiographical rumination (assumed as a paradigm case of imagination and DMN activity) usually has the "self" as an object within the virtual reality narratives of daydreaming. The self is an agent, either represented in third-person or first-person point of view. But this *centralized state* of consciousness (integrated memories and projections organized into an internal narrative) is not the same as the *stream state* of consciousness wherein the self is lost (Asma 2017). In stream state consciousness, agency is disintegrated and the subject is filled with feeling states, flowing associations—what James (1890) called the "blooming and buzzing confusion" of pure sensations before rationality gives order. This ecstatic experience is a huge part of involuntary imagination, and artists throughout history have chased this flow state with intoxicants while spiritualists chased it with meditation techniques. In my view it cannot be called "autobiographical" creativity until it reenters an integration mode of consciousness via executive capacities (centralized consciousness). Papering over these important distinctions by attributing everything to the DMN is not entirely helpful. And the kind of creativity a researcher takes as paradigmatic influences the theory. If the model of imaginative creativity

is Stephen King sitting at his desk as he mind-wanders a new story, then one's view of creativity will be more about voluntary integration of memory and narrative elements (interacting with autobiographical rumination capacities). But if your model of imaginative creativity is Miles Davis blowing an improvised horn solo over a lightning-fast jazz tune, or John Lennon free associating nonsensical lyrics, then your view of creativity is disintegrated coherence and stream of consciousness. Some researchers have assumed that the DMN supports the online integration of multiple units of information into a coherent whole (Roberts and Addis 2018), so it underlies all forms of creativity from autobiographical to non-autobiographical. But as I've argued, here one of the main engines of imagination is non-integration, incoherence, chaos, or what Nietzsche might have summarized with the label "Dionysian." We'll need thick description by artists and imaginative practitioners of different creativity modes (and stages) to show us the contours of these diverse types of imagination.

(B) More serious attention to the imaginative dimensions in animism, religion, paranormal claims, and magical thinking is necessary. It is too common for current scholars to study literature and film exclusively, drawing grand theories from a tiny and relatively recent subset of rarified literacy. It would be good for researchers to sometimes get in the trenches and see how imagination works among the unlettered and the underprivileged, since those high-stakes conditions tells us a lot more about the evolution and the therapeutics of the imagination.

(C) Psychedelics research is having a renaissance currently and it could be a boon for imagination science. Psychedelic substances engender psychological and philosophical states that might reveal important features of imaginative structure and function. Psychedelics, for example, seem to activate transient hypofrontality and loosen the tyranny of the Task Positive Network (TPN). The TPN consists of more peripheral brain regions: lateral prefrontal cortex (lPFC), the anterior cingulate cortex (ACC), the insula, and the somatosensory cortex, and underlies our focused attention and goal-directed activities—everything from concentrating on a chess game, or analyzing a mechanical problem, to solving a math problem. Psychedelics also seem to suspend the usual subject/object distinction in consciousness. Moreover, psychedelic experiences can re-enchant nature and self, activating teleological, animistic, and even poetic perspectives that were previously missing. Such substances may also help us find universal or common hidden cognitive grammars of imagination.

And lastly (D) we need more evolutionary psychology for the adaptive value of specific stories, images, or musical forms. 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.

From the evolutionary perspective we must also think beyond straightforward adaptationist stories, though imagination certainly is adaptive. It's possible, for example, that imagination emerged as a surplus of cognitive power (4E power). In other words, we have more such power than we need for ecological *niche 1* (our given environmental and social niche). But subsequently this surplus cognition can then create offline (virtual) novel niches and resources (niche 2, 3, 4, etc.), eventually bringing some of this back online to not only respond adaptively to stimuli but to actually make new stimuli too. This ability is one of the reasons why our species survives and thrives. It's time to give imagination its due as a core cognitive power, epistemic workhorse, and therapeutic wellspring.

Declarations

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