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Reflective Imagination: The Cognitive Process Underlying the Experience of Meaning through Music

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Background in philosophy. Over the past few decades several philosophers have drawn parallels between the engagement with music and imagination. For instance, Kendall L. Walton (1994; 1999) maintains that the same kind of imagining is involved in experiencing music as in experiencing narratives. Andrew Kania (2015) underlines that our experience of musical space and movement, much like our experience of fiction, is imaginative. Jerrold Levinson (1996) suggests that listeners experience music imaginatively—specifically, imagining others expressing emotions through the music (Gendler 2018).

Background in cognitive science. Anna Abraham and Andreja Bubic (2015) have recently argued that semantic memory is the root of all aspects of human imagination. Abraham (2016) proposes five categories to analyze the human imaginative mind: (i) perceptual/motor related mental imagery, (ii) recollective or intentionality processing, (iii) generative or novel combinatorial processing, (iv) exceptional phenomenology in the aesthetic response, and (v) altered psychological states such as dreams, hallucinations, and delusions (2016: 4197).

Aims. To shed light on the experience of meaning through music, I expand upon the assertions of philosophers who argue that the experience of music is underlain by imagination—but miss the role played by the development of memory retrieval mechanisms on this experience—and upon the findings of cognitive scientists who—while recognizing how memory retrieval mechanisms help to explain imagination—confuse aesthetic processing with artistic experience.

Main contribution. In this paper I argue that basic to the experience of meaning through music is the role of *reflective imagination* (Wah 2017; 2019), a process that includes the imaginative experience of narratives (Walton), the imagination of space and movement (Kania), and the imagination of one's own or others mental states (Levinson). Nonetheless, I underline that this experience is neither automatic nor unconscious, as these philosophers postulate (see Kania 2015, 166). Drawing upon research by Abraham and Bubic (2015), and on developmental theory, I point to a close link between the development of memory retrieval mechanisms and the development of imagination. By pointing out how reflective imagination underlies the experience of meaning through music, I elucidate the distinctions between *meaning* and *experience of meaning*, and between *aesthetic processing* and *artistic experience*. Such distinctions help to explain why the experience of meaning through music is characteristically human, begins in childhood, and is a highly individual and continuous process of interpretation.

Implications. By focusing on the cognitive process underlying the artistic experience, I offer an alternative to “unify the arts” as a category, to posit a kinship of the arts. This unification, as Ellen Dissanayake points out, would have to include the arts of all kinds, including that of music, in all times and places, including the evolutionary past, making it possible to explore their universality and probable adaptive value (Dissanayake 2015: 5).

Keywords: experience of music, meaning, emotion, memory, perception, imagination, metacognition, reflective imagination

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Introduction

Scientists have aimed to explain the artistic experience, including the experience of music, on the basis of aesthetics. In what is now referred to as empirical aesthetics and neuroaesthetics, scientists have commonly overlooked imaginative accounts of engagement with music by focusing on emotional responses to the perception of formal features of stimuli (see Fechner 1860; Kawabata and Zeki 2004).

In previous publications, I have argued that the artistic experience is the characteristically human capacity to experience oneself or others in a narrative by means of music, dance, song, pantomime, drawing, pretend play, or verbal language. I have pointed out that although the artistic experience certainly begins with emotional responses to the perception of significant stimuli, it is characterized not by emotion and perception, as often stated, as by particular degrees of memory, imagination, and consciousness which distinguish humans from other species. I call this cognitive process *reflective imagination* (Wah 2017; 2019; *forthcoming*).

Based upon a theory of Francesco Ferretti et al. I have explained that reflective imagination, the cognitive process underlying the artistic experience, including the experience of music, is possible due to the human narrative ability underlain by global coherence (the capacity to relate events causally); and a triadic system consisting of mental space travel (the capacity to imagine different spatial locations), mental time travel (the capacity to imagine oneself or others at different times, distinguishing between past, present, and future), and mental mind travel (the capacity to attribute mental states to oneself or others, also referred to as mind-reading or theory of mind). The fact that the triadic system of mental space travel, mental time travel, and mental mind travel is, to some extent, present in nonhuman animals suggests that this system precedes verbal language (Ferretti et al. 2017: 111–114).

I have reconstructed an evolutionary trajectory (from *Australopithecines* to *Homo sapiens*) and a developmental path (from infancy to senescence) of the reflective imagination via the artistic experience (Wah 2019). Here, I focus on the development of the imaginative capacity to experience meaning through music. I argue that the development of this experience is closely linked to the development of memory retrieval mechanisms. By pointing out the layers of this experience I clarify the distinctions between *meaning* and *experience of meaning*, and between *aesthetic processing* and *artistic experience*. My aim is thus to shed light on why the experience of meaning through music is characteristically human, begins in childhood, and is a highly individual and continuous process of interpretation.

Aesthetic Processing

Emotional Responses to the Perception of Meaningful Stimuli

One may think of meaning as something only pertaining to humans, and thus related to intentionality, the use of signs, and verbal language. But one may also understand meaning as biological significance or value (Dissanayake 2000: 73; van Heusden 2009: 613–5). From this latter perspective, the environment is a world full of meaning, and its meaning is dependent on the bodily anatomy and the behavioral patterns of any organism (von Uexküll 1926). In this sense, if something has meaning it triggers an action, and without action, there is no meaning (van Heusden 2009: 612–615).

For instance, humans seem to respond with the activation of neural patterns associated with emotions when perceiving certain formal features of stimuli. Examples of such emotionally competent features are certain organizations of sounds in relation to timbres, pitches, and rhythms. According to Antonio Damasio, these formal features of stimuli arrest attention and are processed and detected by the nervous system, triggering the enactment of a body state characteristic of a certain emotion. To react emotionally to these formal features of stimuli, recognition is not necessary. The only requirement is that the organism's early sensory cortices detect and categorize the key feature or features of a given entity, and that structures such as the amygdala receive signals concerning their presence (Damasio 1994: 131).

These evolved preferences, inclinations, or emotional responses to the perception of certain formal features of stimuli presumably have adaptive value and became established in the Pleistocene (Damasio 2010: 295). Exact placement in time of responses to the perception of timbres, pitches, and rhythms has not yet been determined. Evidence from the Upper Paleolithic, at least 35,000-year-old, includes musical instruments made from bone and ivory (see Conard, Malina and Münzel, 2009). For now, no archeological evidence seems to exist to confirm the existence of even earlier responses to the perception of timbres, pitches, and rhythms. Nonetheless, the use of musical artefacts must have been preceded by the bodily expression of musical capacities through movements, sounds, and gestures (Wah 2019).

According to Ian Cross, the capacity to entrain or synchronize with others to an external perceived rhythm, pulse, or beat, characteristic of music and dance, must have arisen in the hominin lineage 5-7 million years ago (Cross 2016: 13). Proto-musical and dance-like behaviors, as well as early sing-song vocalizations seem to have characterized the behavior of *Australopithecines* and *early Homo* (Wah 2019: 62). This affective processing must have been as relevant in the early Pleistocene as it appears to be in human infancy.

There is evidence for the evolved drive and early emergence of proto-musical and dance-like behaviors during typical development in humans. Infants as young as three weeks spontaneously synchronize body movements to auditory stimuli such as

entraining beats, an effect evident throughout early childhood and replicated cross-culturally (Fitch 2006; Christensen et al. 2017: 10–11). These behaviors are referred to as “proto-musical” and “dance-like” because in human infancy interaction appears to be unintentional and unimaginative, relying only on the perception of rhythmic and coordinated sensorimotor patterns in the here and now.

Evidence suggests that during human infancy, memory is not reflective or accessible to voluntary recall, expanding over a sequence of actions and interactions (Nelson and Fivush 2000; 2004; Nelson 2005: 121–128). Infants do not create meaning as much as feel what is meaningful—security, warmth, and emotional nourishment (Dissanayake 2000, 73). They respond to stimuli in the here and now on the basis of evolved preferences, basic reflexes, basic emotional responses, and universal meanings (Wah 2019). Babies do not yet have a conception of past and future, nor the capacity to understand another’s perspective (Nelson 2005: 129).

Ellen Dissanayake traces the origins of what she calls “artification” in the adaptive mother-infant interaction and views it as a ritualized behavior in the ethological sense (see Huxley 1914; Tinbergen 1952; Smith 1977; Eibl-Eibesfeldt 1989). In the mother-infant interaction the affiliative vocalizations, facial expressions, and head and body movements of the human adult are transformed into attention-getting signals by the process of ritualization becoming stereotyped, repeated, exaggerated, elaborated, and temporally patterned (Dissanayake 2000; 2001; 2015). By means of sound patterns such as lullaby and play songs, adults appear to regulate the state of the infant through the immediate, emotive aspects of sound perception and production (Reybrouck and Eerola 2017: 5).

To study the experience of meaning through music, it appears thus necessary to consider these first emotional responses to the perception of significant formal features of stimuli. These emotional responses can be taken to constitute a first layer of meaning in aesthetic processing (Wah 2017: 49).

Even though attention is first motivated by innate preferences, it is also motivated by learned preferences and goals acquired on the basis of those innate preferences (Damasio 1994: 185, 198). To come to grips with the experience of meaning through music, it thus seems necessary to take into account that emotional responses are also closely tied to learned meaning. The senses engage memories and by means of an associative process, one learns to respond emotionally to many other formal features of stimuli (Damasio 2001: 67, 68). For instance, emotional responses to certain features of perceived stimuli appear to change through repeated encounters, going from mere exposure to habituation and sensitization, and to the co-occurrence with other stimuli (Moors 2007: 1241 in Reybrouck and Eerola 2017: 9)

Stimuli seem thus to acquire different meanings and perceptual values in different contexts, and at different times, as one interacts with them in terms of what one already knows. These learned emotional responses can be taken to constitute a second layer of meaning in aesthetic processing (Wah 2017: 49).

Be that as it may, the activation of emotional responses to the perception of meaningful formal features of stimuli, or aesthetic processing, does not as such constitute an artistic experience, including the experience of music (Wah 2017: 49). One cannot fully explain the experience of meaning through music only by studying emotional responses to perceived timbres, pitches, or rhythms.

These levels of meaning do not explain the uniqueness of the human experience of meaning through music. Responses to the perception of timbres, pitches, and rhythms are, to some extent, also present in nonhuman animals. For instance, a degree of entraining seems to be present among some species; song-like behaviors have been shown in birds, dolphins, seals, sea lions, and whales (Jordania 2011: 86); dance-like behaviors have been reported in bees, birds, a parrot, a sea lion, and an elephant (Christensen et al. 2017: 11); and gesture-like behaviors have been reported in nonhuman great apes (Corballis 2011: 162–3; Ferretti et al. 2017).

The emotional power of music seems therefore strongly linked to the evolution of basic motor and emotional systems. Most movements have distinct rhythms, and basic emotions are characterized by distinct affective sounds, at least in all mammalian species. These sounds seem to have been crucial pre-adaptations for the emergence of the melodic stream of music in humans (Panksepp 2009–2010: 229).

The difference seems to lie in that, unlike other species, humans are born with an evolved readiness to seek, engage, and respond to mutuality, and to find, make, and share meaning (Dissanayake 2000: 129). Affective processing reflects an early evolutionary form of consciousness above which more layers of consciousness can emerge (Panksepp 2005). Core affects, basic and complex emotions can be superposed by conscious interpretations (Eerola 2017; Reybrouck and Eerola 2017: 8). These cumulative layers of consciousness, of conscious interpretations, and of meaning making appear to be reflected in ontogeny.

In typical development, the course of infancy is marked by a rapid change in perceptual and motor capacities. The first level of experiential awareness in infants is that of a self, one that distinguishes the boundary between self and other; midway in the first year this boundary extends to a relation between self, other, and object (Nelson 2005: 118, 126–128). This means that the beginning of the understanding of space precedes the understanding of time (Corballis 2011: 119). The ability to mental space travel seems to be a property of semantic memory and a precondition for mental time travel (Tulving 2005: 7).

The first recognition of the self has been set towards the end of the second year, once the young child passes the mirror test (the ability to recognize the image reflected in a mirror as belonging to itself). The cognitive self is understood as the beginning of memory as a recursive or metacognitive phenomenon (Tulving 2005: 34; Corballis 2011: 83). Children begin then to respond emotionally not only to the perception of meaningful stimuli in the here and now, but also to the consciously recalled and imagined.

Imagination plays a vital role in turning sensory stimuli into meaningful experience (Thomas 2014: 158). According to Barend van Heusden what distinguishes human cognition from that of other organisms is not meaning, but the absence of meaning. Humans may recognize situations and events on the basis of matching patterns of behavior, but they may also not recognize a situation or event. This awareness of absence of meaning seems to be basic to human cognition, and to characterize the human sense of space, time, and self; although this generates doubt and uncertainty, it also frees humans from immediacy of perception, thereby allowing for imagination (van Heusden 2009: 612–615).

To analyze the human imaginative mind, Anna Abraham has proposed five categories: (i) perceptual/motor related mental imagery, (ii) recollective or intentionality processing, (iii) generative or novel combinatorial processing, (iv) exceptional phenomenology in the aesthetic response, and (v) altered psychological states such as dreams, hallucinations, and delusions which range from commonplace to dysfunctional (Abraham 2016: 4197).

The first, the second, and the fifth categories have been reported, to some extent, in some nonhuman animals, whereas the third category, the power to intentionally recall, retain, and manipulate mental patterns, including visual, auditory, olfactory, gustatory, tactile, and kinesthetic images, seems to be characteristically human (Darwin 1871: 47; Romanes 1885: 142–154; Clayton et al. 2003; Plotnik et al. 2010; de Waal and Ferrari 2012: 4, 5; Thomas 2014: 140; Harpham 2017: 94). The fourth category is problematic from the perspective of this paper, as Abraham uses the aesthetic and the artistic interchangeably. Elsewhere I have argued that aesthetic processing, unlike the artistic experience, does not require reflective imagination (Wah 2017).

The development of imagination seems to be closely linked to the development of memory retrieval mechanisms such as semantic memory (knowing), episodic memory (self-conscious remembering), and autobiographical memory (personal memories that appear repeatedly during one's life) (see Schacter and Tulving 1994; Tulving 2005: 9, 34). Anna Abraham and Andreja Bubic propose semantic memory as the root of all aspects of imagination (Abraham and Bubic 2015). From this standpoint, reflective imagination emerges from and expands beyond episodic memory, which in turn requires, but goes beyond, the semantic memory system (Wah 2019).

The development of cognition in humans becomes evident around the third year, with considerable advances in increased attention and episodic memory. Episodic memory involves conscious acts of construction and locates events in time. It is now that young children begin to reflect upon their experiences (or potential experiences) in the past, present, and future, and can mental time travel and begin to follow a storyline (Tulving 1985; Suddendorf and Corballis 1997; 2007; Nelson 2005: 128, 134; Terrace and Metcalfe 2005; Ferretti et al. 2017: 110).

Children can master narrative skills through experiencing stories by means of music. They also develop mental mind travel, the imaginative ability to predict, take

another's viewpoint, and understand their own and others' mental states, such as thoughts, feelings, actions, and intentions (Currie 1995; Thomas 2003: 81; Damasio 2010: 296). This capacity increases dramatically between ages five and eleven (Goswami 2008). This means that the triadic system of mental space travel, mental time travel, and mental mind travel underlying the cognitive capacity of reflective imagination can be fully present in late childhood (Wah 2019). I therefore argue that only in childhood do humans begin to have the reflective imaginative capacity underlying the artistic experience, and thus, to experience meaning through music.

Artistic Experience

Experience of Meaning

Elizabeth Margulis and colleagues have recently pointed out that instrumental music is capable of triggering the experience of narratives, without the use of words, cross-culturally. However, they underline, it is still unclear what leads to this narrativization (Margulis et al. 2019).

Here, I have argued that the experience of meaning through music does require engagement through narratives and is implicitly reflective and imaginative. This seems to mark the difference between the artistic experience and entertainment. In entertainment one perceives a situation but does not re-create oneself or others in the imagination, whereas the experience of meaning through music allows one to imagine oneself or others in a different situation, time, or mental state than the actual one. This reflective imaginative experience enables one to grasp what others may convey. The exercise in mental space travel, mental time travel, and mental mind travel sharpens the ability to infer other experiences making interpretation possible.

In humans, memory enhancement continues with major developments in autobiographical memory in adolescence. Episodic memory combined with aspects of semantic memory makes up what is known as autobiographical memory (Corballis 2011: 84). Adolescents acquire the meanings, significances, and values of their social group and develop a sense of identity. Memory is central to one's identity, and identity constructions are important because they provide orientation, guide behavior, and may lead to action (Damasio 2003: 208; Kandel 2006: 116; van Heusden 2009: 13; Damasio 2010: 294; van Heusden 2010: 159–161).

Evidence suggests that experiencing a story collectively by means of music arrests attention and instills feelings of confidence and trust, reinforcing the individual's identity within the group. This collective experience seems to release chemicals such as oxytocin that promote affiliation and suppresses cortisol released in stressful situations (Freeman [1995] in Dissanayake 2000: 163; Gebauer et al. 2016). Cross argues that entrainment, the synchronization of organisms to an external perceived rhythm, pulse, or beat, allows humans to experience a sense of "shared intentionality" or collective meaning, permitting individuals to interact even while holding to personal meanings and goals (Cross 2005; 2016).

However, these accounts appear to focus on the synchronized movement involving coordinating perception and behavior around periodic pulses or beats. They seem to overlook the role played by memory, imagination, and metacognition in establishing affiliation among individuals and thereby promoting bonding within a group. Such bonding is commonly reported during rituals, concerts, religious ceremonies, sports events, and wars. For instance, U.S.A. soldiers have said that it would have been impossible for them to fight without the collective experience of heavy, rhythmic, rock music (Pieslak 2009).

Cross adds that by virtue of its “polyvalent significances”, the experience of meaning through music can facilitate communicative interactions that, were they to be conducted linguistically, might give rise to conflict (see Morley 2013). Not only can the same patterns of sound have different meanings in different societies; they can also have different meanings within the same society because of different social contexts, an attribute of music that can be described as “floating intentionality” or “floating meaning” (Cross 1999; 2016).

During adolescence, thinking gradually becomes more abstract and more flexible (Griffin 1992: 201). Imagining reflectively via the artistic experience, including the experience of music, can trigger the development of the capacity to think about situations from different perspectives characteristic of adulthood. A concrete example on the cohesive force of the experience of meaning through music for interpersonal and intercultural dialogue is the project of musician Jordi Savall and singer Montserrat Figueras (2009). By playing music and singing together, adult musicians and singers from nations at war imagined themselves in a situation different from their actual one, marked by the learned tensions of war, empathizing with each other. This exemplifies the unique power and function of this stage of the reflective imagination via the experience of meaning through music (Wah 2019).

The stage of senescence is characterized by a pattern of cognitive decline. For instance, the pitch range that adults and older adults can perceive decreases with time. Older adults also generate fewer episode-specific details relating to past events than younger adults (Schacter et al. 2007: 658). However, imagining reflectively via the experience of meaning through music seems to trigger episode-specific details relating to past events. This experience has been proven to delay, arrest, or even reverse the detrimental effects of ageing on learning and memory capacity while recruiting attention, motor function, semantic processing, episodic memory, and autobiographical memory (Matrone and Brattico 2015: 3; Reybrouck et al. 2018: 94–96).

To what extent the experience of musicians and non-musicians, of active and passive beholders, causes similar imaginative effects remains to be established. Embodiment accounts suggest that watching a dance might engage one’s body much as if one were dancing (Christensen et al. 2017). From this perspective, distinctions between musicians and non-musicians, active and passive beholders are not fully necessary.

The experience of reflective imagination seems not limited to exceptionally creative individuals, but appears equally at work in the mind of any self-imaginative engaged beholder (see Currie in Roth 2007: xxxiii).

Solitary and passive engagement with music also appears to rely on entrainment processes, evidenced in periodic modulation of attentional load (Clarke 2005; Cross 2016). Even when we sit still the experience of music seems to activate the motor areas of the brain (Janata and Grafton 2003; Mithen 2005: 25; Huovinen and Kaila 2015). It may be that these processes become activated precisely via the imaginative triadic system underlying reflective imagination.

Whether reflective imagination is related to the so-called “default mode network” (DMN) (see Buckner et al. 2008) is still to be explored. Reybrouck et al. refer to findings that suggest activation of the DMN during listening to music, especially with emotional music and particularly with naïve listeners. They underline that the involvement of this network may be linked to the importance of music for introspective thought, and generally for the formation of self, identity, and cultural belongingness, especially in adolescence (see Saarikallio et al. 2007; Tanner et al. 2008; Vessel et al 2013 in Reybrouck et al. 2018)

Much is still unknown about how meaning is experienced through music. Immense scope remains for empirical exploration, also in light of the pressing need to investigate the success of music as a therapeutic medium. A fundamental challenge is that art therapists, including music therapists, commonly make use of institutional art instead of musical stimuli that are individually emotionally effective. I have argued that emotionally competent stimuli are a precondition for the experience of meaning. Art therapists could focus on the here proposed triadic system underlying the reflective imagination to determine which factors enhance the functions of the experience of meaning through music.

An experience that, far from being peripheral, dysfunctional, or trivial, is overwhelmingly integral to humankind (Dissanayake 1992: xvi, xix, 24; 2015; Donald 2006: 4; Damasio 2010: 294). Recognizing the cognitive process of reflective imagination can help to clarify why the experience of meaning through music is characteristically human, begins in childhood, and is a highly individual and continuous process of interpretation.

Conclusion

In previous publications, I have argued that the artistic experience is the characteristically human capacity to experience oneself or others in a narrative by means of music, dance, song, pantomime, drawing, pretend play, or verbal language. I have pointed out that the artistic experience certainly begins with emotional responses to the perception of meaningful stimuli, that is, aesthetic processing, but is characterized not by perception and emotion, as often stated, but by particular degrees of memory, imagination, and consciousness. I call this cognitive process *reflective imagination* (Wah 2017; 2019; *forthcoming*).

In this paper I have elaborated on the statements of philosophers who argue that the experience of music is underlain by imagination—but miss the role played by the development of memory retrieval mechanisms on this experience—and on the findings of cognitive scientists who—although taking memory retrieval mechanisms into account to explain imagination—confuse aesthetic processing with artistic experience.

I have argued that, unlike the artistic experience, aesthetic processing does not require reflective imagination. The experience of meaning through music is an interdependent cumulative process, linked to the evolution and development of cognitive capacities. This experience begins with emotional responses to the perception of significant stimuli, but is underlain by reflective imagination—which emerges from and expands beyond episodic memory, which in turn requires, but goes beyond, the semantic memory system.

Recognizing reflective imagination as the cognitive process underlying the artistic experience, including that of music, helps to explain why the experience of meaning through music is characteristically human, begins in childhood, and is a highly individual and continuous process of interpretation.

References

- Abraham, Anna. 2016. "The Imaginative Mind." *Human Brain Mapping* 37 (11): 4197–4211. doi:10.1002/hbm.23300.
- Abraham, Anna, and Andreja Bubic. 2015. "Semantic Memory as the Root of Imagination." *Frontiers in Psychology* 6 (325): 1–5. doi:10.3389/fpsyg.2015.00325.
- Bogin, Barry, and B. Holly Smith. 2012. "Evolution of the Human Life Cycle." In *Human Biology: An Evolutionary and Biocultural Perspective*, edited by Sara Stinson, Barry Bogin, and Dennis H. O'Rourke, 515–586. New York: Wiley-Blackwell. doi.org/10.1002/9781118108062.ch1.
- Buckner, Randy L., Jessica R. Andrews-Hanna, and Daniel L. Schacter. 2008. "The Brain's Default Network Anatomy, Function, and Relevance to Disease." *Annals of the New York Academy of Sciences*, 1124 (3): 1–38. doi.org/10.1196/annals.1440.011.
- Budd, Malcolm. 2003. "Musical Movement and Aesthetic Metaphors." *British Journal of Aesthetics* 43 (3): 209–223. doi:10.1093/bjaesthetics/43.3.209.
- Clarke, Eric F. 2005. *Ways of listening: An Ecological Approach to the Perception of Musical Meaning*. Oxford: Oxford University Press.
- Clayton, Nicola S., Timothy J. Bussey, and Anthony Dickinson. 2003. "Can Animals Recall the Past and Plan for the Future?" *Nature Reviews Neuroscience* 4 (8): 685–691. doi.org/10.1038/nrn1180.

- Christensen, Julia F., Camilo José Cela-Conde, and Antoni Gomila. 2017. "Not All About Sex: Neural and Biobehavioral Functions of Human dance." *Annals of the New York Academy of Sciences* 1400 (1): 8–32. doi:10.1111/nyas.13420.
- Conard, Nicholas J., Maria Malina, and Susanne C. Münzel. 2009. "New Flutes Document the Earliest Musical Tradition in Southwestern Germany." *Nature* 460 (7256): 737–740. doi:10.1038/nature08169.
- Corballis, Michael C. 2011. *The Recursive Mind: The Origins of Human Language, Thought, and Civilization*. Princeton: Princeton University Press.
- Cross, Ian. 1999. "Is Music the Most Important Thing We Ever Did? Music, Development and Evolution." In *Music, Mind and Science*, edited by Suk Won Yi, 10–39. Seoul: Seoul National University Press.
- . 2005. "Music and Meaning, Ambiguity and Evolution." In *Musical Communication*, edited by Dorothy Miell, Raymond MacDonald, and David J Hargreaves, 27–43. Oxford: Oxford University Press.
- . 2016. "The Nature of Music and Its Evolution." In *Oxford Handbook of Music Psychology*, edited by Susan Hallam, Ian Cross, and Michael Thaut, 3–17. 2nd ed. Oxford, UK: Oxford University Press.
- Currie, Gregory. 1995. "Visual Imagery as the Simulation of Vision." *Mind and Language* 10 (1/2): 25–44. doi.org/10.1111/j.1468-0017.1995.tb00004.x.
- . 2007. "A Claim on the Reader." In *Imaginative Minds*, edited by Ilona Roth, 169–186. Oxford, UK: Oxford University Press.
- Damasio, Antonio. 1994. *Descartes' Error: Emotion, Reason, and the Human Brain*. New York, NY: Putnam.
- . 2001. "Some Notes on Brain, Imagination and Creativity." In *The Origins of Creativity*, edited by Karl H. Pfenninger and Valerie R. Shubik, 59–68. Oxford, UK: Oxford University Press.
- . 2003. *Looking for Spinoza: Joy, Sorrow, and the Feeling Brain*. Orlando, FL: Harcourt.
- . 2010. *Self Comes to Mind: Constructing the Conscious Brain*. New York: Pantheon Books.
- Darwin, Charles. 1871. *The Descent of Man and Selection in Relation to Sex*. New York: D. Appleton.
- Davies, Stephen. 2011. "Music and Metaphor." In *Musical Understandings and Other Essays on the Philosophy of Music*, 21–33. New York: Oxford University Press. doi:10.1093/acprof:oso/9780199608775.003.0003.
- Dissanayake, Ellen. 1992. *Homo Aestheticus: Where Art Comes From and Why*. Seattle: University of Washington Press.
- . 2000. *Art and Intimacy: How the Arts Began*. Seattle: University of Washington Press.
- . 2001. "Becoming Homo Aestheticus: Sources of Aesthetic Imagination in Mother-Infant Interactions." *SubStance* 30 (1/2): 85–103. doi.org/10.1353/sub.2001.0005.
- . 2015. "'Aesthetic Primitives': Fundamental Biological Elements of a Naturalistic Aesthetics." *Aisthesis: Pratiche, Linguaggi e Saperi dell'Estetico* 8 (1): 6–24. doi.org/10.13128/Aisthesis-16203.

- Donald, Merlin. 2006. "Art and Cognitive Evolution." In *The Artful Mind: Cognitive Science and the Riddle of Human Creativity*, edited by Mark Turner, 3–20. Oxford: Oxford University Press.
- . 2013. "Mimesis Theory Re-Examined, Twenty Years After the Fact." In *Evolution of Mind, Brain, and Culture*, edited by Gary Hatfield, and Holly Pittman, 169–192. Philadelphia: University of Pennsylvania Press.
- Eerola, Tuomas. 2017. "Music and Emotions." In *Handbook of Systematic Musicology*, edited by Stefan Koelsch, 541–556. Berlin: Springer.
- Eibl-Eibesfeldt, Irenäus. 1989. *Human Ethology*. New York: Aldine de Gruyter.
- Fechner, Gustav T. 1860. *Elemente der Psychophysik*. Leipzig: Breitkopf und Härtel. (Reprinted, Bristol: Thoemmes Press, 1999).
- Ferretti, Francesco, Ines Adornetti, Alessandra Chiera, Serena Nicchiarelli, Rita Magni, Giovanni Valeri, and Andrea Marini. 2017. "Mental Time Travel and Language Evolution: A Narrative Account of The Origins of Human Communication." *Language Sciences* 63: 105–118. doi.org/10.1016/j.langsci.2017.01.002.
- Fitch, William Tecumseh. 2006. "The Biology and Evolution of Music: A Comparative Perspective." *Cognition* 100 (1): 173–215. doi:10.1016/j.cognition.2005.11.009.
- Freeman, Walter. 1995. *Societies of Brains*. Hillsdale, NJ: Erlbaum.
- Gebauer, Line, Maria A. G. Witek, Niels C. Hansen, Jana Thomas, Ivanka Konvalinka, and Peter Vuust. 2016. "Oxytocin Improves Synchronisation in Leader-Follower Interaction." *Scientific Reports* 6 (38416): 1–13. doi.org/10.1038/srep38416.
- Gendler, Tamar. 2018. "Imagination." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, <<https://plato.stanford.edu/archives/sum2018/entries/imagination/>>.
- Goldman, Laurence R. 1998. *Child's Play: Myth, Mimesis and Make-Believe*. Oxford: Berg.
- Goswami, Usha. 2008. *Cognitive Development, the Learning Brain*. New York: Psychology Press.
- Griffin, Susan. 1992. "Young Children's Awareness of Their Inner World: A Neo-Structural Analysis of the Development of Intrapersonal Intelligence." In *The Mind's Staircase; Exploring the Conceptual Underpinnings of Children's Thought and Knowledge*, edited by Robbie Case, 189–206. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Gurche, John. 2013. *Shaping Humanity: How Science, Art, and Imagination Help Us Understand Our Origins*. New Haven: Yale University Press.
- Harpham, Geoffrey Galt. 2017. "Imagination, the Junk Yard of the Mind." *Evolutionary Studies in Imaginative Culture* 1 (2): 85–92. doi:10.26613/esic/1.2.50.
- Harris, Paul L. 2000. *The Work of the Imagination*. Oxford, UK: Blackwell.
- Heusden, Barend P. van. 2009. "Semiotic Cognition and the Logic of Culture." *Pragmatics and Cognition* 17 (3): 611–627. doi.org/10.1075/pc.17.3.07van.
- . 2010. "Estrangement and the Representation of Life in Art." In *Ostrannenie: On 'Strangeness' and the Moving Image: The History, Reception, and Relevance*

- of a Concept*, edited by Annie van den Oever, 157–164. Amsterdam: Amsterdam University Press.
- Huovinen, Erkki, and Anna-Kaisa Kaila. 2015. “The Semantics of Musical Topoi: An Empirical Approach.” *Music Perception* 33 (2): 217–243. doi:10.1525/mp.2015.33.2.217.
- Huxley, Julian. 1914. “The Courtship Habits of the Great Crested Grebe (*Podiceps Cristatus*) together with a Discussion of the Evolution of Courtship in Birds.” *Journal of the Linnean Society of London, Zoology* 53 (3): 253–292.
- Janata, Petr, and Scott T. Grafton. 2003. “Swinging in the Brain: Shared Neural Substrates for Behaviors Related to Sequencing and Music.” *Nature Neuroscience* 6 (7): 682–687. doi:10.1038/nn1081.
- Jordania, Joseph. 2011. *Why do People Sing? Music in Human Evolution*. Logos: Tbilisi.
- Juslin, Patrik N., and Daniel Västfjäll. 2008. “Emotional Responses to Music: the Need to Consider the Underlying Mechanisms.” *Behavioral and Brain Sciences* 31 (6): 559–575. doi:10.1017/S0140525X08005293.
- Kandel, Eric R. 2006. *In Search of Memory: The Emergence of a New Science of Mind*. New York: Norton.
- Kania, Andrew. 2015. “An Imaginative Theory of Musical Space and Movement.” *British Journal of Aesthetics* 55 (2): 157–172. doi:10.1093/aesthj/ayu100.
- Kawabata, Hideaki, and Semir Zeki. 2004. “Neural Correlates of Beauty.” *Journal of Neurophysiology* 91 (4): 1699–1705. doi.org/10.1152/jn.00696.2003.
- Levinson, Jerrold. 1996. “Musical Expressiveness.” In *The Pleasures of Aesthetics*, 90–125. Ithaca, NY: Cornell University Press.
- Margulis, Elizabeth H., Patrick C. M. Wong, Rhimmon Simchy-Gross, and J. Devin McAuley. 2019. “What the Music Said: Narrative Listening Across Cultures.” *Palgrave Communications* 5 (146): 1–8. doi.org/10.1057/s41599-019-0363-1.
- Matrone, Carmela, and Elvira Brattico. 2015. “The Power of Music on Alzheimer’s Disease and the Need to Understand the Underlying Molecular Mechanisms.” *Journal of Alzheimer’s Disease & Parkinsonism* 5 (3): 1–7. doi:10.4172/2161-0460.1000196.
- Mithen, Steven. 2005. *The Singing Neanderthals: The Origins of Music, Language, Mind, and Body*. Cambridge, MA: Harvard University Press.
- Moors, Agnes. 2007. “Can Cognitive Methods Be Used to Study the Unique Aspect of Emotion: An Appraisal Theorist’s Answer.” *Cognition and Emotion* 21 (6): 1238–1269. doi:10.1080/02699930701438061.
- Morley, Ian. 2013. *The Prehistory of Music*. Oxford, UK: Oxford University Press.
- Nelson, Katherine. 2005. “Emerging Levels of Consciousness in Early Human Development.” In *The Missing Link in Cognition: Origins of Self-Reflective Consciousness*, edited by Herbert S. Terrace, and Janet Metcalfe, 117–141. Oxford, UK: Oxford University Press. doi.org/10.1093/acprof:oso/9780195161564.003.0004.
- Nelson, Katherine, and Robyn Fivush. 2000. “Socialization of Memory.” In *The Oxford Handbook of Memory*, edited by Endel Tulving and Fergus Craik, 283–295. Oxford: Oxford University Press. doi.org/10.1016/s0001-6918(00)00065-2.

- . 2004. “The Emergence of Autobiographical Memory: A Social Cultural Developmental Theory.” *Psychological Review* 111 (2): 486–511. doi:10.1037/0033-295X.111.2.486.
- Panksepp, Jaak. 2005. “Affective Consciousness: Core Emotional Feelings in Animals and Humans.” *Consciousness and Cognition* 14 (1): 30–80. doi:10.1016/j.concog.2004.10.004.
- . 2009–2010. “The Emotional Antecedents to the Evolution of Music and Language.” *Musicae Scientiae* 13: 229–259. doi:10.1177/1029864909013002111.
- Pieslak, Jonathan. 2009. *Sound Targets: American Soldiers and Music in the Iraq War*. Indiana University Press.
- Plotnik, Joshua M., Frans B. M. de Waal, Donald Moore, and Diana Reiss. 2010. “Self-Recognition in the Asian Elephant and Future Directions for Cognitive Research with Elephants in Zoological Settings.” *Zoo Biology* 29 (2): 179–191. doi.org/10.1002/zoo.20257.
- Reybrouck, Mark, and Tuomas Eerola. 2017. “Music and Its Inductive Power: A Psychobiological and Evolutionary Approach to Musical Emotions.” *Frontiers in Psychology* 8 (494): 1–14. doi:10.3389/fpsyg.2017.00494.
- Reybrouck, Mark, Peter Vuust, and Elvira Brattico. 2018. “Brain Connectivity Networks and the Aesthetic Experience of Music.” *Brain Sciences* 8 (6): 1–14. doi:10.3390/brainsci8060107.
- . 2018. “Music and Brain Plasticity: How Sounds Trigger Neurogenerative Adaptations.” *IntechOpen*: 85–103. doi.org/10.5772/intechopen.74318.
- Romanes, George J. 1885. *Mental Evolution in Animals*. London: Kegan Paul, Trench, & Co.
- Saarikallio, Suvi, and Jaakko Erkkila. 2007. “The Role of Music in Adolescents’ Mood Regulation.” *Psychology of Music* 35 (1), 88–109. doi.org/10.1177/0305735607068889.
- Savall, Jordi. 2009. “The Power of Music.” In *Seminar on the Social Responsibility of the Artist*. Centre for the Humanities, Utrecht University. September 6.
- Schacter, Daniel L., Donna Rose Addis, Demis Hassabis, Victoria C. Martin, R. Nathan Spreng, and Karl K. Szpunar. 2012. “The Future of Memory: Remembering, Imagining, and the Brain.” *Neuron* 76 (4): 677–694. doi:10.1016/j.neuron.2012.11.001.
- Schacter, Daniel L., Donna Rose Addis, and Randy L. Buckner. 2007. “Remembering the Past to Imagine the Future: the Prospective Brain.” *Nature Reviews Neuroscience* 8: 657–661. doi.org/10.1038/nrn2213.
- Schacter, Daniel L., and Endel Tulving. 1994. “What are the Memory Systems of 1994?” In *Memory Systems*, edited by Daniel Schacter and Endel Tulving, 1–39. Cambridge, MA: MIT Press. doi.org/10.1017/s1355617700001223.
- Smith, W. John. 1977. *The Behavior of Communicating: An Evolutionary Approach*. Cambridge, UK: Cambridge University Press.
- Suddendorf, Thomas, and Michael C. Corballis. 1997. “Mental Time Travel and the Evolution of the Human Mind.” *Genetic, Social, and General Psychology Monographs* 123 (2): 133–167.

- . 2007. "The Evolution of Foresight: What is Mental Time Travel, and is It Unique to Humans?" *Behavioral and Brain Sciences* 30 (3): 299–313. doi.org/10.1017/S0140525X07001975.
- Tanner, Julian, Mark Asbridge, and Scot Wortley. 2008. "Our Favourite Melodies: Musical Consumption and Teenage Lifestyles." *The British Journal of Sociology* 59 (1): 117–144. doi.org/10.1111/j.1468-4446.2007.00185.x.
- Terrace, Herbert S. 2005. "Metacognition and the Evolution of Language." In *The Missing Link in Cognition: Origins of Self-Reflective Consciousness*, edited by Herbert S. Terrace, and Janet Metcalfe, 84–115. New York: Oxford University Press.
- Terrace, Herbert S., and Janet Metcalfe, eds. 2005. *The Missing Link in Cognition: Origins of Self-Reflective Consciousness*. Oxford: Oxford University Press.
- Thomas, Nigel J. T. 2003. "Imagining Minds." *Journal of Consciousness Studies* 10 (11): 79–84.
- . 2014. "The Multidimensional Spectrum of Imagination: Images, Dreams, Hallucinations, and Active, Imaginative Perception." *Humanities* 3 (2): 132–184. doi:10.3390/h3020132.
- Tinbergen, Nikolaas. 1952. "Derived Activities: Their Causation, Biological Significance, Origin, and Emancipation During Evolution." *Quarterly Review of Biology* 27 (1): 1–32. doi.org/10.1086/398642.
- Trivedi, Saam. 2011. "Music and Imagination." In *The Routledge Companion to Philosophy and Music*, edited by Theodore Gracyk and Andrew Kania, 113–122. New York: Routledge.
- Tulving, Endel. 1985. *Elements of Episodic Memory*. Oxford, UK: Oxford University Press.
- . 2005. "Episodic Memory and Autonoesis: Uniquely Human?" In *The Missing Link in Cognition: Origins of Self-Reflective Consciousness*, edited by Herbert S. Terrace, and Janet Metcalfe, 3–56. Oxford: Oxford University Press.
- Uexküll, Jakob von. 1926. *Theoretical Biology*. New York: Harcourt, Brace & Co.
- Vessel, Edward, Gabrielle Starr, and Nava Rubin. 2013. "Art Reaches Within: Aesthetic Experience, the Self and the Default Network." *Frontiers in Neuroscience* 7: 1–9. doi.org/10.3389/fnins.2013.00258.
- Waal, Frans B. M. de, and Pier Francesco Ferrari. 2012. *The Primate Mind: Build to Connect with Other Minds*. Cambridge, MA: Harvard University Press.
- Wah, Alejandra. 2017. "Cognitive Processes Underlying the Artistic Experience." *Avant: Trends in Interdisciplinary Studies VIII* (1): 45–58. doi:10.26913/80102017.0101.0003.
- . 2019. "Reflective Imagination via the Artistic Experience: Evolutionary Trajectory, Developmental Path, and Possible Functions." *Evolutionary Studies in Imaginative Culture*, 3 (2): 53–71. doi:10.26613/esic/3.2.143
- . In Press. "Cognitive Processes Underlying Play and Pretend Play: A Comparative Cross-Species Study on Degrees of Memory, Perception, Imagination, and Consciousness." *American Journal of Play*.
- Walton, Kendall L. 1994. "'Listening with Imagination': Is Music Representational?" *The Journal of Aesthetics and Art Criticism* 52 (1) 53–54.
- . 1999 "Projectivism, Empathy, and Musical Tension." *Philosophical Topics* 26 (1/2): 407–440. doi:10.5840/philtopics1999261/231.

Biography

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