Constructing Representations: Jungian Archetypes and the Free Energy Principle

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Abstract

Jungian archetypes have been of interest to psychoanalysts and have been a cornerstone of Jungian psychology through much of the 20th century. Whilst the notion of archetypes has been debated amongst psychoanalytic traditions as well as in contemporary mythology/anthropology, little work has been done on their utility in the cognitive and neurosciences. We propose a novel neural mechanism of archetypes, grounded in cross-cultural psychology, comparative mythology, as well as developmental psychology. The pragmatic function of archetypes may serve as a collective effort of free energy minimization under the free energy principle, emergent due to the sets of affordances offered by culture and ecology. In line with Carl Jung's definitional scope, we argue that archetypes are rooted in deep ecological and social forces, generationally ingrained for the purpose of optimizing the accurate conceptual representation of agents' ecological and social environments. We then speculate on theoretical mechanisms by which archetypes are transmitted across time. Finally, we discuss implications for the utility of Jungian archetypes and outline future research directions to expand this concept in the cognitive neurosciences.

Keywords: Jungian, philosophy, free energy, mythology, archetypes, culture

Constructing Representations: Free Energy, Affordances, and Jungian Archetypes

Jungian archetypes have gained substantial interest in psychoanalytic therapeutic contexts (Jung, 1936; Jung, 1959; Jung, 2014; Rosen, 1991; Knox, 2001; Walters, 1994; Hunt, 2012), yet have received relatively little interest in contemporary neuroscience or evolutionary psychology (Hunt, 2012; Roesler, 2012). Here, we sketch an argument that nests Jungian archetypes within an affordance's framework (Ramstead et al., 2016), falling under the free energy principle (Friston, 2010). Insodoing, we posit that archetypes arise due to the collective need to, in the simplest possible manner, account for sensory data of environmental and social regularities. Adaptive instincts, drives, and motivators arising at the behavioural level can be linked to broader representational forms at the collective level. We describe how groups and individuals minimize energy costs in forming shared representations of the local ecology and social world – these mechanisms can be grounded in modern neuroscience to accommodate previously ambiguously defined concepts like archetypes and the 'collective unconscious'. We suggest archetypes are represented in individual agents as tangible imagery, impressions, or symbolism, but require group level processes to emerge.

We first outline archetypes as described by Jung (1912; 1919; 1959) and highlight their primary modes of transmission; bearing in mind some theoretical conflict and dissonance in definitional frameworks. While Jung argued for the numinous and transpersonal nature of archetypes, group cognition processes amenable to the Free Energy Principle (FEP) provide parsimony and explanatory power for archetype emergence which lend to greater testability of Jung's thesis. We draw reference to ecological and cultural affordances (Veisseire et al., 2020; Ramstead et al., 2018), and niche construction (Heras-Escribano, 2020) as potential top-down mechanisms of archetypal representation. Due to the complexity of the psychoanalytic debate about archetypes, we note that our model presents one theoretical postulation on archetypal transmission and is by no means a complete or exhaustive explanation of cultural/genetic mechanisms of transmission.

Archetypes in the Collective Unconscious

Jung first proposed the notion of archetypes in Symbols of Transformation (1912); however, the term itself was not coined until 1919, in Instincts and the Unconscious. Jung expanded greatly on these initial conceptions in Archetypes of the Collective Unconscious (1934). In each, Jung argued for inherited patterns to thought, perception, and action (Roesler, 2012). Comparable archetypal images and representations inevitably arise independent of one another across human societies and cultures (Jung, 1934).

In Archetypes of the Collective Unconscious (1934, see Collected Works, p. 5587), Jung noted "all the mythologized processes of nature, such as summer and winter, the phases of the moon, the rainy seasons, and so forth, are in no sense allegories of these objective occurrences; rather they are symbolic expressions of the inner, unconscious drama of the psyche which becomes accessible to man's consciousness by way of projection—that is, mirrored in the events of nature"; further "the contents of the collective unconscious have never been in consciousness, and therefore have never been individually acquired, but owe

their existence exclusively to heredity. Whereas the personal unconscious consists for the most part of complexes, the content of the collective unconscious is made up essentially of archetypes" (p. 5635).

Jung's conceptualization of archetype can be grounded in Plato's notion of 'forms' (see Soccio, 2015). Plato's 'forms' illustrate non-material representation of concepts in their quintessential nature, through which our tangible experiences of such objects are appraised. For example, an apple picked from a tree, which one intuitively compares with the broad concept 'apple'. This dualistic interplay is well-exemplified by philosophy scholars with the allegory of the cave: we see only the shadows of quintessential forms (e.g., a replicate version of the apple). The quintessential apple does not require holistic representation for one to know that one has indeed picked any apple from a tree. Archetypes differ from forms in that they are not static but dynamically interact with conscious cognitive processes. Mythological representations of various concepts in anthropology and history illustrate the dynamic relationship human beings (as conscious representors) have with the numinous and transcendent (unconscious). As an aside, we ought to point out that the archetype is a unique form of representation in psychology when contrasted with group cognition more broadly (e.g., a stereotype or gesture; see Rosch, 1973 or Rosch & Lloyd, 1978). We should therefore cautiously not conflate archetypal representation with other forms of cognitive representations, such as memetics (for example, as discussed at length by Richard Dawkins), shared customs/traditions, or group memories, all of which play a proximate role in group cognition but are uniquely distinct to the universal and innate nature of archetypes.

Importantly, many Jungian scholars have distinguished archetypal representation from the archetype itself (Stevens, 2012). To extend the above example, while we can dream of the potential 'perfect apple', the experience itself cannot be apprehended – as Jung posited, we cannot epistemically acquire the archetype itself, only the imagery or representation of the archetype. Another example, from film studies, illustrates that while heroes and villains often represent many of the archetypal qualities of good and evil, we may only be conscious of a representation rather than the true distilled essence of the archetypal Hero or Villain. In following, we can easily cite many 'heroic' characteristics in literature, without being able to convey the quintessential nature of the singular and whole Hero archetype as such.

How do archetypes emerge?

Theorist such as Anthony Stevens (2015) have emphasised Jung's proposition that archetypes appear to be species-specific, lending support for collective representations in dreams, poetic expression, and folklore. Eric Goodwyn (2010) offers a good discourse on the genetic argument for archetypal transmission, highlighting potential limitations in our genes to store the broad gamut of archetypal contents that are surely relevant to the human condition. Goodwyn notes that our genetic sequencing (of 30,000 genes) at first appears too small to carry the vast mythological spectrum of archetypal representation.

Other scholars note that the archetypal impulse is all that is required genetically or biologically; comparable to analogue and propositional theories of vision in cognitive

sciences, the entire characteristic of the archetype does not require epigenetic encoding – many behavioural impulses lie along the evolutionary lines of the archaic rather than modern brain. Jean Knox (2003) echoes a similar sentiment, in that scholars can study the effects of the archetype, but not the archetype itself; as such, a vast complexity of representation can arise from very few starting concepts or propositional foundations. On the other hand, scholars such as Colman (2018) have argued that psychologists must dispose of the notion of archetypes outright, replacing it with more parsimonious representations, such as the instinct towards attachment or survival (i.e., without requiring a neo-Platonic image or representation of those biological mechanisms). Others conceive of archetypal representations as foremost cognitive and symbolic in nature, a theoretical perspective captured by James Hillman and psychosocial schools of thought (Hillman, 2004; Hillman & Moore, 2013). A different perspective is offered by Hogenson (2019), based on a complex systems model, arguing that nested systems in which brain, behaviour, and society interact, illustrate the importance of archetypes and their ties to intrinsic 'human' experience. Hogenson posits that due to the nature of complex systems, archetypal psychology must be considered within an interactionist account, rather than a reductionistic one. Other scholars advocate for archetypes as a 'mythopoetic' interaction between the material and the numinous, as Donald Kalsched (2014) summated in his interpretation of Jung's work on the transpersonal. Kalsched's contention sheds light on the rational-mystical axis relevant to archetypes, in which the numinous (Transpersonal) and the cognitive archetypal image (Personal) interplay. Figure 1 illustrates that we cannot divorce the archetype from the archetypal image because both are intrinsically linked – one situated in the world of things and the other in the world of ideas. It is the numinous quality that provides the ground for representation, and in turn representations allow us to dream of the numinous, in symbiotic correspondence.

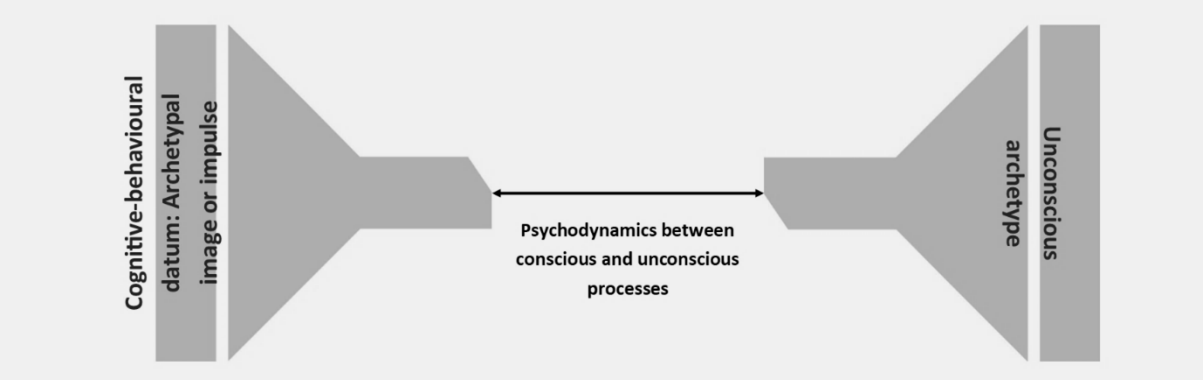

Figure 1. Interplay between the archetype and the archetypal image.

Limits on cognition

Cognitive scientists have long contemplated the limits of human cognition and perception, from Millers' hypothesis of the "magic number 7" (with regards to limitations on memory) to bottleneck theories of attention in the early 1960s. William James summed up the predicament of efficient representation with the words "Millions of items... are present to

my senses which never properly enter my experience. Why?". James (1881; 1968) was among the first to propose the notion of a 'low-level representation', positing that the human unconscious feeds into religion and religious imagery. Expanding on these initial formulations, Jung posited that the unconscious plays host to psychological patterns of thought and imagery forged over evolutionary time. Jung argued that patterns of thought carried through generations make themselves apparent as unconscious images and material often not accessible to the conscious mind (Jung, 1919). These images, and subconscious thoughts, forged by human history and evolution, present themselves in altered states of consciousness, such as dreams and episodes of psychosis (see Carhart-Harris et al., 2014).

It has been argued that themes pertaining to archetypes underlie all human storytelling (Booker, 2004) and form the basis for religious imagery and representation (James, 1968). Work by the mythologist Joseph Campbell highlighted many of the archetypal themes, symbology, and iconography that saturate modern film, literature, and music (Campbell, 2008). Further evidence for the existence of consistent themes and representation come from ethnology (Arne & Thompson, 1961; Kluckhohn, 1960), comparative mythology (Bastian, 1881), and clinical studies with psychedelic drugs (Carhart-Harris et al., 2014; Winkelman, 2017). For example, Aarne and Thompson (1961) suggested that all the fairy tales that exist could be succinctly captured by approximately 100 different thematic types. This suggests that, although different environments inhabited by different cultures offer varying affordances (see below), the common affordances offered by social and physical environments may play a role in producing similar themes in mythology and story across distant cultures (Veisseire et al., 2020).

While there are no conceptual limits on the number of archetypes, the constraints on biological instincts are often less ambiguous. Human beings cannot fly, but they can conceptualize what it would be like to fly through the heavens in dreamlike or imaginary contexts. The Nietzschean notion of the superman could not come about if we lacked the capacity to dream and metaphorically grasp at a promethean fire of possibility (see Nietzsche, 1886). Likewise, without the transcendent function, the conception of many different gods (i.e., polytheism), and likewise the conception of one true God would not be attainable.

In the next section, we develop a neuroscience-driven account of how archetypes may emerge to help deal with the increasing cognitive 'costs' of representation. That contents which cannot be easily mentalised at a conscious level may be offset in a manner to broader level representations at a species level, for example.

The Free Energy Principle

Biological systems all obey the second law of thermodynamics in that they move inevitably toward disorder (Schneider & Kay, 1994). To enable survival, biological agents must be able to continually resist such dissipation (Friston, 2010; Hirsh et al., 2012). The evolutionary game of survival demonstrates the abilities of biological agents doing so, via motivation toward attainment of states enabling their survival (Ramstead et al., 2018; McGovern et al., 2022). Termed 'attractor' states, are the number of possible compositions in

state-space in which the biological agent can feasibly sustain their existence. In mathematical theory, attractor states may be spatial and/or temporal and facilitate the evolution of a given system. In dynamical systems theory, factors such as uniformity and randomness play a part in system dynamics. Notably, the consciousness problem in cognitive sciences, also relevant to conscious representations, has been debated (Keshmiri, 2020), especially in its potential to influence and/or resist certain states.

State-space constitutes the time and place of viable attractor states, for instance, the oscillations of a pendulum where idealized states are represented by the angle and angular velocity of its motion. The Free Energy Principle attempts to explain how biological agents move to attainment of these attractor states (Friston, 2010; Hirsh et al., 2012), to resist the entropic slowing of the pendulum, via the generation of internal models of the outside world. The Free Energy principle is thus a formalized description of how biological systems define themselves as physically distinct from the environment. The drawing of this boundary is referred to as the formation of a Markov blanket (Friston, 2013; Palacios et al., 2017; Kirchoff et al., 2018), which differentiates the biological agent from its surrounding environment. An essential part of the biological agent resisting their own dissipation is the maintenance of the boundary (Markov blanket) between themselves and the outside world.

To define these boundaries, biological agents model external states of the world, and themselves within those states (see Friston, 2006; 2010; 2012). The Free Energy Principle posits that free energy is the internal system's upper bound on the uncertainty it has regarding the causal structure and composition of external states (see Friston, 2006; 2010; Ramstead et al., 2018). Minimizing free energy is thus equivalent to the minimization of surprise in the systems model of the external world. From an account based within first principles offered by the free energy principle, we can thus derive how humans infer specifics about 'other' – from the 'type' of person they are (see Veisseire et al., 2018), which ultimately gives rise to statistical regularities of the social (and occasionally non-social) landscape. From a social and evolutionary perspective, such a supposition is consistent with Kohut's self-psychology (see H. Baker & M. Baker, 1987) and Adler's social cooperation principle (Overholser, 2010), that is the primary, if not sole, purpose of these processes to inform our relational understanding of our world. Minimization of free energy applies to human minds but also broader social landscapes, as can be seen in the complementary and compensatory behaviour of animals (for examples: the cooperative behaviour of ants). While it is well-known in cognitive neuroscience that group cognition processes occur in many living organisms, the mechanism of representation is still debated at large.

In accordance with Jung's definition of archetype, it is only the representation that we can study (usually visually) rather than being able to ostensibly capture the root essence of the archetype, which is transcendent of cultural representation due to its holistic nature. While our conscious cognition can represent parts of complex phenomena (defined here with an upper limit of mental representation), the unconscious mind may represent, or minimally intuit, broader components of the same system of cognition. To adopt the spirit of Jungian

thought, there are no fixed archetypes per se, rather only low-bandwidth representations of persistent themes of human conscious experience. Archetypes thus present as fluid and changing, morphing in accordance with affordances offered by biology, ecology, and culture.

More specifically, archetypes can fall into one of three broad variants. These are events (e.g., birth, death, initiation, marriage), figures (e.g., great mother, devil, wise old man, hero), and motifs (e.g., apocalypse, creation, heroes' journey) (Jung, 1919; 1934). Others have devised taxonomies of 'primary' archetypes based on extensive clinical observation and research of Jung's work on the topic (Moore & Gillette, 1990). Moore offers 20 core archetypal representations to draw upon, which can be depicted on four core axes: King, Magician, Lover, Warrior (Moore & Gillette, 1990). Consistent themes and notions arise across cultures to an almost universal basis- based on the need to minimise free energy affordances common to humans across different ecological niches [2] (Constant et al., 2018; Vessiere et al., 2020), as we will discuss next. Jungian theorists have discussed at length how grand narratives surrounding certain archetypes (for example, the Great Mother) can influence human behaviour at the more local, or personal, level. Such assertions fit well within the Free Energy Principle, in that statistical randomness and order can be considered at both the broader systemic (i.e., whether cultural, genetic, or epigenetic) level as well as the personal and social realm of one's day-to-day lived experience.

Constructing Archetypal Representations: from Neurons to Populations

The Free Energy Principle has proven a powerful explanatory framework for understanding not only how brains operate, but how individual organisms behave (Ramstead et al., 2020), how cultures and ideologies form (Ramstead et al., 2018; Constant et al., 2019a; Ramstead et al., 2019 Veisseire et al., 2020; Wheeler et al., 2020), how niches are constructed (Veisseire et al., 2020), and even how climactic systems behave (Rubin et al., 2020). The Free Energy Principles suggests that to minimize free energy, agents can either update an internal model, or change their environment via action policies to enable the environment to conform to their expectations (see Akers et al., 2015). However, this is not only the case for individual agents. Entire populations of creatures and agents can attempt to collectively minimize free energy via niche construction, wherein creatures construct and inhabit environmental niches as a means of conforming them with prior expectations, enabling constituents to collectively minimize free energy (Constant et al., 2019).

We extend on prior work on the Free Energy Principle by proposing that Jungian archetypes are low-bandwidth representations of social and environmental information – the downstream effect of a series of agents attempting to act toward free energy minimization individually and collectively. In doing so, we provide a pathway for more formal conceptions of archetypes and their construction to be considered. Falling under the rubric of the Free Energy Principle, Ramstead et al (2016) recently offered a conceptual framework for understanding how affordances (see Box 1) give rise to the creation of common meaning and shared representations of the sensed world (see Ramstead et al., 2016); a conceptualization

well-substantiated by a large body of literature (Gibson, 1977; Jones, 2003). Figure 2 offers some examples of affordances commonly studied in cognitive science.

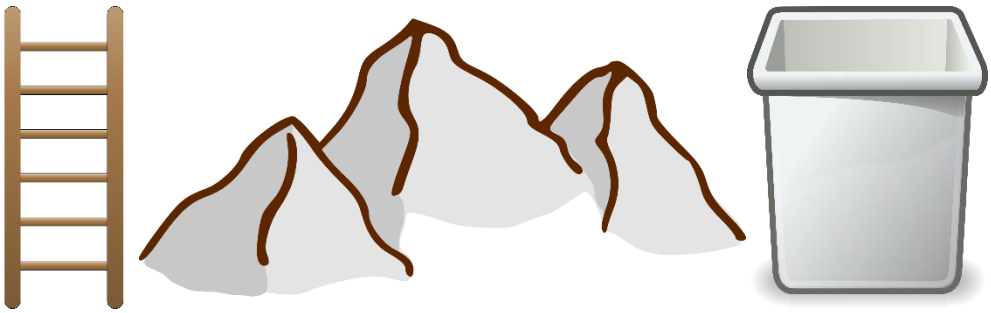

Figure 2. Three basic examples of perceptual affordances. Scholars such as James Gibson believed that complex cognitive hierarchy is not required and most mammals with an in-tact sensory system can navigate their lifeworld and understand that a ladder/step can be climbed, that a mountain ascends/descends, and that an object with a void can hold/contain other objects – these demonstrate affordances both arising in naturalistic as well as contrived settings. Further discussion follows.

Next, we draw from Ramstead's framework to develop our thesis of how archetypes are constructed via niche construction within an affordance framework. Humans are unique among the animal kingdom in being dispersed planetwide. We inhabit many different environments and ecologies (O'Brien et al., 2012). Each ecology offers its own challenges and affordances for the inhabitants, influencing subsequent cultural development. For example, the differences between a society who live on the coast, and those that live in the forest, will have a different set of affordances, and thus different versions of, for example, predators, prey, and perhaps even different notions of God (Metzinger, 2009; Gervais et al., 2012).

Biological agents are fundamentally limited by two factors. First, their bodily composition and the types of actions which are possible given this composition. Second, the specifics of the environment they live in. To offer a simple example, if a species lived on an island across a small body of water from another (assuming they do not have the ability to build transportation), they could not get across it unless they possessed physical features which allowed them to do so. Insofar as the species' physical features allow them to travel across water, this could be considered an affordance (Chemero, 2003; 2009; Bruinberg & Rietveld, 2014; Rietveld & Kiverstein, 2014).

Affordances give rise to differing collective representations of each population's natural and social world (see Table 1). Via these mechanisms, human populations necessarily share the same (or comparable) regimes of attention (see Ramstead et al., 2016), which illustrates the regimentation of biological imperatives as these flow to cultural structures, allowing both individuals and the group to survive.A child quickly recognizes that a body of water that at first appears shallow may be dangerous, for instance, by drawing upon various cues that may precede mere instructional or social learning (see Vygotsky, 2012). Badock, Constant, and Ramstead (2019) provide other examples of what they term 'sensory automation', in which members of a social group or tribe who determine the best path to

take from one point to another appear to literally pave the road for their antecedents who then carry intuitive (i.e., likely somatosensory) inclinations on the most efficient and safest means to travel to a given point.

Box 1

Name	Description
Affordance	The relationship between a feature of an organism's physical habitat and actions available to that organism based on their phenotype (Chemero, 2003; 2009; Bruinberg & Rietveld, 2014; Rietveld & Kiverstein, 2014; Ramstead et al., 2016).
Cultural Affordance	Affordances encountered in the niches that humans construct (Ramstead et al., 2016).
Natural Affordances	What sets of actions, or action policies available to organisms given their environment, given traits expressed in their phenotype.
Conventional affordances	Possible action sequences based on reference cultural norms and conventions. Note that this is bases on the agent's ability to interpret these appropriately. Essentially, they can be thought of as the cultural expectations of how to interpret other agents – all of which is mediated by the social, symbolic, and linguistic norms and conventions of the cultural setting (Scarantino & Piccini, 2010; Tomasello, 2014; Satne, 2015; Scarantino, 2015; Ramstead et al., 2016).
Fields of Affordances	Fields of Affordance are sets of affordances that present themselves to agents within a specified time. They capture this attention due to being relevant for the pursuits, interests, and possible states the organism can exist in (Rietveld, 2008a; Bruinberg & Rietveld, 2014; Rietveld & Kiverstein, 2014; Ramstead et al., 2016).

Landscape of affordances	Affordances which are possible for a population in a particular time frame and niche (see Rietveld, 2008a; Rietveld et al. 2013; Bruinberg & Rietveld, 2014; Rietveld & Kiverstein, 2014; Ramstead et al., 2016).

Archetype transmission

Affordances ultimately set the stage for how agents across different ecologies come to represent their unique ecological and social worlds. Once this stage is set, what then are the micro mechanisms of how these representations form over time? Below, we assess cultural modes of transmission, within individual lifetimes as well as how archetypes develop via cultural transmission over generations.

Cultural Learning

Though human cultures differ massively, they ultimately function as tools enabling the population to converge on a set of shared assumptions about the world, allowing them to collectively solve problems (Barkow et al., 1995). The very existence of behavioural variability gives rise to the notion of so-called ’culture‘ (Tomasello, 2009; Veisseire et al., 2018). Attempts to explain shared representations about the world appear as a longstanding and consistent theme in both the evolutionary and social sciences (See Durkheim, 1985; Mauss, 1973). Previous work has outlined how FEP may be applied to culture and niche construction (Vessiere et al., 2020; Goldstein et al., 2009; Hacking, 1998; Gold & Gold, 2015). Representations of the outside world that social cognitive processes thus give rise to differs markedly across cultures (Vessiere et al., 2020). Given the large variability in the niches that human populations construct across the world, as well as the ecologies in which they do so, it is hardly surprising that such representational variability exists. At the same time, many bodies of work demonstrate human universals in representation, such as the idea of a deity (Paley, 1829; Norenzayan, 2010), and notions of good and evil (Farley, 1990: Peeters, 1986). Indeed, it might be said that the universals are more fundamental processes, which ultimately cause emergent differences in representation based on ecological particulars about a region.

Constructing a niche is where organisms alter and morph their own local environment. In morphing the environment to a creature's preferences, niche construction **“**is a primary mechanism allowing formation of networks of shared expectations encoded across brain, bodies constructed environments, and other agents which guide attention action and entail the learning of patterned behaviors” (Veisseire et al., 2020, pp. 16). These niches constitute an edifice of shared expectations and representation about the world which enable formation of cultural and social norms (Veisseire et al., 2020).

The relationship between niche construction and archetypes can be seen in the pervasive nature of certain imagery and cultural themes geographically. The construction of temples, churches, and even pre-historic architecture (e.g., the pyramids in Egypt) signal a connection

to the divine or sacred. While the archetypal connection and union with this symbology may present in dream and motif, the tangible, physical architecture often serves not only a symbolic figurehead but also utility application for the archetype itself (i.e., attending the church/temple and performing certain rituals or rites).

Early relationships and attachment

Stevens (2003) argued that attachment research lends support to the existence of archetypes, as attachment patterns tend to be somewhat universal cross-culturally (Van Ijzendoorm et al., 2008), although variations exist which mean patterns might be expressed differently (Barrett, 2020). From early in life, human infants learn the norms of their culture through various means. Methods of cultural transmission include imitation, instruction, and learning with other infants respectively (see Tomasello et al., 1993). It has even been proposed that human infants are uniquely sensitive to cultural learning (see Trevarthen, 1993; Tomasello et al., 1993; Tomasello, 2016). Given repeated modes of interaction, infants learn to form generalized representations of the general and social environment. As a simple example, they learn that their male caregiver is referred to as “Father”, and the female caregiver is “Mother” (Solms & Turnbull, 2018). Based on these representations, infants thus learn to form expectations about the relationship between their actions and outcomes (Kast, 1990; Stern, 1985). Such learning, it is suggested, evolved in our ancestral lineage by way of enabling infant survival (see Hrdy, 1999; 2005; 2009; 2016; Hawkes, 2014; 2020).

Shared Representation and Survival

We therefore suggest that creation of low-bandwidth representations of one’s social and environmental ecology occurs due to cross-cultural learning mechanisms, which serve universal biological imperatives of survival and reproduction. These representations facilitate more efficient transmission of important information, allowing individual agents to effectively learn, optimize, and form evolutionarily important representations of their environment. This is done with the ultimate result of improved free energy minimization at the population and individual level – such that the group and its constituents’ structures become an optimal model of their environment. Namely, that agents must undertake actions that minimize surprisal, and thence resolve uncertainty, as they actively sample their environments. Consider the following example put forward by Kirchoff et al (2018, p.18).

"Imagine a creature confronted with a riverbank: in the absence of any prior beliefs about what it would be like to be in the water, the river holds an epistemic affordance (i.e., novelty), in the sense that entering the water resolves uncertainty about ‘what would happen if I did that’. If the unfortunate creature subsequently drowned, priors would emerge (with a bit of natural selection) in her conspecifics that water is not a natural habitat. A few generations down the line, the creature, when confronted with a riverbank, will maintain a safe distance in virtue of avoiding expected surprise, i.e., fulfilling the prior belief that ‘creatures like me are not found in water" (Kirchoff, 2018, p. 18).

This brings us to the crux of our argument—to minimize free energy about the environment, human ancestral populations (over evolutionary time) form and thus have the need to optimally model their environment. Via collective and individual efforts to minimize free energy, populations and individual agents will converge on shared regimes of attentions (i.e., culturally shared attentional regimes; Constant et al., 2019), resulting in shared sets of assumptions (see Tomasello, 2014), in turn resulting in common representational contents (within the individual agents) of their social and ecological environment. We argue these representations[1] are functionally equivalent to Jungian archetypes.

Niche Construction: Thinking with other Minds

The Free Energy Principle supposes that agents can act to collectively minimize free energy via cultural learning processes, culminating in shared representations. This can occur at the population level, with populations of agents morphing their ecological environment to conform to their expectations via niche construction. In turn, this carries the benefit of agents being able to learn from each other via cultural learning and thinking through other minds (see Veisseire et al., 2020), meaning that individual agentic representations need not be formed entirely from scratch. Instead, inherited regimes of attention, learning, and accumulated knowledge allow individual agents to optimally form environmental representation.

From an affordance perspective, niche construction can be thought of as process wherein populations of creatures construct their niche in such a way that it is more likely to be consistent with their prior expectations (Constant et al., 2018). In this way, niches are the result of collections of individual agents seeking to ensure the environment falls within the range of each agents' expectations. In changing the physical states of their niche, the agents oftentimes make this niche a good representation of the agent's foraging habits, functional anatomy, and brain-based expectations (Constant et al., 2018, pp. 42). This process allows a collective effort to minimize uncertainty in the local field of affordances, allowing our immediate environment to become more predictable.

The resultant regimes of attention (those features which necessarily attract attention given the niche constructed) can ultimately give rise to shared patterns of attention, assumptions, and ultimately shared representations of extant patterns in the local social and ecological environment. Archetypal representations are grounded in the notion that we do not by virtue need to represent the entirety of a given concept or idea, but merely an underlying conceptual characteristic or image useful for survival or other evolutionary purposes. For example, Jungian analysts argue that one's mother or father instinct to raise a child may be drawn from archetypal representations of the ideal father or mother. Notably, no sole parent can read the entire scope of all parenting literature and guidebooks, but an intrinsic instinct to parent is acclimated via generations of cultural and social learning.

To further the above example, the process from shared attentional patterns to shared representations can be considered in the cross-cultural idea of the Father archetype. Consistent across phylogeny and human cultures, fathers have acted as the primary defence of both provider and protector from the elements (Lamb, Pleck, Charnov, & Levine, 2017; Tamis-LeMonda, 2004), although this of course carries substantial cross-cultural variation;- for example, in modern societies in which gender roles are more fluid (Kite, 2001; Sweting et al., 2014).

Via cultural learning and imitative modelling, the agent having learned this cultural expectation, will attempt to act out their model of the world so that it conforms to their expectations. In doing so, they will rely heavily on the inherited patterns of attention, behavior, and representation that will allow them to minimize free energy as they navigate their social world. As mentioned earlier, in the case of this agent, it is not that the father archetype is particularly pertinent for them to learn. We therefore see that as individual agents and populations attempt to minimize free energy, they will converge on shared assumptions and representations based on the statistical regularities observed in their own social and ecological environments. Via genetic and cultural learning processes, these patterned representations come to inform the representations we see in religious, mythical, and artistic works.

Niche construction takes place multi-generationally, with each generation of a species drawing from the epistemic affordances (Ramstead et al., 2016; Veisseire et al., 2020) afforded by the constructed niche. This allows the population at large to track social (and non-social) regularities unfolding over long scales of time- so they may be represented in meaningful ways to agents which are only present for a specified time within these time spans. As such, we must form" low-level"—in that it is able to be quickly discerned—representations of longer term environmental and social patterns and statistical regularities.

We posit that as well as explaining the acquisition, production, stabilization of cultural expectations (see Ramstead et al., 2016; Veisseire et al., 2020), a free energy perspective can also explain the shared representations (such as imagery, art, religious themes) present in cultural regimes- which we argue are formally equivalent to archetypes as put forward in Archetypes of the Collective Unconscious (Jung, 1959). In sum, we posit that in the service of free energy minimization, human cultures form low level representations of social and environmental regularities. This process allows simultaneously the group (society) to collectively act to minimize long term surprise, as well as individual agents within that environment over the course of generations.

Archetypes as shared representations

Via various affordances and cultural learning mechanisms, human agents come to form collective representations of the social world and of the physical environment. These structures, as we have outlined here, are constructed over deep time, and are clustered together according to the statistical regularity with which its elements are associated.

As Jung (1919) pointed out, these are not necessarily images per se, but a more general tendency to form a particular representation (see Roesler, 2012). Our argument is thus based on the notion that environments and niches offer specific affordances, which (based on the shape of their pressure toward one affordance or another) mould and shape the more salient aspects of the environment and social world toward which shared regimes of attention are paid. In turn, such attentional regularities allow the agents to form representations most salient to their evolutionary and motivational imperatives. The aspects will thus form clusters of information, based on which agents form patterned (rather than detailed) representation of the regularities. The representations formed allow the cultural agents to optimally navigate the social world, allowing constituent agents to minimize free energy (psychologically speaking, surprise) as they navigate their social world. In turn, this allows human agents to understand and simplify the environment (see Figure 3).

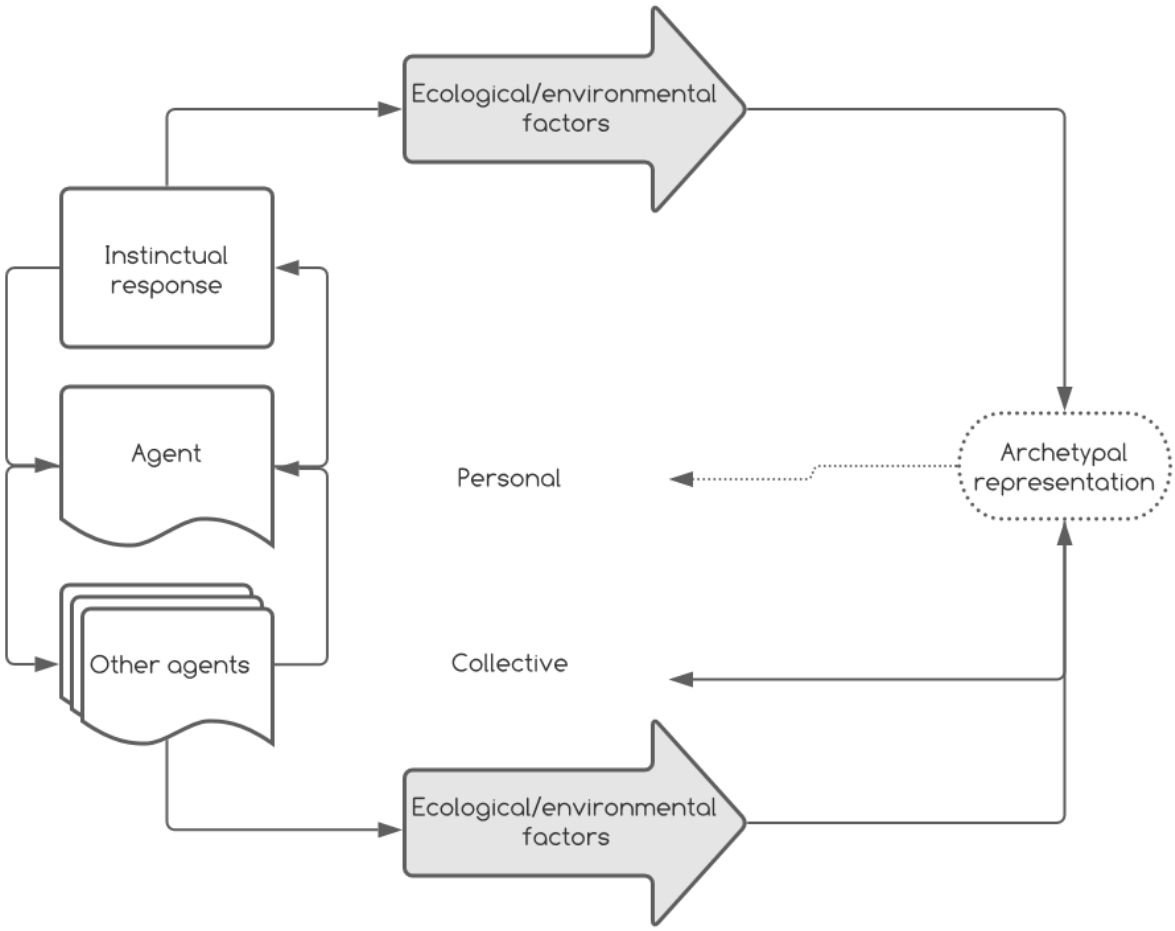

Figure 3. Abstraction of how human agents form representation over time. Agents form and update representation based on feedback from their environment and other human agents. Over time the human agents learn regularities and thus "themes" of information which is

consistent over time. Via such a process human agents form deep, unconscious abstractions over time, represented in imagery and conceptualisation.

Future Directions: Expounding the role of free energy

Our contention not only makes abstract psychoanalytic conceptions tenable to a formal scientific understanding, but also offers a road map for what imagery, themes, and representations a culture will carry given a specific set of affordances. For example, a researcher might take culture A in an ecology A, compared with culture B in ecology B. We might expect that, given a particular set of affordances, a culture might form a collective representation to manage the evolutionary pressures they were exposed to. Alternatively, given a particular set of cultural themes and archetypes, we might infer the affordances available to populations over evolutionary time. This could help explain the functional utility or archetypal images and cultural themes, and the adaptive value they (once) offered ancestral populations.

There are a few questions remaining for future research: the universality of archetypes, meta-mechanisms of transmission, and the role of representation in the archetype-instinct axis. First, there is continued debate about the universality or cultural specificity in which archetypes may endure. The timeless aspect of archetypes, as expressed by Jung's conception of the spirit of the times v the spirit of the depths, raises epistemic and ontological questions about whether archetypes precede nurture or are shaped by it. While archetypal representations can certainly be moulded by environmental factors (culture and context), primary archetypal structures appear innate and non-consequential to these forces. That leads on to the second remaining question, in the sense of 'where' archetypes are stored, whether in genes (biological), physics principles (cosmological), or somewhere in between (emergent factors). A simpler way to think about this question is whether we adopt archetypes in a top-down manner (i.e., Platonic thought) or generate archetypal representations in a bottom-up fashion (Aristotelian thought). While our niche-construction comparison offers good avenues for testability, it does not presume to remark on the epistemological status of the archetype, in the sense of whether archetypes precede or follow from conscious and cognitive representations.

Third, future work might consider the archetype-instinct axis. Jung stated that an archetype is an "instinct's perception of itself" (see Alho, 2020, p. 2). As explored above, our genetic drives and archetypal representations are inextricably linked (see Alcaro et al., 2017). In Davis and Montag's (2019) work on 'Pankseppian Instincts', they describe seven fundamental instinctual drives (i.e., 'seeking', 'rage', 'fear', 'lust' 'care', 'panic' and 'play') are represented in mammalian emotional brain regions (Panksepp, 1998; Panksepp & Biven, 2012). We can see evidence of these primary instincts in most mammals; a strong biological and evolutionary basis is drawn upon for each (Panksepp & Biven, 2012; Panksepp et al., 2017). Additionally, other instinctual mechanisms, such as the attachment drive (pertinent to relating), the transcendent function, and the survival impetus within an evolutionary biology

context, can be considered. Notably, the interplay between instinct and archetype must be factored across many generations of genetic development, that may only later correspond to more concrete cultural appropriations and representations of conscious material.

Conclusion

Archetypes have remained a controversial construct within analytical, and particularly academic psychology. By placing them within a free energy and evolutionary framework, they may instead be thought of as collective representations or phenomena which served evolutionary and adaptive functions to ancestral populations. Via this argumentation, we suggest they may in fact offer useful sets of heuristics for understanding how ancestral populations represented and came to understand their ecological and social worlds. In doing so, we have attempted to make archetypes not only something tenable to Jungian and analytical psychology, but an emergent phenomenon able to be explained by a formal scientific framework.

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