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Ellen Dissanayake

The Artification Hypothesis and Its Relevance to Cognitive Science, Evolutionary Aesthetics, and Neuroaesthetics

Abstract
An ethological description of mother-infant interaction suggests that it was adaptive during human evolution. From their early weeks, infants universally respond to certain affect-laden elements of maternal communication that can be called "proto-aesthetic." I hypothesize that these capacities and receptivities, which evolved from about 1.7 million years ago to enable mother-infant bonding, became a reservoir of affective mechanisms that could be used subsequently by ancestral humans when they first began to "artify"—that is, when they invented the "arts" as vehicles of ceremonial religious experience. The ethological, evolutionary, and cross-cultural foundations of the Artification Hypothesis challenge current influential ideas in cognitive science, evolutionary aesthetics, and neuroaesthetics about human aesthetic capacities and behavior. The hypothesis offers a broader and deeper view to these fields by emphasizing preverbal, presymbolic, pancultural, cross-modal, supra-modal, participative, temporally organized, affective, and affinitive aspects of aesthetic cognition and behavior. It additionally proposes that artifying is an unrecognized but vital evolved component of human nature.

CORRESPONDENCE: Ellen Dissanayake. School of Music, University of Washington, Seattle, WA, USA EMAIL: edissana@seanet.com

Introduction

Since the late 1950s, a number of once distinct areas in psychology and philosophy have gradually gathered under what might be called a cognitive umbrella or canopy. After incorporating an influential newcomer, cognitive neuroscience, it is not too much to say that two thousand years of theory about what once was called epistemology have been irrevocably altered—subsumed by and re-conceptualized as "the brain" and "mind."

The successes of cognitive science, along with those of its fellow-traveler evolutionary psychology, have led some researchers recently to train their field glasses on philosophical subjects that have traditionally been of little interest to

neuroscience or evolution—aesthetics and the arts. Thus we have "neuroaesthetics" (Ramachandran and Hirstein 1999, Skov and Vartanian 2009, Zeki 1999), "evolutionary aesthetics" (Voland and Grammer 2003), and now, in this volume, "aesthetic cognition."

My own academic work in arts and aesthetics was underway before the prominence of cognitive studies, although I was one of the first to approach these subjects from the perspectives of ethology and what soon became evolutionary psychology (Dissanayake 1974, 1979, 1984). Working in parallel with but outside the cognitivist project, I gradually developed a hypothesis that locates the emergence of aesthetic (or "proto-"aesthetic) capacities and sensitivities in the evolution of a universal biologically-essential behavior—coordinated interactions between human mothers and their immature infants that contributed to the survival of the latter and consequently to a mother's reproductive success. I argue that this "bonding ritual", as it began to evolve in early hominin mother-infant pairs—perhaps as early as 1.7 million years ago (Falk 2009, Leakey 1994)—relied upon distinctive emotionally affecting "proto-aesthetic operations"[1] on common vocal, facial, and kinetic expressions of friendliness or affiliation, making them attention-getting and pleasurable. Importantly, the interaction became temporally-organized, allowing for further aesthetic effects (see below and Dissanayake 2000, 2008, 2009).

Consideration of proto-aesthetic components that inhere in this generally overlooked human behavior—notable for being dyadic and collaborative rather than individual and self-interested[2]—provides important additions to or modifications of the orthodox cognitivist project as well as to orthodox evolutionary psychology. Indeed, it is not too much to suggest that "cognition" is not only embodied (Lakoff and Johnson 1999; Slingerland 2008) but that the readiness to respond to affect-laden (proto)-aesthetic operations, in place at the beginning of human life, precedes and influences the development of embodied cognition (or any other kind). Additionally, the evolutionary

1 The modifier "proto" indicates that although these alterations of communicative signals can be considered "aesthetic," mothers use them spontaneously and unconsciously with infants, not intentionally as they are later employed in deliberate artification.

2 Certainly parent and infant have competing interests (Trivers 1974) and altruism provides benefits to the self (Hamilton 1964, Maynard Smith 1964). Yet let us not forget that the lives of our Pleistocene ancestors required not only resourceful, competitive individuals but also strongly bonded social groups that could work together with confidence and loyalty. The usual view of humans as selfish, cooperating only so they can advance their own interests, cannot account for the tenacity and resilience of their emotional bonds to one another. (Cacioppo and Patrick 2008; Gintis 2000; Rossano 2007; Sober and Wilson 1998; Sterelny 1996; Taylor 1992).

appearance and development of "artification"—a behavioral predisposition for deliberate use of aesthetic operations by adult individuals and groups in contexts and circumstances of uncertainty (occurring perhaps as early as 200 kya [thousand years ago])[3]—has implications for prevalent cognitivist and evolutionary ideas about the relationship between ritual, religion, and the arts. Moreover, the ethological, evolutionary, and cross-cultural perspectives of the artification hypothesis broaden and deepen the current cognitivist purview of human aesthetic capacities and behavior by emphasizing their preverbal, presymbolic, pancultural, cross-modal, supra-modal, participative, temporally-organized, affective, and affinitive aspects. The artification hypothesis as presented here is necessarily speculative, but grows out of the synthesis of an array of established findings and well-researched conjectures about early human and hominin behavior.

PART I. THE ARTIFICATION HYPOTHESIS

Proto-Aesthetic Dispositions in Infants

During the years that cognitive science was becoming consolidated, developmental psychologists began to discover remarkable cognitive abilities in young infants. Before these investigations, common pediatric wisdom held that apart from a few innate reflex behaviors—crying, suckling, clinging, startling—babies were pretty much wax tablets for their elders to inscribe as they (and their cultures) decreed. Today, however, it is well established that newborns come into the world with decided preferences and motivations, so that one can speak intelligently of "infant semiosis" and even "fetal psychology" (Trevarthen 1994, 1997).

We now know that newborns have innate capacities that predispose them not only to solicit physical care but specifically to elicit social and emotional interaction with others. For example, newborns prefer human faces to any other sight and human voices to any other sound. They can imitate face, mouth, and hand movements (Meltzoff and Moore 1977) and respond appropriately to another person's emotional expressions of sadness, fear, and surprise (Field et al. 1982). At birth, infants can estimate and anticipate intervals of time and temporal sequences and remember these temporal patterns,

3 The beginning of art(ification) depends on what one considers to be "art." Cupules—patterned, repeated hemispherical indentations in rock surfaces, which I consider to be an early instance of artification—have been minimally dated from as early as 200-150kya in Auditorium Cave in Bhimbetka, India (Bednarik 2003).

categorizing them both in time and space and in terms of affect and arousal (Jaffe et al. 2001). By six weeks of age, these perceptual and cognitive abilities permit normal infants to engage with adult partners in complex communicative interchanges—the playful behavior that is colloquially called "baby talk."

In all cultures,[4] human mothers (and other adults) behave differently with infants than with adults or even older children. They use a special vocal register: a high, soft, breathy, singsong tone of voice, which babies prefer to typical adult conversational speech. Vocal contours are much more labile than in ordinary speech directed to other adults (Fernald 1992), and the tempo of speaking is slower (Longhi 2003).

Even though they realize that infants cannot understand words, many mothers speak to small babies as if they expect a reply: "You going to tell me a story? Tell me a story then. Tell me a story. Really! Ah, that's a good story! That's a good story, tell me more. Tell me more. Tell me more, yes?" As evident from this example, the utterances are simplified, rhythmic, and highly repetitive. Transcripts such as these reveal poetic features: talk to babies is composed of phrases, each (whether having two or nine syllables) about three and a half to five seconds in length—the temporal length of a poetic line, a musical phrase, and a phrase of speech in adults (Lynch et al. 1995; Turner 1985)—and these phrase segments are combined with others in "stanzas" that comprise a theme with variations. Subtler poetic features of language such as metrics, phonetics, and foregrounding are discernible with further close analysis (Miall and Dissanayake 2002). Despite the fact that in some societies there is no tradition of talking to babies, other rhythmically regular noises such as tongue-clicking, hissing, grunting, or lip-smacking may be used and supplemented by physical movements and exaggerated facial expressions. Even deaf mothers use a "baby talk" version of sign language (simplified, exaggerated, and repetitive), which a deaf baby prefers to adult-oriented signing (Masataka 1996).

Along with this special vocal behavior, adults engage and keep infants' attention by the use of rhythmic body movements (touching, patting, stroking), hugging and kissing, unusual facial expressions (uninterrupted gazing into the baby's eyes, sustained smiles, an open mouth, widened eyes, raised eyebrows),

4 Mother-infant interaction has been well studied in a number of different cultures over the past quarter century (Field et al. 1981; Leiderman et al. 1977). Although differences have been found among the practices of different socioeconomic classes and ethnic groups in the United States and Europe and variations observed among these and some Native American and African societies, for the most part the differences are small, having to do with the proportion of time spent looking, smiling, and vocalizing by the mother or infant and with the pace and intensity of the encounters.

and characteristic head movements (backward bobs, nods, and wags). The baby responds to these peculiarly repetitive, exaggerated, and elaborated antics with wriggles, kicks, and smiles. Indeed, it is infants' own positive and negative reactions that persuade caretakers to entertain them with only certain kinds of movements, expressions and sounds, for without an expected infant response (and one's own wish to provoke it) there would be no reason to behave in this unusual and odd way. It is not too much to say that the behavior is dyadic, since infants actively elicit, shape, and otherwise influence the pace, intensity, and variety of signals that adults present to them.

Another important and relevant finding is that infants perceive their mother's vocal, visual, and kinetic signals simultaneously as a package (Schore 1994) and in general are capable of crossmodal processing. For example, three-week-olds can perceive the similarity between bright colors and loud sounds (Lewkowicz and Turkewitz 1980). At six months babies recognize that a pulsing tone (heard) and a dotted line (seen) are alike, as are a continuous tone and an unbroken line (Wagner et al. 1981). Thus in early interactions, behaviors are not only directly mirrored or imitated but also may be matched by either partner in supramodal qualities such as intensity, contour, duration, or rhythm—qualities that apply to any sense modality. That is to say, the loudness of a sound may be matched by a strong arm or leg movement (or vice versa) or the downward contour of a head movement by a downward fall of the voice (or vice versa) (Beebe and Gerstman 1984; Eimas 1984; Marks, Hammeal, and Bornstein 1987; Stern 1985).

The temporal dimension is also significant. Microanalyses of videotaped engagements reveal that the ongoing packages of simultaneous sounds, movements, and facial expressions exchanged by the pair are exquisitely coordinated in time.[5] Both mother and baby adjust their responses to each other within seconds or fractions of seconds, according to discernible "rules" of mutual regulation that are made up as they go along (Beebe 1986; Beebe, Stern and Jaffe, 1979; Beebe et al. 1988; Nadel et al. 1999; Papoušek and Papoušek 1981; Stern 1971). Over much of the first year of the infant's life, the pair engage and disengage, synchronize and alternate, practicing their physical, physiological, and emotional "attunement" by means of these multimodal expressive signals.

5 There may be, of course, "miscoordinations," as when one or the other member of a pair is unresponsive or when a mother is "intrusive," unable to read the baby's signals of overstimulation and its wish to disengage (Beebe and Lachmann 1988).

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Mother-Infant Interaction is Adaptive

Studies show that interaction with caretakers, as described in the preceding section, has practical cognitive and social benefits for infants, such as helping them to practice and perfect the give-and-take of social participation. It helps them to recognize and regulate their own shifting levels of emotion and assists their recognition of prototypical sounds of the language they will eventually speak. By anticipating what comes next in a familiar sequence, the baby "hypothesizes" or predicts when a climax will occur and then experiences its fulfillment. Being able to recognize pattern in the behavior of others—what psychologists call "sequencing"—is essential to eventual social and intellectual competence, making it possible to comprehend and predict others' behavior (Greenspan 1997: 6, 67).

I claim that mother-infant interaction is, in fact, a bona fide adaptation that evolutionary psychologists have largely overlooked, despite its ubiquity. In evolutionary theory, an adaptation is an anatomical structure, a physiological process, or a behavior pattern that contributed to ancestral individuals' ability to survive and reproduce in competition with other members of their species (Crawford 1998). I argue that the evolution of mother-infant interaction as described above helped to address an important problem for our Pleistocene ancestors.

Evolving hominins came to differ from earlier primates in various ways, including upright walking. Bipedalism required numerous gradual alterations in human skeletal and muscle anatomy, including a shortened and narrowed birth canal. At the same time, human brains were enlarging quite dramatically. These conflicting trends presented a serious problem at parturition and resulted, over millennia, in a gradually reduced gestation period that produced increasingly immature infants that could pass through the reshaped birth canal.[6] Compared to other primates, the resulting hominin babies were unusually helpless, requiring care and vigilance for an unprecedentedly long period of time. It has been calculated that for an infant human to be as mature at birth as an infant chimpanzee, gestation would last for 21 months and the baby would weigh 25 pounds (Gould 1977; Leakey 1994, 44; Portmann 1941). Based on fossil evidence, I suggest that the mother-infant interaction (with its proto-aesthetic

6 Other anatomical adaptations developed simultaneously to address this critical problem. Compared to other primates, considerable brain growth of human infants occurs after birth; the skull of human neonates can be compressed during parturition; and parturient human mothers have a separable pubic symphysis.

operations) was underway in *Homo ergaster*, which lived approximately 1.7 million years ago,[7] or its close relative or descendant *H. erectus* (Leakey 1994).

The universal mother-infant interaction is, I propose, a *behavioral* adaptation that assured that mothers would be emotionally bonded to their immature offspring and thus willing to provide the necessary extended care over months and years. Such a hypothesis gains credibility when it is pointed out that each vocal, facial, and gestural component of mothers' signals to their babies is drawn from common ordinary vocal, facial, and gestural signals of friendliness and affinity used among adults. Soft, higher-pitched, relaxed voices; smiles, an open mouth, eyebrow-flashes, head bobs and nods; and touches, pats, hugs, and kisses are expressions and behaviors spontaneously and habitually used by individual adults in everyday friendly interaction with each other. Because higher primates also use similar expressions in ordinary sociable circumstances (King 2004), it is not farfetched to assume that our hominin ancestors also used them.

Ritualization

Without even thinking about it, mothers make ordinary, everyday affinitive sounds, facial expressions, and head and body movements extraordinary. Just how extraordinary becomes clear if we imagine interacting with our friends and associates as we do with babies. Ethologists describe a similar or analogous phenomenon in other animals, especially birds. When ordinary movements and sounds are made conspicuous and distinctive, ethologists call this evolutionary process "ritualization" and the behaviors themselves "ritualized." In this process, head and body movements and/or vocalizations that are ordinarily used in an instrumental context (say, pecking for food, preening, plucking grass for a nest, making a sound that attracts parental attention) become altered in special ways. They are formalized (simplified or stereotyped), repeated, exaggerated, elaborated, and used in a new context to communicate a different, non-ordinary message. In the garganey duck, for example, the casual everyday behavior of turning the head and cleaning the wing feathers is transformed by these special alterations into a noticeably different formal, regularized and repeated activity in which preening does not occur at all. The head turns back and forth, swinging the bill so that its tip simply touches one spot on the wing,

7 *H. ergaster* had a narrower pelvis than its predecessor, *H. habilis*, in which rapid brain expansion was occurring between 3-2mya (Wade 2006:18-22). "Turkana Lad," a specimen of *H. erectus* of 1.6mya, also has a narrow pelvis (Falk 2009: 51).

over and over again. In this context, the message is no longer "I'm preening" (as if anyone would care) but, rather, "I want to mate with you." Females have evolved to understand this new, acquired meaning.

In mother-infant interaction, the instrumental context for, say, touching is grooming and tending; for smiling it is showing relaxed pleasure. The other signals similarly also communicate friendliness or affiliation. When simplified and regularized, repeated, exaggerated, and elaborated, however, the new message expresses and communicates intense affection, attentive reassurance, and delighted regard far beyond the usual casual contexts with other adults of friendly acknowledgement or companionship. Importantly, these particular ritualized signals of ancestral mothers were adaptive because—having originated in innate *affinitive* expressions—they reinforced (when formalized, repeated, exaggerated, and elaborated) the neural circuits for affinitive feelings in a mother's own brain through proprioceptive feedback (Scherer and Zentner 2001). An infant who called forth from its mother frequent positive reinforcements of loving concern presumably enjoyed greater survival as its mother enjoyed greater reproductive success. Neither of the pair "knew" why they acted and responded as they did. Pleasure was the reward, as it is in other crucial adaptive behaviors relating to sex, food, rest, being liked and admired, and staying warm.

Proto-Aesthetic Operations and Artification

The process of ritualization makes specific signals salient. Its operations are all ways of attracting and sustaining attention. Salience—prominence or emphasis of any sort—is potentially emotional. Normally our daily lives are spent in a generalized, unremarkable state of ordinary consciousness in which we do not experience "emotion" so much as what might be described as mood fluctuations, whose eddies are more or less good (positive), bad (negative), or indifferent. Emotion enters (or potentially enters) the scene when there is some discrepancy or change, provoking an interest. We appraise a salient or novel cue, anticipating what it means for our vital interests (Watson and Clark 1994).

I suggest that artists in all media deliberately perform the operations described by ethologists as they occur instinctively during a ritualized behavior: they simplify or formalize, repeat (sometimes with variation), exaggerate, and elaborate ordinary materials, bodies, surroundings, tones, beats, body movements, semantics and syntax, motifs, ideas—thereby making these things more than ordinary (Hogan 2003; Jakobson 1971; Mukařovský 1964/1932; Shklovsky

1965/1917).[8] By doing so, artists attract attention, sustain interest, and create and mold emotion in their audience (which is what mothers also achieve with babies.)[9]

I suggest that the earliest arts appeared when humans invented ceremonial rituals, where they drew upon already evolved capacities to use (and sensitivities to respond to) proto-aesthetic operations. Ritual ceremonies are meant to affect biologically-important states of affairs that humans necessarily care about—assuring food, safety, health, fertility, prosperity, and so forth. These occasions are times of uncertainty when circumstances can become better or worse (Turner 1969; van Gennep 1960/1909).[10] I suggest that uncertainty—leading to emotional investment or "caring about"—was the original motivating impetus for the human invention of religion and its accompanying behavioral expression, which in earlier writings I have called "making special," "making the ordinary extraordinary," and—in recent years—"artification."

The artification hypothesis conceptualizes art differently from most other schemes—as a behavior ("artifying"), not as the results (paintings, carvings, dances, songs, or poems) or their putative defining qualities (beauty, harmony, complexity, skill). By considering human art as something that people do, it is possible to ask what its adaptiveness might be.

At its most basic, artifying is the deliberate use of the proto-aesthetic operations that evolved—as described above—as mechanisms used unconsciously by ancestral human mothers in the highly adaptive context of reinforcing emotional bonds with ever more helpless infants. In these early interactions, we cannot yet speak of arts or even artifying, although the proto-aesthetic operations came to exist as a sort of reservoir of capacities and sensitivities that when used deliberately in a new context (culturally-created ritual ceremonies) again became adaptive. In other words, the proto-aesthetic operations are Tier One of my hypothesis, and the results of artification (music, dance, shaping and embellishing surroundings, poetic language, dramatic performance and the like),

8 The universal aesthetic principles cited by neuroscientists Ramachandran and Hirstein (1999) can be distributed between two of the aesthetic operations described in my scheme as forma lization (grouping, binding, contrast extraction, perceptual problem solving, symmetry) and exaggeration (peak shift, super-normal stimulus, caricature). Three of the four ways in which poets develop poetic metaphor, according to Lakoff and Turner (1989), are also covered by aesthetic operations—i.e., extension (my exaggeration and repetition), elaboration, and questioning (manipulating expectation).

9 As infants mature and require less soothing and more excitement, mothers often sponta-neously manipulate their expectations as in games of "Peek-a-Boo" or "This Little Piggy." Artists also notably manipulate expectation and "surprise" their audiences.

10 Ritualized signals in animals are also often associated with ambivalence (Hinde 1982: 126).

based on these operations and developed in humanly-unique and culturally-invented religious ceremonies, are Tier Two.[11]

Religion, Ritual, and Artification

Over the millennia of hominin evolution, the human mind increasingly became a "making sense" organ. Interrelated powers of memory, foresight, and imagination gradually developed and allowed humans to stabilize and confine the stream of life by making mental connections between past, present, and future, or among different experiences or observations. They could remember good and bad things and imagine them happening again. One cost of this growing awareness of the possibilities and unpredictability of life was uncertainty and anxiety.

I have suggested that artification first arose in ceremonies that accompanied the invention of religion , another prominent component of human nature that in recent years has been addressed by a number of evolutionary psychologists and cognitive scientists (e.g., Atran 2002; Boyer 2001; Wilson 2002). Although Atran (2002) and Boyer (2001), consider religion to be an evolutionary by-product that parasitizes other adaptive mental processes, Wilson (2002) and others (e.g., Alcorta and Sosis, 2006; Richerson and Boyd, 1998; Rossano 2007) argue that religion offers fitness advantages through increased group cooperation and solidarity. However, apart from Alcorta and Sosis (2006), none of these scholars seems to recognize the important part played by *the arts* in instilling cooperation and solidarity.

Although anthropologists usually conceptualize a society's "rituals" as part of its symbolic cognitive system, they typically overlook the fact that regardless of the meanings that are conveyed, ceremonial rituals *are constituted of arts and would not exist without them*. Bodies, surroundings, sounds, movements, and so forth are artified (as described earlier, with aesthetic operations) in order to attract attention, sustain interest, coordinate group effort, and provide emotional excitement and satisfaction. Because of the inseparability of religious practice and artification, it is plausible to suggest that the arts arose in human evolution as components of ceremonial behavior rather than as independently-evolved activities. Through a ceremony's artifications, its messages or meanings were reinforced and the practitioners convinced that they were addressing the

11 Although deliberate artification may be considered an exaptation (side-effect or by-product) of the adaptive mechanisms that promote mother-infant bonding, its ability to relieve anxiety and coordinate individuals in ceremonial contexts was and still is also adaptive. See discussion in the following sections.

matter at hand. Belief in religious dogma may or may not be adaptive, but the vehicles that installed and reinforced the beliefs, the artifications developed and practiced in religious ceremony, could inadvertently become adaptive.[12]

Whether or not a ceremony achieved its intended result of, say, attracting game or promoting fertility, I submit that it may have provided two general adaptive benefits that affected individuals and groups. By artifying in a culturally-sanctioned manner, individuals had "something to do" in uncertain circumstances, giving them a sense of control and thereby relieving anxiety. Additionally, through participation in a temporally-organized activity or performance, a group reinforces its social bonds. Both these outcomes can reasonably be identified as adaptive. In the first instance, it is well known that prolonged emotional stress and anxiety compromise a wide range of bodily functions including energy release, immune system activity, mental activity, digestive function, and growth and tissue repair, as well as reproductive physiology and behavior (Sapolsky 1992). Second, the physical and neurological coordination of participating with others in temporally organized activity has at least three stabilizing effects: satisfying predictability, tension-producing-andresolving manipulation of expectation, and neurophysiological coordination that is felt subjectively as emotional coordination or integration, which ultimately provides individuals and groups with a sense of coping through social support (Caporael 1997). Several studies report that ritual and artful behavior increased in prehistory at times of resource stress, as in populations of Mimbres (Brody 1977: 210), Late Dorset (Taçon 1983), prehistoric Arnhem Land (Taçon and Brockwell 1995; Taçon, Wilson and Chippindale 1996), and Numic-speaking peoples (Garfinkel, Marcom and Schiffman 2003).

12 Ritual practice as a concomitant of religion is commonly thought to have arisen as part of the suite of traits made possible by language and symbolizing ability—i.e., ca. 50kya, according to recent conjecture (Wade 2006: 164-165). Yet artifications such as perforated pendants are found from 300kya, ostrich eggshell disc beads from 200kya, and shaped pieces of ochre (to color bodies and objects) from these dates or even earlier (Bednarik 2003); musical/dance behavior leaves no trace and may well also have occurred at these times. I agree with Donald (1991, 2006), who suggests that pre-verbal "mimetic" culture (using gesture, pantomime, dance, visual analogy, and ritual) could have developed in *H. erectus*, i.e., after 1.8mya.

PART II: SOME IMPLICATIONS OF THE ARTIFICATION HYPOTHESIS FOR COGNITIVE, EVOLUTIONARY, AND NEURO-AESTHETICS (CENA)[13]

The artification hypothesis claims that an accurate understanding of human artmaking and participation is both broader and deeper than the prevalent view of aesthetic cognition and behavior as described by CENA which, to begin with, is suffused with modern Western notions about art. For example, visual arts or pictured (or real) landscapes are typically treated as if they were static entities perceived by static individuals. Researchers in evolutionary aesthetics and neuroaesthetics assume that art can be characterized by (or even be considered synonymous with) beauty (Dutton, 2009; Martindale, Locher, & Petrov 2006; Thornhill 2003), talent (Dutton 2009), originality (Miller 2000), creativity (Martindale, Locher, & Petrov 2006; Miller 2000; Dutton 2009) and rarity (Dutton 2009). But ethnologists' reports from premodern societies indicate that stationary arts and contemplative observers are rare. On the contrary, nearly everyone actively makes or participates in the arts, tradition is frequently valued over novelty and creativity, and fearsomeness or shock may trump beauty.

For its part, cognitive studies of music investigate the perception and performance of fragments of musical behavior such as awareness of pitch, rhythm, intervals, and other measurable elements of Western tonal music. Illustrative examples of music (like neuroaesthetics' studies of visual arts) are frequently Western masterpieces, which in important ways are unlike the sources for aesthetic engagement in premodern or Pleistocene peoples or in small children.

Neuroaesthetics treats visual arts as packages of perceptual stimuli, even though these same stimuli also occur in nonaesthetic contexts and it is not clear whether or how the two can be distinguished (Brown and Dissanayake, 2009). Evolutionary aesthetics and neuroaesthetics studies are typically concerned with perceptual and cognitive preferences for features that were or are adaptive—e.g., associated with salubrious landscapes, healthy mates, nutritious food, cognitively-satisfying forms, or works—e.g., pictorial or literary depictions of adaptively relevant subjects such as romance or resolved conflict (Barash & Barash 2005; Martindale, Locher, & Petrov 2007; Voland and Grammer 2003).

13 Because evolutionary aesthetics and neuroaesthetics along with cognitive studies in general share some common ideas about the arts, I use an acronym, CENA, when referring to all three fields as a group.

Such studies are worthwhile, but rarely considered are aesthetic capacities or mechanisms—the behavioral and emotional means and manipulations by which features or works have their effects.

The arts do not have their effects (adaptive or otherwise) simply because they activate cognitive/perceptual modules that direct us to good mates, or because they contain the color red that connotes biologically salient stimuli such as blood or ripe berries. If the mere stimulus were sufficient (say, a pornographic image or a gushing wound), there would be no need at all to embed these categories or features in art works or events in which they are arranged with relation to other stimuli and otherwise manipulated. It is the manipulations—what is done, the operations or means to the end of art—that produce their emotional effects. And it is in the temporal arts—i.e., those that take place in time—that one can best appreciate how emotion can be manipulated to expressive and eventually adaptive ends. Whatever else aesthetic cognition may consist in, it should include consideration of aesthetic manipulations.

Although the artification hypothesis has been gradually developing along with the maturation of cognitive science, its emphasis on ethology—considering art and aesthetics as adaptive behaviors with their roots in early hominins—suggests important and relevant observations that CENA have dismissed or overlooked.

1. Humans are animals: ethological and evolutionary thinking are important to understanding human cognition and behavior.
It might seem surprising that human infants are born with the rudiments of aesthetic cognition—that they are ready to respond to proto-aesthetic manipulations of visual, vocal, and gestural signals. Yet, from the viewpoint of ethology, it is no surprise at all: many animals also respond to formalization, repetition, exaggeration, elaboration, and manipulation of expectation. One might say that aesthetic cognition, based in proto-aesthetic operations that evolved in H. ergaster mothers and infants, is a pivotal behavior between primate ancestors and modern humans, who are unique among other animals in deliberately performing aesthetic operations with the intention of making the ordinary extra-ordinary and consequently having an emotional effect on other people, including ancestors and spirits.

Ethology is perhaps more associated today with field naturalists who carry binoculars and a notebook than with the CENA crowd who may work with

expensive brain imaging machinery. For understanding aesthetic cognition and behavior, however, the "whole animal approach" of ethology reminds us of another antedecent of artification: the behavior of play (Deacon 1997, 2006; Dissanayake 1974). In many juvenile animals, including hominins (presumably) and humans, play creates a special world in which such actions as play-stalking, play-fighting, and even play-courtship are acknowledged as being "not for real." As in ritualized behaviors, another ethological subject, participants in play realize that altering ordinary behavior in a new context bestows a new or special meaning.

Ethology has been described as the naturalistic study of behavior from an evolutionary perspective (Burghardt 2005). Full appreciation of the fact that all cognition and behavior necessarily have their roots in the evolutionary past seems perplexingly and inexcusably absent in much that goes on under the cognitive canopy. Although they are aware that minds are composed of neural matter, all too many cognitive psychologists—like their academic counterparts in the humanities—still operate as though minds are detached from evolutionary reality (Slingerland 2008: 95).[14] Surprisingly, this seems to be the case with embodiment philosophers who accept that minds arise from our physical being and are "embodied" or "metaphorical" yet don't appear to wonder why that sort of mentation should have evolved to characterize human cognition. For example, why should such basic-level cognitive structures as "paths" and "containers" appear as paths and containers to cognitively normal human beings (Slingerland 2008: 23)? We know that minds, like the output of other organs, work as they do because that way of working (and not some other way) contributed to survival and reproductive success. What is or was that contribution?

One can approach this question with knowledge of our Pleistocene past in which humans were motivated to desire the same primal requirements that face any wild, group-living animal: sustenance (food, water, warmth); social acceptance and participation; sex and mutuality; care of offspring; safety (avoidance of pain and death); and competence (knowing what to do to survive—to achieve one's goals and satisfy one's needs) (Panksepp 1998).

14 Brandt (2006: 184) is an exception. He acknowledges the "macroscopic" scale of evolutionary time (the "why?"), along with the microscopic scale of neurology (the "how?"), and the mesoscopic (historical) scale of our own space and time (the "what?") and recommends that the levels and questions be and remain in contact. Among cognitivists, the work of Merlin Donald (1991, 2006) and Terrence Deacon (1997, 2006) is noteworthy in finding the origins of aesthetic cognition and behavior in the evolutionary and even animal past—in preliterate and even preverbal hominins.

Paths, containers, and other metaphors of embodied cognition have evolutionary as well as "bodily" meanings that have no doubt influenced their pervasiveness in language and thought.[15]

2. Preverbal affective and aesthetic mechanisms continue to influence human language and cognition; they are a critical, if neglected, component of CENA.

There are more than a few cognitivists who consider minds only as they exist in modern human adult individuals—that is, people who are verbal, rational, and tacitly literate. But such individuals are a miniscule proportion of humans, past and present, who think and have minds; such an emphasis may well exclude preverbal infants and preliterate children, nonliterate peoples in small-scale societies, and Pleistocene ancestors. According to the artification hypothesis, the precursor to aesthetic cognition began in hominin mother-infant interactions as early as 1.7 mya. These ancestors made tools and lived in small hunter-gatherer groups but did not speak—though like apes they could have made expressive vocalizations. By 200 to 150kya, Archaic hominins were in what is now India, carving cupules and quite likely singing and dancing, although they may also not have yet had much if any language.

Although some have claimed that the selective pressure for the language faculty was the adaptive value of communicating complex propositions (e.g., Pinker and Jackendoff 2005: 204),[16] this view of things seems too narrow if one takes into account the paralinguistic or expressive "half" of speech. It seems worth considering that, as Panksepp (1998: 302) has said, "the brain mechanisms for language were designed for social interactions, not for the conduct of science." Certainly baby talk, as described, has nothing to do with the exchange of verbal information about the world and everything to do with coordinating individuals and sharing social experience, which has obvious adaptive value.

15 See Pinker (2007: 235-278) for an extensive discussion of reasons that the "embodied cognition" or "metaphor" theory is not biologically fundamental in the ways that its proponents presume.

16 On p. 231 of the same paper, Pinker and Jackendoff also contend that language (not "the language faculty") "is an adaptation for the communication of knowledge and intentions" and that "as a species humans rely on acquired technology, know-how and extensive cooperation among non-kin." This way of putting it is more acceptable than the "complex propositions" cited in the first paragraph of their paper (p. 204). It leaves open the possibility of accepting the evolutionary importance of artification (arising from the evolved human ability, originating in ancestral mother-infant interactions, to interact contingently and to entrain emotional state) insofar as it contributes to socialization and cooperation.

After living with nonliterate Trobriand Islanders nearly a century ago, Malinowski (1925) was moved to suggest that language serves not to imitate thought but to move another to act; like artification, it is intended "to produce an effect"[17] (see also Donald 2006). Malinowski's contemporary, British social anthropologist A. R. Radcliffe-Brown (1948/1922: 234), proposed that ceremonies (composed, as described earlier, of arts, including verbal arts) serve to maintain and transmit from one generation to another the emotional dispositions—not only or even primarily the complex propositions—on which a society depends for its existence.

With some exceptions, practitioners of CENA tend not only to emphasize language and ignore preverbal or nonverbal experience but because emotions are viewed as proximate mechanisms designed to address adaptive problems by motivating behavior (Tooby and Cosmides 1992: 99), their varieties, subtleties, complexities, *and importance* are typically neglected. *Affective* neuroscience, as described by Jaak Panksepp (1998), is therefore requisite to an understanding of human thought and behavior and, particularly, to understanding aesthetic cognition and behavior which, in their earliest manifestations, had to do with the artifications of ceremonial practices that were intended to help people obtain the life needs that they had evolved to care about.

Important in the evolution of proto-aesthetic operations is their temporal organization and coordination, which makes possible the emotionally satisfying, tension-resolving, and unifying effects described at the end of Part I. Infants are supremely sensitive to repetition and variation in the pulses, phrases, and narrative episodes of their mothers' babytalk (Gratier and Apter-Danon 2009). This suggests that both the creation and the experience of the temporal arts of poetry, music, and dance inhere in our fundamental psychobiology. Malloch and Trevarthen (2009: 8) claim that human action, thought, and feeling take place under the coordinated and integrated control of a time keeping, energy regulating Intrinsic Motive Pulse (IMP) and that the brain is a network of dynamic systems all obedient to a scale of rhythms that flow in unison—an "innate communicative musicality." Such a formulation makes clear that much is overlooked when aesthetic cognition is conceptualized (as by some CENA theorists) simply as "sensory" or "perceptual" or primarily based in language or verbal thought.

17 Such a view corresponds with the categories of infants' first words, which at thirteen months have to do with parents, requests and refusals, and greetings, in that order (Hauser 1996: 338).

3. The bio-ecological requirements of several million years of hunter-gatherer life have affected human cognition.

In his study of thought in individuals who live in small-scale societies, anthropologist C. R. Hallpike (1979) has demonstrated that with regard to the development of cognitive processes such as symbolization, classification, number, measurement, conservation, space, time, and causality, premodern people do not require what Piaget (1970) called "concrete operations" and that for most purposes "pre-operatory" thought is just fine. Although they may have little need to "communicate complex propositions," they have a myriad of adaptive abilities that use other kinds of thought. Howard Gardner's theory of "multiple intelligences" is also relevant here (Gardner 1983, 1999).[18] He suggests that individuals possess varying degrees of eight broad cognitive capacities: linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalist. An adequate description of the components of these capacities and their interrelationship requires more nuance than is possible here. However, it suffices to say that the intelligences described by Gardner have definable neural substrates and would have emerged during human evolution. It is not difficult to see that they would all contribute to hunter-gatherer lives. All of them, according to Gardner, can be used in the making and experiencing of art works. All require "thinking" (cognition), even though in most of the intelligences, verbal or formal operational (propositional) thought would not be required.

In small-scale societies of the recent past, propositional thought may not have been a priority but artification was central, as in the Yirkalla, an Aboriginal population of Arnhem Land in Australia with a total population in the 1950s of about four hundred. According to Richard Waterman, "[T]he arts . . are unified to an unusual degree, in that the subject matter of all of them—graphic, plastic, folkloric, choreographic, dramatic, and musical—is largely confined to activities of totemic species and totemic ancestors. Within the largest musical category almost every song has a painted iconographic design or hard-wood carving, a story, a dance, and a segment of ritual associated with it" (Waterman 1955: 40).[19]

18 The influential theories of Piaget and Gardner have been challenged and are not accepted in all their details by all psychologists; my use of them is general and serves my purposes here. This is not the place to defend particular aspects of their complexities.

19 Waterman's description illustrates or implies several claims made in this article about aesthetic operations (cognition?) in the majority of societies over evolutionary time: the arts are typically presented and experienced in a complex multi-media manner; people make art

A cynic might say that the Yirkalla use of language—artified and performed in a multi-media setting—was obviously not adaptive since the group could not compete with European settlers who, in addition to their greater technological prowess, were able to express and understand complex propositions. Yet in Australia such groups persisted for at least forty thousand years, whereas complex propositional thought would not have been used until the invention of writing some six thousand years ago (and may yet turn out to have been an adaptive dead-end).

4. Artification and aesthetic cognition are adaptive in their own right, not by-products of symbolizing or other cognitive ability; evolutionarily, they have been as adaptively important to successful human lives as the verbal transfer of information.

Although some animals and a number of birds perform art-like behaviors—and, like human infants, respond to formalizing, repeating, exaggerating, and elaborating—humans as a species are unique in that, without being constrained by season or gender or genetic program, they deliberately use these operations to make their bodies, vocalizations, movements, and surroundings extraordinary or special. I consider this phenomenon of artifying to be in the same range of importance to human evolution as tool making, speech, or the making and using of symbols. It is a grave oversight that such a crucial human activity has been inadequately recognized by those who are concerned with human cognitive abilities.[20] To my knowledge no advocate of CENA has considered aesthetic cognition (as artification) to be foundational or even important in human mentation.[21]

Prehistorians study material artifacts and visual images, so it is perhaps not surprising that they generally assume that human art, like speech, is a consequence or offshoot of symbolizing ability.[22] Evolutionary aesthetics and

about things they care about; participation (rather than passive contemplation) is prominent; the arts are intended to produce an effect; and the arts are collective and social, helping their participants to share mental representations and create culture (see also Donald 2006: 14).

20 Brandt (2006: 176), insofar as he posits a similar "aesthetic register" of the mind, is an exception, although he seems to be concerned more with cultural than biological evolution. He characterizes art as "any expressive or instrumental doing that deliberately creates excess structure" (and uses the words "special," "extraordinary" and "elaborated").

21 Although the title, *The Artful Mind* (Turner 2006) might suggest otherwise, the subtitle (*Cognitive Science and the Riddle of Human Creativity*) refers to creativity, which can be applied to a multitude of activities, not specifically to a behavior of artification.

22 As Nicholas Wade remarks, "Archaeologists ... tend to equate full-fledged modern language with art, which only becomes common in the archaeological record some 45,000 years ago.

neuroaesthetics are concerned with preferences for perceptual signals (signs) of biological reward or cognitive coherence. In considering art to be a behavior—something that people do (not its product as an artifact or image)—the artification hypothesis challenges these assumptions.

If one considers the temporal arts, it is clear that not all arts are symbolic—for instance vocalizing or playing a musical instrument, marking beats, or dancing. Their effects are emotional more than cognitive-symbolic: they attract attention, sustain interest, and create and mold emotion. Visual marks need not automatically be assumed to be representational, as in the earliest drawings of children and, arguably, the earliest rock markings of our ancestors. On the contrary, these are traces of marking as an activity in its own right, having an effect on the world and making the ordinary surface extraordinary. Aesthetic operations of regularizing or formalizing, repeating, exaggerating, and elaborating these marks are additionally interesting and satisfying, even when they are not symbolic.

But even symbolic marks can produce a variety of effects that have little or nothing to do with their intended symbols or referents. The complex red, black, and white designs on prows of ocean-going ceremonial canoes (*masawa*) of Trobriand Islanders are meant to dazzle those who see them so that they will be helplessly persuaded to trade their most valuable shells in the *kula* exchange (Campbell 2002). The Trobrianders know the symbolism of these designs—stylized animals and birds that in various ways represent power. Their trading partners do not know but the optical dazzle in itself is intended to disorient them.

Proponents of CENA would note that *masawa* designs stimulate perceivers' neuro-optic apparatus. They could suggest adaptive antecedents for the choice of curvilinear shapes and bold colors. But their theoretical emphasis on perception and signals obscures important emotional aspects that are the motivation for artifying in the first place, as well as the emotional responses that artifications produce apart from their representational or symbolic meaning.

Their argument is that creation of art implies symbolic thinking in the mind of the artist, and therefore possession of language to share these abstract ideas" (Wade 2006: 46; see also Balter 2009). This is so of course only if one takes for granted that "art" is representational and visually perceived, as with the famed Upper Palaeolithic rupestrian paintings and mobiliary artifacts. For stimulating counter-ideas about the earliest appearance of human palaeoart and language, see Bednarik (2003).

Additionally, adult perceivers, like the infants they once were, respond emotionally to "vitality effects"—supra-modal qualities of intensity, shape or contour, motion, duration, and rhythm that occur in both space and time and help to manipulate expectation (Stern 1985, 1999). Such effects as surging, fading away, fleeting, being drawn out, or being shaken to the core (dazzled) each apply to a variety of circumstances in visual, auditory, and kinetic modalities.[23] Additionally, they have associations with various colors and shapes that spread out into modalities other than visual. If the expressive forms and media of art are intended to influence the minds of an audience (Donald 2006: 4; Malinowski 1925), artifications give perceptions emotional oomph, thereby bestowing conviction on the beliefs that are the occasions for ritual ceremonies.

Rather than being symbolic, the vitality effects described by Stern (1999), along with aesthetic operations as described here, are examples of *analogy* (Donald 1991, 2006).[24] They have biological meanings of fast and slow, loud and soft, large and small, extravagant and dainty, careless and precise, which in some cases even other animals can recognize. Prosody and gesture are also analogous—both may have preceded speech by 2 million years when brains expanded rapidly (Corballis 2002).[25]

In summary, the ethological, evolutionary, and cross-cultural perspectives of the Artification Hypothesis challenge some current CENA pronouncements by emphasizing the importance of preverbal, presymbolic, pancultural, cross-modal, supra-modal, participative, temporally organized, affective, and affiliative aspects of human art-making and response. Additionally, the hypothesis proposes that artification is a universal behavioral predisposition whose components are ancient and influential—if unregarded—features of human cognition.

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23 In this regard, one can remind advocates of embodied or narrative thinking that people find paths to be thorny, obscure, winding, or welcoming; containers can be capacious, constricting, smooth, or crowded.

24 Merlin Donald's (1991, 2006) views of mimesis and analogy are rich and complex; they would be augmented by incorporation of the artification hypothesis and they complement my discussion here.

25 Lawrence Barsalou (1999a, b) has proposed that analog images are the sole medium of human thought.

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