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Evolutionary Psychology and the Performing Arts

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INTRODUCTION

This chapter explores an evolutionary approach to the phenomenon of human performative culture. In attempting to 'reverse-engineer' capacities that we find to be universal in human society, we first consider what these may represent: a range of aptitudes and characteristics, and the relationships evident between them. A suite of practices embraces music, dance, mime, and drama, together with combinations and extensions of these (e.g., puppetry, pageant, opera, religious observance, some spectator sports) informed by the diverse contexts of play, ritual, and narrative presentation. Performances work on audiences in varied ways: on memory, anticipation, social cohesion, emotion, and cognition. The performing arts exploit language and are commonly rehearsed and responded to with recourse to this medium. But not only can music, mime, and dance be practiced and transmitted independently of language, their complementary status in relation to verbal interaction points to the possibility of their being considerably older behaviors that predate the emergence of speech.

The timescale we need to invoke for the development of the performing arts is thus one that reaches into deep prehistory for us to discern patterns of origin in traits possessed by other species with which *Homo sapiens* share common ancestry. In parallel with analysis of divergent evolution on these lines will be a consideration of the adaptations to changing environmental challenges that permit modern humans to survive across the globe. A role is evident for inter-species mimicry that may have been shaped by hunting practices and predator avoidance which have left their mark on spirituality and ritual.

The animal origins of expressive representation and communication underpin the genetically-determined, instinctive behaviors of each individual. These become capable of release and intentional exploitation through cultural transmission that depends

on collective interaction. A candidate model for capturing this relationship is recapitulation theory (Gould, 1977), tracing parallels between phylogeny and ontogeny. While modern humans are bipedal, they pass through a significant quadruped phase in infancy in which their four-footed gait presents similarities to that of mammal quadrupeds (Righetti et al., 2015; Zehr et al., 2009). Descent from tree-dwelling ancestors has left vestiges of the instinct to brachiation evident in newborn humans (Futagi et al., 2012); though without special training (gymnasts, acrobats, circus performers; Pennock, 2013), few of us successfully transcend the upright ambulant locomotion of our modern evolved anatomy. Nevertheless, the specialized role of human limbs, divided between the function of the legs in bipedal locomotion and the arms and hands in a sophisticated capacity for independent manipulation, presents the anatomical resources for complex patterns of movement in dance, contrasting modes of employment in work, and instrumental performance that exploit these evolved characteristics to the full. The recapitulation of phylogeny in ontogeny features in a variety of ways in the modeling of how the performing arts have emerged.

A range of facial expressions, correlating with specific emotions which motivate instinctive vocal utterance, corresponds to a set of timbral characteristics that supply the vowel sounds on which language depends (Bannan, 2008; Manén, 1974). The means by which vocal learning permits these to be controlled confers advantages both in the capacity for speech, and in the medium of coordinated wordless song. In terms of vocal range, human children of both sexes share with their mothers an average octave difference from adult males in both speech and song; male adolescents undergo a rapid transformation through which the voice deepens to conform to their fathers' range (Puts et al., 2006; Cooksey, 1997). The consequence of this acoustic arrangement, for the family and tribe, is the capacity for harmonic reinforcement through which the entire group performs resonantly to its mutual benefit and well-being (Bannan, 2012b).

The story of the performing arts is complex, and its disentanglement on evolutionary grounds somewhat provisional. This chapter therefore proposes trajectories that may inspire further research, drawing on existing work in disciplines such as archaeology, anthropology, semiotics, neurology, vocal acoustics, audiology, child development, and social psychology, in order to illuminate the principal issues that can inform future investigation.

MODELS FOR EVOLUTIONARY THINKING: DARWIN'S LEGACY

In exploring their perspective on the origin of the performing arts, Darwin's evolutionary theories, variously extended and interpreted since their original presentation in the second half of the 19th century, provide convincing proposals for the origins of traits and abilities that have given rise to culture. A sequence of three publications presented the foundations of the evolutionary approach to be explored in this review. The principal of Natural Selection was proposed in *The Origin of Species* (1859); Sexual Selection as the mechanism of characteristics that govern reproduction was propounded in *The Descent of Man* (1871); and the key focus on communication was the theme of *The Expression of the Emotions in Man and Animals* (1872).

Darwin's achievement immediately inspired responses from his contemporaries, spreading the influence of his theories into other disciplines as their potential lent itself to elaboration. Variant interpretations unrepresentative of Darwin's own thinking have complicated a clear understanding of the implications of his work, and inhibited acceptance of its application to fields such as music (Kivy, 1959). For instance, Spencer's (1857) account of the origins of music saw

it as derived from emotionally heightened speech, whereas Darwin's own conclusion (1871) was that musical vocalization occupied a developmental stage between animal communication and language:

> We must suppose that the rhythms and cadences of oratory are derived from previously developed musical powers. We can thus understand how it is that music, dancing, song, and poetry are such very ancient arts. We may go even further than this, and … believe that musical sounds afforded one of the bases for the development of language. (Darwin, 2004: 638–9)

The 'survival of the fittest' tag (Spencer, 1864) illustrates a preoccupation among post-Darwinian commentators (Galton, 1869) with intra-species competition, whereas Darwin's preferred focus was more on the adaptive nature of cooperation. The meme even arose in the biographical literature that Darwin was himself 'tone deaf', a description entirely at odds with his early interest in music and its significance in his attraction to Emma Wedgwood (Healey, 2001), let alone his employment of music in his experiments with animals and infant humans, his informed observations of the musical performances encountered while on the *Beagle* voyage, and his lasting contribution to speculation on the purpose and origins of the arts (Bannan, 2017).

Tylor's *Primitive Culture* appeared in 1871, in the same year as *The Descent of Man*, and from the same publisher, John Murray. Tylor (1871: 152, 223) cites Darwin's eyewitness accounts of religious ceremonies and performances from the *Beagle* Journal (Darwin et al., 1839). The fledgling field of anthropology thus emerged out of an evolutionary approach to humankind and the manifestations of culture. An aspect of this perspective, and a source of contention both within the discipline and in contemporary politics, was the concept of universality: the principle that all members of the species *Homo sapiens* share the same inherited characteristics and therefore an equivalent capacity for cultural expression[1]. The Berlin School of Ethnomusicology led by Curt Sachs and Erich von Hornbostel based the development of their approach upon fieldwork and the analysis of recordings informed by the scientific application of acoustics, psychology, and anatomy (Hornbostel and Sachs, 1914). The German-language original of Sachs's *World History of the Dance* was published in 1933, its author escaping to the USA, where universalism proved less unacceptable than in Nazi Germany. The book opens:

> The dance is the mother of the arts. Music and poetry exist in time; painting and architecture in space. But the dance lives at once in time and space. The creator and the thing created, the artist and the work are still one and the same thing. (Sachs, 1937: 3)

Parallels to the universalist approach to dance and music emerged in Carl Jung's (1919) idea of the collective unconscious and the expressive archetypes that derive from it, Lévi-Strauss's (1962) analysis of myth and narrative, and Bowra's cross-cultural investigation into the texts of Primitive Song (1962).

A convincing adaptationist account of the role and origins of music and the performing arts did not fully emerge until the last quarter of the 20th century, in a series of publications that included Livingstone (1973), Wallin (1991) and Mithen (2005). While writers such as Pinker (1997) have argued against an evolutionary explanation for the phenomenon of music, let alone for its claimed role as a precursor to language, a growing consensus across several disciplines has moved this topic from the periphery towards a central position in accounting for the nature and attributes of human culture (Ball, 2010; Bannan, 2012a; Changizi, 2011; Levitin, 2006; Morley, 2013; Tomlinson, 2015; Wallin et al., 2000).

The framework for the research trajectory that made possible this new focus on the adaptive nature of the arts has drawn extensively on earlier interpreters of Darwin in creating the synthesis that has informed speculation and research. For instance, the American

scholar Baldwin (1896) accomplished a significant application of Darwinian thinking to psychology, proposing that behavioral response to a changed environment shapes natural selection. Podlipniak (2017) proposed on Baldwinian lines a theory of the development of the role in perception and production of the pitch center that accounts for the phenomena of both musical tonality and prosody in language (see, also, Bannan, 2012b). The evolutionary term *exaptation* (Gould and Vrba, 1982) captures the means whereby a characteristic that evolved in response to one set of circumstances could prove useful for a different purpose in a changed environment (c.f. Changizi's (2011) concept of an existing trait 'harnessed' to new purpose). These modifications of classic natural selection are particularly suitable to theorization concerning the arts and their significance. Of special consequence to the story of human culture is the nature of collective reinforcement in dance and song: the capacity for precise coordination in three-dimensional movement (Garfinkel, 2010; Large, 2000) and the musical parameters of pitch, duration, amplitude, and timbre that constitute unison singing (Bannan, 2020; Merker, 1999). A further variant of natural selection, *group* or *kin selection* (Hamilton, 1971), has featured in explanation of the crucial behavioral trait represented by simultaneous performance in both sound and movement. While there is growing evidence of the physical and psychological benefits of coordinated group engagement consistent with adaptive origins (Dunbar et al., 2012; Koch et al., 2014), these are generally viewed as specialized outcomes of natural selection.

However, if artistic expression is adaptive (Morriss-Kay, 2009), then we need to understand the process by which instinctive responses carried in our genes form the basis for learning and exchange mediated, accelerated, and recorded by cultural transmission. Tinbergen (1951) posed four questions to determine whether and in what way a trait or ability is instinctive:

1 How has the capability evolved in the species?
2 How do individuals within the species develop the capability?
3 What happens in the nervous system when the capability is exercised?
4 Why is the capability exercised in a particular circumstance?

These questions divide into two pairs: 1 and 2 represent the investigation of ultimate explanations ('why?'); 3 and 4 deal with proximate ('how?') (Scott-Phillips et al., 2011). In sifting through the evidence associated with the development of the performing arts, whether in the fossil record, the material legacy, the recorded accomplishments of historic and living humans, or comparisons between animal and human behaviors, we remain guided by Tinbergen's approach, and aim to discriminate between ultimate and proximate interpretations.

Examples of ultimate evolutionary causality which may have given rise to aspects of the performing arts include:

mate attraction and retention;
understanding of the minds of conspecifics;
understanding of and capacity to mimic and exploit other species;
capacity to exchange information through vocal, gestural, and imitative means;
capacity to engage in collective activity, including work, defense, and hunting;
the protection and nurture of infants.

By contrast, examples of proximate explanation include:

the assumption of tokens of role and hierarchy (crowns, weapons, uniforms);
the mnemonic abilities conferred by performative and artistic media;
activities that permit and convey measurement, its recall, and its role in prediction and planning;
play and ritual as rehearsal for work, defense, hunting, and parenting;
activities oriented to instruct or encourage others;
self-recognition and self-consciousness;
sacrifice, and the presentation of altruism.

These categories represent abstract or theoretical applications of Darwinian analysis in preparation for a closer consideration of real-life examples that are consistent with a variety of evidence.

'REVERSE-ENGINEERING' THE ANATOMICAL PREREQUISITES FOR THE PERFORMING ARTS

Reconstructing the means by which artistic traits may have emerged in human culture relies on evidence and its interpretation in two principal research fields. The first is that of modern human anatomy, including its consequences for psychology; the second is the material record of human culture – the use of fire, of tools and ornaments, and of spaces in which performances may have been enacted. Investigation of the fossil record illustrates the extent to which analysis of these two forms of evidence combines as traces of cultural behavior began to accompany the deposit of human remains.

Consideration of anatomical features of the evolved prerequisites for art and culture (Bannan, 2003; Morley, 2013) commences with the senses and their integration in perception. The aural system presents a means of spatial location suitable for life in dense forest or the tall grass of tropical savannah, capable of detecting direction and speed of movement through Doppler analysis (Changizi, 2011) and of discriminating timbre and its combination through an instinctive response to harmonicity (Bannan, 2012b; Podlipniak, 2017). Hearing is the first system to commence laying down memories, which it does in the three months *in utero*, prior to birth (Woodward, 2019). Indeed, Prochnow et al. (2017) compared the intonation of German and Swedish babies to suggest that the precise shape of the infant's first cry is influenced by the sound of its mother-tongue perceived in the womb. The human visual system perfectly complements the aural, the forward-facing, binocular presentation of the eyes working in tandem with hearing to locate the origin of sound sources and track speed and direction of movement. Both hearing and sight gather stimuli from a position near to the vertical maximum of an upright posture oriented to optimum exploitation of the vestibular system on which bipedal locomotion depends (Bannan, 2003; Morley, 2013). The senses of taste and smell involve receptors in the mouth and nose that interact with the digestive and respiratory tracts, respectively. Receptors for these four senses – hearing, sight, taste, and smell – are located within the mid-to-forward section of the skull and, in their connection to the brain, exhibit a degree of overlap, especially where one sense primes for the expectation of perception in another. The tactile sense receives information to differing extents from all over the surface of the body, with a concentration of sensitivity in the feet and hands, and especially the fingertips.

Learning and discrimination proceed as extensions of instinctive responses related to basic needs and their emotional expression. These are exhibited from the first hours of life. Hunger and thirst, discomfort in relation to temperature or wetness, and separation from the provider of care and attention lead to stress that, on its alleviation, may be accompanied by pleasure or relaxation. Disgust sends a signal, as well as registering the need for avoidance. Interaction with carers lays down the means by which instinctive responses can be captured as the bases for communicative behaviors in sound and gesture, involving mimicry and repetition that enables learning and voluntary control.

A bridge between perception and production is evident in several examples of instinctive response to stimuli that provide an early indication of how the senses may be primed for social interaction and learning. Meltzoff and Moore (1977) presented evidence for the instinctive imitation of tongue protrusion and manual gestures in newborns, while Kessen et al. (1979) recorded aural-oral responses

between infants and mothers in the matching of precisely pitched vocalizations. A walking or stepping reflex is exhibited soon after birth, the child supported by a carer in an upright position, and it can form the basis for training that encourages and accelerates the eventual achievement of independent locomotion (Forssberg, 1985; Yang et al., 1998).

A set of physical reflexes elicited by clinical staff as a means of checking for neural abnormalities provides insight into the ontogeny of human locomotion (Futagi et al., 2012). The palmar and plantar grasp reflexes can be elicited in utero by the 25th week of pregnancy. Ernst Moro (1918) described a reflex that now bears his name, also observable *in utero*. Once born, infants continue to exhibit these reflexes in response to specific stimulation. The palmar grasp involves the infant wrapping its fingers around the finger of an examiner who lightly touches the infant palm (Futagi et al., 2012: 2). The grasp reflex in newborns is sufficiently strong for them to support their own body weight (Futagi et al., 2012: 7). The plantar grasp is an equivalent response in the infant foot, involving the flexion and adduction of the toes. Both of these reflexes decline and disappear by the age of six months (palmar) and 12 months (plantar), as the infant begins voluntarily to employ the hands to grasp, and the feet to stand, and to practice locomotive and manipulative functions that require the limbs to be under intentional control.

The Moro reflex (Futagi et al., 2012: 5) is a response to surprise that may take the form of a sudden sound or movement, sensation of cold on the chest or stomach, or change to the sense of support of the head. The response of the infant comprises abduction of the arms at the shoulders coupled to extension of the forearms at the elbows, together with extension of the spine and retraction of the head. The Moro reflex also usually disappears by around six months. Futagi et al. (2012: 8) speculate on the phylogenetic origins of these responses as having been essential to the survival of the young in arboreal predecessor species. Interestingly, the Moro reflex has also been observed in infant apes and monkeys (Katona, 1998), and evidence that the palmar reflex inhibits the Moro reflex may suggest that it played a role in interaction with the mother as a form of protection against falling (Futagi et al., 2012: 9). What is clear in the interaction between human mothers and infants is that mediation of these instinctive responses plays a part in bonding and socialization involving multi-modal emotional engagement arising out of the infant's trustful dependence on a carer.

Perception and instinctive response provide the basis for infants' expressive employment for learning of their increasingly familiar anatomy as cognition engages with the vocal system and limbs in communicative production and generativity that is uniquely human. Rhythmic entrainment to musical stimuli interacts with the rehearsal of locomotion, which depends on precisely repeated patterns that lend themselves to play and elaboration. Musical responses in the movement of the limbs parallel the acquisition of vocal control (Bannan, 2003), rehearsed by solitary infants but strongly related to interaction with carers. The hands develop the independent abilities that confer interaction with the extrasomatic environment (grasping, holding, placing objects) and of communicative potential (pointing, gesturing). Voice and gesture interact with facial expression, which commences instinctively as an honest signal prior to control being acquired to permit artificial representation (play-acting; the 'poker face') and deception. These co-opt muscular responses arising from specific emotions that can be recalled and expressed both instinctively and as learned patterns. As upright posture is achieved, it completes a functional array of bodily positions (lying, kneeling, sitting, squatting, standing) in which songs, games, and narratives can enact movement between one position and another. Songs and movement games rehearse bodily self-knowledge ('Heads, shoulders, knees and toes', etc.). Enculturation accelerates bodily

self-knowledge in the kinesthetic and vocal domains.

The anatomical and sensory advances through which communication develops are made possible by the large and complex brains with which human infants are endowed. Especially significant to the relationship between emotion and cognition that enables artistic expression and language is plasticity (Hrvoj-Mihic et al., 2013). We are well equipped to deal with changing circumstances:

> human life history is characterized by an extended period of offspring dependency compared to chimpanzees, delayed onset of reproductive maturation, and long post-reproductive life-span, enabling prolonged cognitive maturation, acquisition of skills necessary for survival, and their transmission across generations. (Hrvoj-Mihic et al., 2013: 1)

Plasticity provides 'selective advantages to hominins in unstable conditions' (Hrvoj-Mihic et al., 2013: 2). The capacity for learning is multi-modal, conferring the advantages of both specialized skills and their integration. Thought can be organized, represented, and expressed through recursion both within and between learned abilities, a capacity that only humans possess that is dependent on a sophisticated ability to lay down, sort, and retrieve memories (Hurford, 2004).

Recursive thought and its role in learning emerge from the developmental interdependence between genetically inherited abilities and cultural transmission that is most strongly evident in mother-infant interaction (Trevarthen, 1998). The literal physical attachment to its mother in the womb involves the fetus in hormonal exchange associated with aural and movement stimuli, an environment that changes radically at birth. Nevertheless, there is continuity in both dependence and perception, a vital component of infant well-being. Bjorklund (2006) reviewed the evolutionary nature of this developmental phase and its crucial role in the expression of behavioral plasticity. He illustrates the epigenetic relationship between genetic and phenotypic factors: 'developmental mechanisms responsive to both genetic and environmental influences produce phenotypic variation that selection might then act upon' (Bjorklund, 2006: 214). What might we then learn from considering the evidence for the nature of the environments into which human infants and their ancestors have been born in widely separated parts of the globe?

Human cognitive plasticity has led to cultural practices that allowed people to adapt to widely different climatic and environmental conditions involving varied diets, contrasting lifestyles (settled, nomadic), and diverse employment of clothing and bodily adornment. The evidence of these in the fossil record allows speculation on the role of the performing arts in early societies and permits comparisons to be drawn with cultural practices that have survived into modern times. A variety of material evidence informs speculation on the relationship between ultimate and proximate evolutionary explanation. Among these are:

- Fire: the husbanding, creation, and control of fire provides for warmth, protection, hunting, shaping the environment, and food preparation (Archibald et al., 2012; Pascoe, 2018). Hearths and remains located close to them provide insight into social organisation and cultural practice. While there is evidence of hominin control of fire from 1 million years ago, creation of fire is traceable to c. 350,000 BP (Shimelmitz et al., 2014). The hearth may be a location for performance (Gamble, 2012).
- Bodily adornment: among the earliest evidence of material associated with bodily adornment (Iliopoulos, 2016) are ochre (Wreschner et al., 1980), shells, and beads made from them (by Neanderthals, Zilhão et al., 2010; by modern humans, d'Errico et al., 2005); and feathers (Finlayson et al., 2102) – materials that are still employed in bodily adornment today, often in circumstances that relate to dance or ritual performance.
- Clothing for warmth: Gilligan (2007) considered the role of clothing in the capacity of modern

humans to survive climate change that may have led to the demise of the Neanderthals during the period 50,000–30,000 years BP. While clothing itself has not survived from such a distant past, buttons to secure clothes and eyed needles to manufacture them have done, and clothed humans are depicted in art from towards the end of the period. Genetic evidence of the divergence between head and bodily lice (Toups et al., 2011) illustrates that clothing may have been in use as early as 170,000 years BP and regularly so by 83,000 years BP. As remains the case today, clothing for practical purposes (warmth, specific tasks, uniformity) conveys the intention to adorn for special purpose (social ceremony, specific role) or to assert rank or status, as well as emphasizing gender and sexual attractiveness.

- Cave art both depicts dance and musical performance and may represent the designed or adapted location for them. The geographically widespread production of hand stencils is itself a performative act that leaves a trace (Dobrez, 2013), and painting using the breath both creates an image and employs a sound-producing instrument (Gheorghiu, 2019). In a tradition with a long prehistory, dance associated with trance states and healing features clearly in San rock paintings from Southern Africa (Lewis-Williams 2010: 139–41). In Gobustan, near Baku, a petroglyph of line dancing from 6,000–7,000 years BP in the Beyukdash rocks resembles others that depict men hunting and inspires present day enactment of the 'yally dance' (Farajova, 2011). Rock art may equally represent the location at which performance took place. Acoustic measurements at sites of depictions and decoration have demonstrated their enhanced response to musical sound (Rifkin, 2009; Till, 2014).
- Weapons and evidence of their use: tools for killing prey are equally capable of being turned on other humans, as the forensic analysis of the cause of death illustrates in buried corpses. Evidence for cannibalism is also consistent with the butchery of human remains. Spears, clubs and bows, slings, and cutting edges represent the means of survival, and their descendants in the arms race of human history have acquired symbolic significance associated with performance and ritual: military bands, ceremonial maces, depictions on flags and coats of arms. Sword and quarterstaff dances exist in a variety of cultures, and a performative ritual frequently both trains for and precedes involvement in a variety of martial arts. Brazilian males dancing capoeira are sublimating an aggressive martial art in cooperative action (Downey, 2008).
- Musical instruments have survived intact as well as in artistic depiction. Excavated at Hole Fels in Southern Germany, flutes crafted from the wing bones of birds have been dated to over 35,000 years ago, as well as one at Geißenklösterle, more painstakingly carved from mammoth ivory (Conard et al., 2009). Other surviving prehistoric musical instruments have included whistles and bullroarers (Morley, 2013). Stockmann (1986) reviewed evidence from European and Mediterranean sites for drums and drumming, including artistic depictions of performance. In accounting for these earliest appearances of surviving instruments, one assumes that where the bone, ivory, and pottery from which they were made has survived, precursors or templates made from wood or bamboo would not have done. There are no prehistoric bark trumpets or didjeridus: but the prevailing ingenuity of craftsmen around the world in making musical instruments from a wide variety of local materials convinces that there could have been equivalents (Espi-Sanchis and Bannan, 2012). A further consideration would be the technological similarity between the design of instruments and those of weapons. Which came first, the end-blown flute or the blowpipe? The sling or the bullroarer? A clue exists in the two different forms of bow on which music is made by the Xhosa people of Southern Africa. The men's hunting bow has a musical equivalent that is played as a resonant bass percussion instrument; women also play, in a more genteel fashion, a scaled-down version that could do no harm to anything, held in the left hand resting on the lap while it is bowed with a stick held in the right hand (Dargie, 2011). Both male and female versions accompany and interact with song within the vocal range of the player.
- Pottery can be employed to make the bodies of drums over which skin can be stretched. It is also an ideal medium for decoration. Garfinkel (2010) proposes that the repeated patterns of human figures on the rims of pottery vessels from several locations in the Eastern Mediterranean and Mesopotamia depict the act of massed dancing that coincides with the kind of large-scale

organisation of labor necessary to devise the irrigation systems and crop husbandry required for the development of agriculture.

- Tools: flint-knapping involves musical listening of a precise kind if fault lines and striking points are to be efficiently detected (Cross et al., 2002). It also leaves a trace on the listening ear in terms of rhythmic iteration and the evaluation of acoustic properties (Blake and Cross, 2008). Where work is to be engaged collectively, it may be achieved to the beat of a drum or to the self-accompaniment of song. Tools – blades, awls, scrapers – would have been essential to the production of musical instruments, while their potential for sound production also gave rise to modified versions of them being employed by performers as musical instruments themselves. There are musical saws and hammers that are still required for the performance of works of art.
- Toys: children's playthings tend to mimic the associated items of the adults of their gender. Boys play-fight with objects resembling weapons. Girls tend to objects that they care for as if nurturing an infant. Songs may accompany these activities, and the narratives arising in relation to them can form a rehearsal for presented drama.
- Burial and funerary goods: the burial of the dead is near-universal in human culture and involves ritual that may comprise musical and oratorical performance. Tolbert (1990) investigated the key role that women's funeral lamenting plays in the musical practice of Karelia. Where people gather to mourn, there is music, and an appropriate rate and quality of movement.
- The adapted environment: in widespread parts of the globe, natural lithophones exhibit shaped surfaces and evidence of wear that illustrates the exploitation of their acoustic properties. These include sculpted stalagmites and stalactites (Díaz-Andreu and Mattioli, 2016); free-standing rocks (Boivin, 2004); and instruments assembled from component pieces of natural stone (Blench, 2006; Espi-Sanchis and Bannan, 2012) – a process that may have formed the template for the development of subsequent technologies for the crafting of tuned instruments from less durable materials. The field of acoustic archaeology proposes that we listen to the acoustic potential of both natural and man-made spaces and the decorations painted or inscribed upon them as a component of understanding their wider significance (Ouzman, 1997; Rifkin, 2009). In particular, one may speculate on the kinds of performative behavior, including specialized clothing and ritual enactment, that may have been associated with the cultural function of such environments (Watson and Keating, 1999; Till, 2014), and the times of year and season in which their relation to astronomical markers was of special significance.

This brief summary of the proximate interpretation of evidence that has come down to us from prehistoric cultures presents parallels with our own modern responses to the acoustic properties of special environments, the playing of instruments fashioned from a wide range of available materials, and the nature of occasions on which performances take place. It provides a foundation for thinking about how such properties are exploited in the wide range of ways through which the performing arts are engaged in today, both in traditional societies and contexts and in the new media that modern technology provides.

A conceptual bridge between prehistory and modern practice has been constructed in the work of archaeologists and anthropologists who have been able to work alongside traditional culture-bearers. This kind of collaboration illuminates the relationship between ancient and more recent artefacts as both contributing to continuing cultural significance. A complementary approach to the analysis of cultural development traces possible continuity between the ancient – surviving artefacts and the impact on the environment of historic and prehistoric ancestors – and the modern, as the use or interpretation of prehistoric evidence is sustained in the practices and lore of recent or current descendant populations. This form of chronologically presented, comparative interpretation is particularly associated with the archaeological practice pioneered in southern Africa by David Lewis-Williams, especially in application to the artistic heritage

of the Khoisan (Lewis-Williams, 2010). A similar collaborative agenda for the exploration, preservation, and interpretation of Australian cultural material is set out in the work of Griffiths (2018) and Pascoe (2018). Reference to models of this kind permits an insight into the examples of ritual behavior that may be associated with artistic performance in the wide variety of cultural practices that have emerged in the radically contrasting environments and climatic conditions of the world.

Two aspects of the practice of the performing arts are associated with the kinds of evidence that have given rise to our understanding of the role of music and dance over deep time: their capacity to act as mnemonic media for the recall of information that represents 'who we are', and the array of material objects on which artistic performance has come to depend.

The mnemonic function in song transmits knowledge from one generation to another. Children have their own repertoires, sometimes created or adapted by them as an alternative to the models endowed by adult teaching (Bannan and Woodward, 2008), including danced and body-percussion components (Chagall, 2014). Bowra (1962) reminds us that ancient texts such as The Bible and Homer came into being as written records arising from oral transmission of far greater age, a process for which he sought parallels in the song literature of indigenous Australians. The song lines of Australia illustrate how a repertoire committed to memory can represent knowledge of geographical relationships, sources of water and sustenance, and degrees of relationship with other people, as well as spiritual explanation for the world as the individual comes to know it as a privileged initiate (Blair et al., 2002, Norris et al., 2014).

A similar kind of repertoire has come down to us in the Psalms of David – poetry intended for sung performance – since it includes instruction on when and with what enthusiasm to sing it, and, in the case of Psalm 150, with precise directions for the accompaniment of instruments. The Psalms combine historical and geographical information with religious instruction and the provision of emotionally varied texts suitable for different occasions. The Psalms formed the performative bedrock of monastic liturgy within the Christian tradition that inherited this Jewish literature as a pattern for living, performed in their entirety over the cycle of worship of the religious orders (Zieman, 2008). One particular psalm carries an additional element beyond its Hebrew verbal origins, even despite translation into Latin and English. Psalm 114 (in the Anglican Prayerbook numbering) can still be sung to a melody, the *Tonus Peregrinus*, a mode of musical performance markedly different to the tonal conformity of the Gregorian Chant through which the psalms were intoned for over a millennium. Instead, the lines of Psalm 114 ('When Israel came out of Egypt/And the House of Jacob from among the strange people') are sung predominantly to two alternating reciting-notes, a practice that has been traced to the earlier tradition of performance in the Jewish temple itself (Lundberg, 2004). Both text and music represent a recorded version, now translated into most of the world's languages, of an originally oral tradition. But in this case, the trace of the means of melodic performance would seem to have survived alongside the text.

The mnemonic role of the Psalms took on a more elaborate role as composers in the European monasteries, colleges, and cathedrals adopted their texts and melodic intonation as the basis of increasingly extravagant musical works. Initially adding complementary voice parts weaving their way around the traditional chant, composers from the 13th century onwards employed the potential of music notation to record in written form music of a complexity that could not have been conceived or transmitted orally. The setting of psalm texts played a significant part in the output of composers as diverse as Josquin, Palestrina, Monteverdi,

Schütz, Handel, Bach, Mozart, Bruckner, Stravinsky, and Britten, as well as the many widely known hymns based on their texts rendered in metric form, and a song, *By the Waters of Babylon*, by the rock gospel performers Boney M. Within the two millennia of the Judaeo-Christian tradition, spanning the world through colonization, vocal performance of the psalms represents a songline of a scale unmatched by any other.

A curious instance of the mnemonic properties of music transmitted inter-generationally that illustrates the uniquely human, cross-modal nature of this form of information encoding and retrieval is provided by the case of vocal learning in a species other than our own. A farmer in rural New South Wales found that the music by J. S. Bach he was performing on the flute was being learned by a young lyrebird (Powys et al., 2013). The lyrebird's performance was uncannily accurate both in sound and content. Does this make it the equal of human music? The lyrebird went on to 'teach' this repertoire to subsequent generations. While the results may have been recognizable to an extent as versions of Bach's music, their survival in the form of a bird's repertoire of song is a quite different phenomenon to that of human music retaining reference to preceding times and places in human experience – not least the crafting of the instrument for which Bach wrote his music.

The cross-modal aspects of human musical performance are often more evident in the cultures of, for instance, Africa and the South Pacific than within the European tradition in which notation has influenced the means by which repertoire is learned. Movement and dance play a part in the embodied structure of song, the interaction between performers, and the relationship of performers to the space in which performance occurs. If a performed songline can achieve a navigational function equivalent to that of a visually presented map, what in origin may have been the relationship between these two modes of encoding and retrieval? Might there have been interaction between performance (vocalization, stepped movement in specific patterns, mimed direction) and visual media – for example the first rock engraving to be claimed as a map (Deleito, 2019)? If this is not a map, what is it? When is an artefact art, let alone a pointer to performance? If this is not the first map so far discovered, then what alternative candidates are there?

In examining the mnemonic properties of performance, we have indicated some features of culture that exemplify its purpose. An alternative field of enquiry is to consider the role of artefacts as components of performance, whether as adornments of the performer, or as tools and prosthetics that extend the range of the human body in visual, spatial, or acoustic dimensions. In turning to the function of material objects and the evidence for their role in performance from prehistory to the present, we can approach their use as augmentations or decorations of the body. Extrasomatic resources for artistic representation and communication include prosthetics such as: stilts, which permit the enlargement of the human frame and the depiction of beings with qualities that may range from either the comical and amusing to the superhuman and disconcerting; masks, which similarly distort, conceal, or amplify the facial repertoire of the wearer; and puppets, which stand in for their human manipulators through a variety of means (including: shadow projection; suspended from strings, as with a marionette; moved with rods; worn like a glove, brought to life through movements of the fingers; held in front of the performer like a smaller projection of their natural movements).

Musical instruments are tools for the controlled production of sound. They can be crafted from a wide variety of available material – bone, ivory, skin, hair, wood, bamboo, silk, stone, metal – and can be grouped by the manner in which they are played: aerophone, chordophone, membranophone, or idiophone (Hornbostel and Sachs, 1914). While designed principally to provide for effective

performance, they may also be highly decorated, and be considered works of art in their own right. The sounds of instruments may have iconic, referential roles in dramatic performance, from Chinese Opera to film music, and also in providing the accompaniment to specific genres of dance, religious processions, military marching, and social events.

Fire has had a role in ritual and performance, both as a source of light – whether the candles of religious ceremony or the blazing torches of open-air events – a symbol of cleansing, in the form of incense, or a supplier of heat, whether that of the hearth around which dancing and music could be performed and tales told into the night, or with the purpose of ritual burning, including animal sacrifice. The auto-da-fé of the Inquisition was a public spectacle involving music, costume, incantation, and a fiery conclusion. Since the development of safe means of lighting buildings in the 19th century, stage lighting has become an art-form in its own right through the medium of son-et-lumière, and lighting plays a vital role in creating the atmosphere of theatrical, ballet, and opera performances. Our response to the colors and intensity of light in achieving such affects have their origins in our experience of the natural world.

Other external artefacts that convey or enhance performance include vehicles – such as those built for street processions, pageants, and carnivals (and which are replaced by decorated boats in places such as Venice and the Pacific islands where transport is normally on water) – or effigies that are carried publicly to celebrate supernatural beings, such as the Madonnas of Catholic Europe or the juggernauts of Hindu festivals in India. Large-scale outdoor events such as these employ banners and flags that carry text or motifs appropriate to or explanatory of the occasion.

These features present proximate examples of the ways in which people observe performance practices, the places in which they do so, and the means they employ. What may be the evolutionary origins of these characteristics?

THE ANIMAL ORIGINS OF EXPRESSIVE REPRESENTATION AND COMMUNICATION

Comparative observation of animal and human behavior suggests that the origins of the performing arts may have represented a bridge shaped by two principal selective mechanisms: mate attraction and retention, and the development of a theory of mind that permits understanding of the intentions and emotions of conspecifics and which empowers collective action. Geoffrey Miller (2000) argues strongly for the role of sexual selection in shaping behaviors such as performance, citing the attractiveness of musicians and dancers in myth, history, and contemporary media coverage. He proposes that art and music were 'conspicuous display behaviors' (Miller, 2000: 5) and cites Zahavi's Handicap Principle (Zahavi, 1975) as a means of explaining the biological basis of altruism whereby prominence in protecting and providing for others is a desirable trait. The contribution to survival made by superior genes coming together through such a mechanism may well explain courtship rituals and anatomical adaptations such as the relative lack of body hair in females and the octave difference between adult male and female voices. However, sexual selection, while playing a definitive role in the development of human characteristics, is insufficient to explain our lifelong engagement in performative interaction: for instance, it does not account for the instinct of infants to respond to music and participate in dance and play-acting (Dissanayake, 2018).

Collective interaction presents a different form of achievement. Robin Dunbar (1998) modeled the birth of language as a focused and efficient form of grooming that permitted larger-brained hominins to keep track of social relationships in groups of increasing size and went on to demonstrate the measurable social benefits of collective laughter (Mehu and Dunbar, 2008), choral singing

(Dunbar et al., 2012), and dance (Tarr et al., 2016). The integration of independent adaptive traits over the thousands of generations, in which our ancestors met and survived changing environmental pressures, indicates that an iterative mosaic of psychological and cultural factors has been at work.

Donald (1991) proposed *mimesis* as an adaptive stage between animal communicative behavior and human culture, including the later emergence of speech. Links between animal behavior and human cultural practice remain prevalent, for a variety of reasons. We are from childhood fascinated by animals: those we relate to as pets, those that we encounter in everyday life such as birds, those we see in zoos or in safari parks, those familiar from wildlife documentaries, and those brought to life by CGI such as dinosaurs and extinct megafauna, or in their anthropomorphic representation in animations such as those made by Disney. The imitation or mimicry of animals plays a role of great significance in human cultural practices. The depiction of animals is one of the oldest and most universal themes in the visual arts (Clark, 1977).

Imitation of animal behavior informs cultural practices from children's songs and games to ritual enactments and spiritual representation (Lewis, 2009). A song structure that invites participants to mimic animal sounds, such as *Old McDonald had a farm*, has widespread parallels around the world (Durojaiye, 1977; Gammon, 2011). Adolescent Watussi girls in Zaire imitate the mating dance of the crowned crane (Wosien, 1974: 86–87), a behavior consistent with material evidence and depictions of similar rituals in prehistoric Çatalhöyük (Russell and McGowan, 2003) and found in cultures throughout Europe and Asia (Armstrong, 1943). Notably, cranes are, like swans that also feature strongly in artistic depiction and narrative, a pair-bonding species.

Ridington (1993) described the relationship between animal imitation and hunting practices in the pre-Columbian Salish of Pacific Canada, including the dancing that accompanied feasting. Individual hunters identified closely with the species which they acquired the special expertise and ritual approbation to kill. Similar beliefs and practices have been found in hunter-gatherer societies in South America, Africa, and Australia, illustrating close connections between the management of food sources, religious systems, and ritual enactment in performance (Nadasdy, 2007).

The interdependence of mankind and animals presents impressions of both ultimate and proximate evolutionary processes. In the former case, man shares instinctive responses and anatomical functions with distant ancestors that shape behavior and interaction with the environment; in the latter, specific attributes of culture are transmitted intergenerationally as the means whereby infants acquire the skills to survive and, eventually, to reproduce. Zlatev et al. (2005) reviewed the influence of Donald's (1991) staged adaptive sequence for the emergence of human culture, drawing on a range of literature concerned with child development, semiotics, and theory of mind to propose mimesis as 'the missing link' in human cognitive evolution. The synthesis presented draws on Vygotsky's (1962) proposal for how infants assimilate cultural competence, first on the social (interpsychological) level, and secondly within their own minds (the intra-psychological level). This represents a mediation between social and cognitive intelligence (see Gardner, 1983 or Mithen's, 1996 'chapels of the mind') that proceeds from imitative interaction to generativity. Grice's (1969) formulation for recursive, intentional communication guides evaluation of the sequence whereby complex, multi-modal transmission emerges from simple imitative origins. This is exemplified in Zlatev et al. (2005: 5) in four stages: *Proto-mimesis* (facial expression, bodily synchronization); *Dyadic mimesis* (shared attention, imperative pointing, mirror self-recognition, do-as-I-do imitation); *Triadic mimesis* (joint attention, declarative pointing, pantomime);

and *Post-mimesis* (signed language). In cognitive terms, this model clearly conveys a hierarchical sequence that captures the stages which distinguish human from animal capacities, consistent with the implications of Vygotsky's (1962) Zone of Proximal Development. In Vygotskyan terms, *triadic mimesis* could be viewed as a stage of development achievable with human intervention in apes, as with parental support in children; but this is the peak of what the ape can achieve, whereas it is a springboard for continued normal development in human infants (Zlatev et al., 2005). This is the point at which the capacity for the performing arts takes flight.

One nagging doubt, however, accompanies consideration of the model explored by Zlatev et al. (2005): why the implied silence of our ancestors ('pantomime'; 'signed language')? It is an issue that troubled Steven Mithen (2003, 2005), motivating his speculation on the musicality of the Neanderthals, and his depiction of early modern humans as dancers, singers, and players of instruments. Aside from the evidence of acoustic archaeology (Ouzman, 1997; Rifkin, 2009), it seems illogical to imagine a cognitive bridge in which the noisy interactions of our nearest genetic relatives did not continue and adapt in parallel fashion to connect with our modern capacity for controlled vocalization, and its combination with other communicative modes. Especially if one considers the necessity of sonic communication where dense vegetation and the long grass of the savannah offer concealment, early human capacity for elaborate and appropriately controlled vocalization – including animal imitation – would seem to offer a survival strategy.

In this respect, a multi-modal Gricean formulation provides a model for the emergence of the performing arts. Intentionality and theory of mind are thus evident not merely in language, but also in other media – music (Livingstone and Thompson, 2009) and dance (Chaplin and Norton, 2015), as well as the mimesis envisioned by Donald (1991). Visual representation of physical processes (such as the cartoon-form instructions that illustrate how to assemble flat-pack furniture without employing language) assumes a similarly shared vocabulary.

In summary, modes of representation and communication such as music, dance, mime, and language permitted humans to employ each other collectively as means for external symbolic storage prior to the development of extrasomatic systems such as writing and depiction. Human bipedal locomotion defines a rhythmic gait, building on an initial quadrupedal stage, onto which elaborate independent employment of the limbs can develop in response to the playing capacities associated with a variety of tools. Instruments such as the piano, the church organ, and the drum-kit require simultaneous, integrated control of all four limbs, as do dance and performances and rituals that involve the carrying of objects while moving – coffins, sculptures, flags, palm leaves, weapons, and the maneuvers of marching bands together with the actions of the drum-majors who direct them or perform choreographed accompaniments through baton-twirling.

Some properties of the principal modes of artistic performance that emerged universally from ancient origins thus include:

> Music: meaningful employment, including in synchrony with others, of control of duration, pitch, timbre, and loudness;
> Dance: control of stasis, rate of movement, pattern of steps, employment of the arms either independently of the movements of the legs, or in coordination with them; synchronisation with others and/or to music;
> Mime: poise; focused imitation of external models including work, the movement patterns of animals and machines; communication of emotion.

While many of these properties are shared by and arguably traceable to those of non-human species, their integration into the encoded cultural practices of humans have unique characteristics of embedding and referentiality, and aspects of these have been

captured in ancient rock art and cave paintings indicating that behaviors of this kind have a long history. Music, dance, and mime may be combined with language in dramatic representations. But all three modes of performative representation and communication can be viewed as alternatives to speech and as founded on animal behaviors that clearly predate the emergence of language in our species.

EVOLUTIONARY PATHWAYS TO HUMAN CULTURE: LEARNING PROCESSES, REPRESENTATION, AND COMMUNICATION

In the diverse contexts of play, ritual, and narrative presentation, the animal origins of a range of behaviors can be discerned. The context in which physical interaction takes place in human culture relies on the development of the human brain as a multi-modal processor capable of metaphorical and recursive thought (Corballis, 2007). This has enabled instinctive responses traceable to pre-human origins to be 'harnessed' (Changizi, 2011) to representational or communicative purposes. For instance, a repertoire of gestures can be observed in chimpanzees that remain central to behaviors arising from physical interaction. These include the adult tickling of infants (Plooij, 1979), the equivalent in humans of which is the kind of play-assault in song-games such as *Round and round the garden* (Dissanayake, 2018), and its adult-to-adult continuation in sexual foreplay and copulation (Tutin and McGrew, 1973).

Provine illustrated the communicative power of two adaptive behaviors that are 'contagious' in humans: yawning (Provine, 1989) and laughter (Provine, 1996). Human yawning, an 'honest' sign of weariness, triggers the desire to yawn in others. Laughter also sets up a chain reaction, eliciting responses even when participants are not aware of the source of amusement. Lacrimose crying is a further emotional signal unique to humans (Provine et al., 2009). These biological expressions form the basis for shared emotional experience, open to amplification in the structures of communicative media such as music and drama in which the continuity, variation, and pace of emotional affect can be controlled as a function of the storyteller's art. They give rise to metaphorical elaboration: in the case of yawning, the calm before the storm as much as the depiction of readiness for sleep; and to presentation that, in the case of laughter or crying, can range from the authentic to the artificial or duplicitous, from the truly funny or sad, to mocking laughter, *schadenfreude,* and crocodile tears.

Deacon (1998) illustrated the cognitive outcomes of contagious social interactions and their capacity to recruit shared emotional states. The powerful forces involved in religious ceremony ('We believe …'), oaths of allegiance, and the like, draw on this human trait and have entered the repertoire of dramatic performance where crowds and choruses are swayed in support of a cause. The nature of such collective behavior is quite different to that of animal species which may appear to resemble it. Vervet monkey 'language' – the specific acoustic and kinesthetic response to threats from snakes, eagles, and leopards – presents both similarities and differences to human artistic performance (Seyfarth and Cheney, 1980). Notably, vervet communication is multi-modal: while sound alerts those out of sight to the presence of a threat, the behavior it accompanies is physically uniform – a dance-like response oriented to the required secure outcome. However, the calls are not so much 'words' referential to perceived visible stimuli as signals that initiate a fixed-action response: 'This is what we do when one of us makes this noise'.

Within the constellation of the performing arts, drama poses a special problem due to its embrace of language and, in the many instances that survive in widespread cultures, its dependence on literacy. Since

language is a uniquely human trait, we should perhaps view drama as a blend of mimesis and language, able to represent in a heightened manner the narratives that may previously have been transmitted by oral tradition around the campfire.

Kidd et al. (2016) proposed a means of investigating the role of storytelling in the acquisition of theory of mind. Certainly, narrative has a mnemonic function that parallels those we have assigned to dance, mime, and music. Drama, as a performative presentation of existing work, whether transmitted orally or recorded in writing, permits the intensification of the experience and its communication to increased audiences.

Oatley (2001) attributed to the simulation of emotion a key role in the cultural phenomena of storytelling and drama: 'Emotions in the individual are types of readiness for certain repertoires of action' (Oatley, 2001: 27). He focused particularly on three emotional states that are open to depiction and elicitation: attachment-based anxiety, assertion-based anger, and affection-based happiness. The means by which narrative and its presentation transmit these attributes onstage to the audience 'transforms our vision of an aspect of reality' (Oatley, 2001: 30). Oatley's analysis of how this is achieved in drama accords with Scherer et al.'s (1991) investigation of the ways in which actors in radio plays adapt their voices in order to communicate the emotional correlates of their lines.

MORTALITY, CONSCIOUSNESS, AND THE CYCLE OF LIFE

What may have been the adaptive Rubicon crossed by the human species which conferred the additional layer of recursive thinking, linking emotion and cognition (Damasio, 1994) in biographic memory and culturally informed response? Harvey (2017) suggests that the step through which humans attained the modern mind capable of language, metaphor, planning, and multi-modal thought and communication was associated with recognition of our own inevitable demise. Addressing the unthinkable motivated the complexity of thought as consciousness of mortality demanded ritual response to allow us to deal with the death of our loved ones, and by extension, of the gods we imagined inhabiting the extended reality that lies beyond death, as well as the perilous destination that each of us faces alone. Young (1992) found in early literature themes that he took to represent a spiritual response not only to death, but to cannibalism and the expiation of guilt. The role of the afterlife in many religions, of reincarnation, and the elaborate rites associated with the appropriate disposal of the dead, illustrate a valuing of human life consistent with understanding that the struggle for existence is played out in a special manner.

Where death is the ultimate separation, we first experience fear of loss in our dependence on care in the long helplessness of human infancy. Maternal separation and separation from the family play a part in the narrative structures of dramatic performances, in which long journeys (Odysseus, Sinbad), periods of living incognito or as an outcast, or lives lived unknown to biological parents are resolved in the emotional release of catharsis and the desire to 'live happily ever after'. Each of us identifies with the hero or heroine whose experience is captured in the narrative: whether the 'Everyman' of medieval drama whom we are invited to consider standing in for us so that we learn from his trials, or the more ancient and colorful figures of legend – Hercules, Hamlet, Joan of Arc, Sita, Robin Hood, Cleopatra, or Pocahontas – whose triumphs and disasters we map evenly onto the shifting emotions of our own lived experience. In doing so, we imagine the achievement of our personal survival, or its equivalent in the commemoration of a glorious death. Art documents the process of human individual and collective continuity: 'Kilroy was here' is writ large and creatively,

from hand stencils on cave walls to a graffito on trees and buildings, and from campfire song to grand opera or a Broadway hit.

PSYCHOLOGICAL FEATURES OF ARTISTIC PERFORMANCE

The infinite generative complexity of the human mind gives rise to artistic products that work on us at many levels. They invoke memory, permitting the anticipation of outcomes and intensifying the emotions we associate with them. They both promote and challenge social cohesion. They intersect with the cycles of seasons and life, reflecting by way of preparation and initiation or recall and explanation the parallels to our own biography of the imaginative worlds to which we are exposed. They achieve this through processes that elevate and make distinctive. Drawing on his application to the origin of language of the *developmental stress hypothesis*, whereby singing birds that make the greatest sacrifices in exhibiting complexity and stamina in song bouts attract the mates through which this trait is reproduced, Merker (2018) proposes that human culture arose through the phenomenon of extravagance: the valuing of the special, that which inspires awe. Aesthetic judgment thus evolved, as Darwin (1871) suggested, on the lines of sexual selection. But it exhibits in the earliest phases of life, in the attraction of infants to the shiny, colorful, pretty-sounding, well-proportioned, and impressive. Dissanayake (2018) views this as related to the patterns of ritual and developing out of the play behaviors through which children interact with the world around them, including 'dressing up'.

We can set out, therefore, a listing of the means by which behaviors are endowed with extravagant or elevated qualities (Table 23.1). This rudimentary set of examples demonstrates processes that link the small-scale, polite, and meaningful affordances and gestures of everyday life to the major undertakings that bind audiences and congregations to elaborate events which depend on expensive and meticulous preparation with the intention to impress.

Table 23.1 The instinct to embellish and adorn everyday behaviors

Everyday Category	*'Elevated' Category*
Eat	Feast
Drink	Toast
Bury (dispose of dead)	Commemorate
Use of fire	Fire festival
Promise	Oath
March	Goose-step
Awaken	Enact dawn ceremony

Aesthetic judgement is founded on emotional responses associated with the attainment of comfort and security from the last trimester in the womb and through responses to the discovery of the self, the world, and other people in infancy (Falk, 2004; Parncutt, 2009). Trevarthen (1998) described the conventions through which *infant semiosis* arises from the intersubjectivity that develops between child and mother, and Street et al. (2003) illustrated that new mothers who did not see themselves as musical became expressively able to communicate through song via the releasing mechanism of caring for a first child. The mother-infant dyad transmits the capacity for performance within both generations, the form of the lullaby arising universally and sung by men as well as women (Nelson, 1997). Play continues its educative and enculturating functions as children attain greater independence. Winnicott (1971) illustrated the key role of the *transitional object* – a favorite toy or security blanket – that stands in for the carer as an imagined source of affection, a metaphorical application open to the youngest mind. Romet (1992) traced the process whereby young children begin to prefer playing with each other, acquiring though singing-games knowledge of rule-based systems that govern turn-taking and social interaction with peers. Cook (2000) argued the importance of such experiences

for the acquisition of language – the ultimate rule-based system – as much through play (songs, chants, altered voices, games) as through more formal processes. The special nature of children's games as a private world exchanged without adult intervention was analyzed internationally by Opie and Opie (1985; see, also, Bannan and Woodward, 2008; Chagall, 2014). Such games and role-play teach anticipation and primed response (Bettelheim, 1987), preparing the player for the appropriate action when required: fight or flight, dodge and counterpunch, serve and volley, parry-riposte. As such, they are adaptive, contributing to survival, while at the same time allowing bonding with peers and membership of the group as learning leads to belonging, and initiation to acceptance.

Neoteny exhibits in humans (Gould, 1977) in two principal ways: the relative similarity of our adult form to a proportionally enlarged version of the infant, and the extension into adulthood of infant behavioral traits. Chisholm (1999) viewed this as a process of self-domestication – the lifelong extension of the 'play window' which closes in other species as they emerge into sexual maturity. Chisholm's formulation provides a convincing model for an evolutionary account of the origins of the performing arts. Recent work on the role of artistic stimulation in patients with Alzheimer's disease demonstrates that media other than language may remain available for communication and affect where speech is inhibited. But the capacity to sing (Bannan and Montgomery-Smith, 2008) or dance (Karkou and Meekums, 2017) in old age needs to have been primed through experience in childhood. Under such circumstances, the arts remain available to us lifelong. An instinctive inclination to interact with the newest generation remains present to the end of our days (St John, 2012).

This perspective on the cycle of life recalls Harvey's (2017) proposal that music (and by my interpretation, the arts more generally) presents the process whereby we cope with the certainty of our own mortality. Such a role for the arts clearly developed alongside the practice of religion, the enhanced emotional responses of awe and wonder giving rise to spirituality and ritual prior to the belief system that depends on language and sacred texts. Oubré (1997) imagined a religion without words that paralleled music as a bridge between animal behavior and language; and a framework for the evolutionary origins of religion (Atran, 2004; Boyer, 2007; Lewis-Williams, 2010) represents a synthesis that transcends the opposition of evolution and belief. The gods and Muses may, according to our literature and repertoire of song and drama, have conferred the capacity for the arts and inspired their practitioners. An evolutionary account of human behavior embraces both worlds.

OUR EVOLUTIONARY FUTURE: THE NEW ENVIRONMENT OF AI

An evolutionary perspective on the performing arts would be incomplete without speculation on what the future may bring. One might hope to see the policies of education providers become informed by the position outlined in this chapter, consistent with the view that the arts are essential to human well-being.

A new influence on human cultural development has arisen since the capacity became available at the turn of the previous century to record artistic products through mechanical and electronic means. During the last 50 years, advances in digital technology have accelerated the employment of devices for the storage, manipulation, creation, and retrieval of images, sounds, and recorded information. Computer generated imagery can enthrall, amuse, and deceive. The artistic history of the world is rapidly becoming accessible at the touch of a button. The medium of music, for instance, has become open to analysis on evolutionary lines adopting the process

of memetics (Dawkins, 1973), to account for growth and change within and between works and styles (Jan, 2007). Parallel to this analytical and philosophical agenda, musical creativity has been synthesized in Artificial Intelligence applications capable of a range of compositional achievements (Chamberlain et al., 2018; Miranda, 2003). Image, plot, and music combine together in the worlds of computer gaming (Kirke, 2018) and Alternative Reality (Men and Bryan-Kinns, 2018). It remains to be seen whether innovations in the generation and presentation of artistic performance represent a continuation of the evolved continuity reviewed in this chapter, or a novel phenomenon that will define a new relationship between the genetically endowed capacity for artistic response and participation and the cultural environment with which this interacts.

Note

1 Darwin had himself been misled by the claimed research of Sir Duncan Gibb (1869) into reporting that the 'different races' of man have different larynxes. This remained an uncorrected viewpoint regarding the range and capacity of the singing voice as recently as the 1970 edition of the Harvard Dictionary of Music.

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