

Stephen Davies, Philosophy, University of Auckland

Important note: This is a final draft and differs from the definitive version, which is published in **The Routledge Handbook of Evolution and Philosophy**, R. Joyce (ed.), New York: Routledge, 2018, 359–371. I have been assured by the University of Auckland's research office that if they have made this publicly available then it does not violate the publisher's copyright rules.

EVOLUTION, AESTHETICS, AND ART: AN OVERVIEW

Preliminaries

It has become common to explore connections between human evolution and aesthetic and artistic behaviours against the background of a certain framework. We ask if these behaviours are (or were) adaptive. That is, did they give those who adopted them a comparative reproductive advantage over those who did not? Or instead, are they by-products (aka spandrels)? That is, are they adventitious but non-adaptive consequences of adaptations whose biological value lies elsewhere? Or finally, are they mainly cultural, depending on our evolved nature only at a remove and in the most general way? That is, are they technologies that are preserved not mainly by biological inheritance but via deliberate cultural transmission on account of their value to groups and individuals?

I will query the usefulness of this framework later. But even if it is the appropriate one, it has proved intractably difficult to sort aesthetic and art behaviours neatly into these categories.

The biological approach to aesthetic and art behaviours can be variously motivated. The concern might lie with uncovering these behaviours' historical origins, or their original adaptive function if they had one, or to explain their current adaptive function if that carries over, or to consider if they have taken on new adaptive or maladaptive functions in their contemporary setting. Alternatively, if they are regarded as evolutionary spandrels, it should be relevant to identify the adaptations of which they are by-products and to show that they have not become adaptive subsequently. (Advocates of the by-product thesis rarely take the trouble to attempt these demonstrations, however.)

Among the evidence relevant to such matters is data on (the history of) neurological and other biological mechanisms that subserve the relevant behaviours,

with special attention to whether these are modularised or task-specific. If some behaviour appears to be relatively hard-wired, so that it emerges spontaneously in development, and the relevant circuitry deals only with the behaviour in question, that would provide strong evidence that the behaviours were adaptive. Unfortunately, this approach is rarely decisive, however. So, inevitably there is speculation about when the pertinent behavioural capacities were acquired, about the role they played in the natural-cum-cultural history of our ancestors, and in the case of claimed adaptations, about the particular reproduction-enhancing benefits they bestowed.

The model of evolutionary explanation adopted is often plainly supposed to be of the classical kind: individuals are the units of selection and the method of intergenerational transmission is genetic. But when the arguments are presented by humanists rather than by biologists and scientists, as is often the case in this area, they are sometimes careless. Benefits accruing from the behaviours in question are cited as evidence of adaptation with little regard to attendant costs or to the heritability of those behaviours. Sometimes the benefit is identified as learned skills or knowledge, rather than as inherited dispositions that make such acquisitions possible. Where the account makes group benefits central to the story, it might be suggested that group-level selection, with intergenerational cultural transmission, is the evolutionary mechanism. But this does not always go with demonstrating that intergroup competition was evolutionarily more significant with respect to the relevant behaviour than intragroup competition, which is the key argument one would hope to find.

Traditionally, the aesthetic has been characterised as the beautiful or sublime, or the experience of these. The meaning of the term “sublime” is perhaps not what it was, but is captured by the notion of awesomeness. Falling within these genera are properties such as elegance, unity, power, splendour. The beautiful and sublime (or the experiences to which they give rise) are valued positively; their opposites are disvalued.

Some scientists, including Darwin (1880, pt. 1, ch. 3 and pt. 2, ch. 11), make the error of treating all sensorily based pleasurable responses as aesthetic. But “I’m hungry and my food looks so good to eat” or “I’m tired, and my bed looks so welcoming” do not report experiences that usually target the beautiful and the sublime. A possible consequence of this confusion is to extend the notion of aesthetic experience inappropriately to animals, birds, and insects, as Darwin does. The female bowerbird might be intrigued by the male’s construction and dancing, but it is not

clear that she is moved by their beauty, and it is more likely that her response is lustful than aesthetic.

Art has proved difficult to define, though plainly many of the products of sculpture, painting, music, ballet, and literature (including poetry and drama) will qualify. Many Fine Art traditions are found in the Middle East and much of south-east Asia, as well as in the West. But if we confine our attention only to these, a strong connection with evolution is less likely to be plain than if we adopt a broad outlook that includes appropriate domestic, decorative, ritual, and folk practices among the arts, along with high quality but popular mass entertainments.

Much art aims to be beautiful or sublime—that is, has an aesthetic dimension—but there can be much more to art than this. It can possess important semantic, representational, expressive, and humorous properties, as well as historically conditioned contextual features, including reference, parody, and influence, along with styles and genres. Some philosophers might prefer to distinguish artistic from aesthetic properties. Others (such as Shelley 2003) would expand the notion of the aesthetic to embrace such features. Even then, the aesthetic is the broader notion, because it can apply to natural or non-artistic events or scenes, such as sunsets, seascapes, sports displays, and rice field terraces, as well as to art.

In considering art, most scientists confine their attention to its sensible aesthetic character and ignore its more abstruse intellectual and symbolic meaning and value. (Among those who are guilty of this are Dissanayake 1988, 2005; Ramachandran and Hirstein 1999.) In doing so, they significantly diminish the achievement that much art displays. Generalizing roughly, scientists often show an impoverished attitude to the comprehension and appreciation of art, one that ignores its cognitive complexity, cultural diversity, and historical embeddedness.

One widespread account, with roots back to Kant (1951 [1790]), regards its lack of functionality as a hallmark of art. Art is for disinterested contemplation for its own sake alone, and not for its usefulness to my ends or those of others. But on the view that art is an evolutionary adaptation, it somehow improves the biological fitness—that is, potential fecundity—of those who pursue it, which is why art behaviours have been selected over successive generations. How are these views to be reconciled?

The inconsistency is merely apparent. What is in a creature's biological interests is often experienced by it as intrinsically pleasurable and hence the relevant

behaviours are self-motivating. Think of food, sleep, and sex. Either the creature in question is not capable of reasoning to what is in its best evolutionary interests or (as in our case) it might not rate evolutionary measures of success above other organism-level goals. The biological agenda can be satisfied without this result being targeted or valued by the creature above the rewards it finds inherent in the relevant behaviours.

That allowed, I think the view that art must be non-functional should be rejected. Art has often explicitly served to polemicize a moral stance, to educate its audience, to elevate the power of ritual, to bond the community, to arouse the group to a shared emotion, and so on. And the generation of useful products is integral to the decorative and domestic arts that were mentioned earlier, while the popular arts are intended as pastimes and entertainments. There need be no incompatibility between appreciating art as art and appreciating it for its functional skill and success. And in the case of Fine Art traditions, rather than describing art as non-functional we might better say that it has a function, namely, to reward close attention that considers it for its own sake.

Aesthetics

When did appreciation of the beautiful and sublime arise?

Beginning about 400 kya, *Homo heidelbergensis*, the progenitor species for the Neanderthals and later for us, lavished special attention on a small minority of the bifacial hand axes. Great care, much more than was necessary for functional efficacy, was taken to make the axes symmetrical. Some axes used rare or special stones, or features fossils and other features of the stone. Others were outsize and impractical. Many of the finest examples show no sign of having been used for cutting.

Some people (Kohn and Mithen 1999; Berleant 2007) regard these special axes as the first artworks. Even if we do not wish to go so far, these axes surely suggest that some axe making was driven in part by aesthetic motives.

With Neanderthals, our European cousins, there are indications that they sometimes adopted personal decorations (d'Errico and Zilhão 2003; Zilhão 2011), though these might have been selected as insignia or signs of status rather than for their beauty. These apparently took the form of bird feathers (Peresani, Flore, et al. 2011; Finlayson, Brown, et al. 2012); also, ochre may have been used to this end. An eagle talon necklace pre-dated the arrival of our species in Europe by 80,000 years

(Radovčić et al. 2015). It has also been suggested that Neanderthals may have made art (Choi 2010; Than 2012; Rodríguez 2014). Nevertheless, archaeological evidence of aesthetic behaviours of European Neanderthals and of their Asian counterparts, the Denisovans, is slight at best, though it is conceivable that they took aesthetic delight in nature—in sunsets, impressive vistas, in the sultry warmth of a summer afternoon—as we do.

Artefactual evidence of aesthetic behaviour is scarce also for our species following its first emergence about 195 kya. There are tantalizing hints. For instance, treatment of stones with fire to alter their flaking properties at Pinnacle Point, South Africa, along with evidence of cognitively sophisticated behaviours, dates back as far as 164,000 years (Stringer 2012; Tattersall 2012). In the Middle Stone Age between 100-60 kya, pierced shells (Stringer 2012; Tattersall 2012), engraved ostrich eggshells (Texier, Porraz, et al. 2010), incised ochre crayons (Henshilwood and d’Errico 2011a), and the ritual use of coloured stone (Coulson, Staurset and Walker 2011) are all suggestive.

A stronger pattern emerges in the Upper Paleolithic (40-12 kya). This saw the flowering of cave art and carved figurines that are widely regarded as art. And at the same time, personal adornments featured as grave goods. Take the spectacular case of the children buried head-to-head about 28 kya at Sunghir in Russia. As well as various mammoth ivory lances and other items, more than 10,000 mammoth ivory beads decorated their clothing and the boy sported a belt adorned with 250 pierced polar fox canines (Trinkaus, Buzhilova et al. 2014). Elsewhere in Europe, tools and other artefacts were extensively decorated with incidental depictions or abstract patterns (Cook 2013). Meanwhile, some of the so-called Venuses, carved statues of women, show various styles of clothing and hair design. The 20,000-year old carving found at Brassempouy survives as a head and neck and the hair is plainly styled (Cook 2013). Indeed, from this time on *Homo sapiens* took its place as the aesthetic decorator par excellence (Dissanayake 1988, 1995).

What is the evolutionary function of the aesthetic sense?

According to evolutionary psychologists, our aesthetic sense was shaped by biological drivers (Orians 2014). In the case of the environment, those who were attracted to live in waterless deserts or fetid swamps by the beauty they found there did not pass on their genes; those who were drawn instead to the beauty of habitats offering food and shelter, prospect and refuge, bred successfully and passed on their

aesthetic preferences for such environments (Kaplan and Kaplan 1989; Orians and Heerwagen 1992). In a more specific version, it is suggested that our hominin ancestors took aesthetic pleasure in the savannah, where they evolved, and that we inherit a vestigial preference for that landscape (Wilson 1984; Dissanayake 1988; Tooby and Cosmides 2001; Dutton 2009; De Smedt and De Cruz 2010). We design parks and gardens to display savannah features, such as long-view lines and scattered clumps of trees. And more generally, we attach a higher real estate value to sites offering elevated views of parkland and lakes, as well as finding calm and psychological therapy in natural, as against urban, environments.

Even if they are plausible, such views must be qualified (S. Davies 2012). From when we began to live in towns, from about 10 kya, until the 19th century, untamed nature was generally regarded as threatening and hostile. And the most favoured “natural” environments are typically humanly constructed, being the product of millennia of grazing, wood-clearing, and the like. Besides, not only have members of our species learned to live in arctic wastes, tropical forests, deserts, and swamps, usually they develop aesthetic preferences for the habitats in which they were raised. At least some of our environmental preferences may be bent to look favourably on habitats and landscapes that support a comparatively easy subsistence, but our flexibility and adaptability in face of extreme environmental change might have been more relevant to our survival. Our *Homo sapiens* ancestors faced the consequences of extreme climate instability, both in and out of Africa, for much of our species’ existence (Fagan 2010; Stringer 2012; Tomlinson 2015), so fixed aesthetic landscape preferences might have been detrimental.

Another driver of aesthetic preferences identified by evolutionary psychologists is the biological imperative to raise children who will be parents in their turn. Those who were attracted to the infertile or the victims of illness and disease are not our ancestors. Because of the different investments made by fathers and mothers in their children, the sexes are identified as having different aesthetic preferences in potential mates (Trivers 1972). Men value youthfulness and physical markers of health and fecundity (such as symmetry and body shape) in women; women value (the potential for) status and wealth in men (Symons 1979; Buss 1994; Fisher 2004; Chatterjee 2014). Whereas a man might seek relationships with many women; his partner prefers him to invest his time and resources only in their current children.

These views are absurdly crude. It is not clear that sexual attraction always amounts to seeking beauty, as was observed previously, so it is not obvious that we are talking here about aesthetic responses. (I concede, though, that there is a close correlation between judgments of sexual attractiveness and of physical beauty.) And the idea that the best strategy for a man is to maximize the number of his sexual partners, or of a woman that she should get better genes for her children than those of her partner via a casual liaison so long as she can rely on her partner to stick around, ignore how liable to failure these strategies can be. In a world in which most women do not seek random sex (never mind random impregnation), a man might raise more children successfully by devoting himself to the ones he has at home. And in a world in which men do what they can to guarantee the paternity of their children and reject mates who are unfaithful, a woman might best provide in her behaviour the assurance her partner desires. Serial monogamy is the norm and we are only mildly polygynous (Dixson 2009).

The attempt to be more nuanced is common. It is likely to be mentioned, for instance, that both sexes highly value intelligence, sensitivity, humour, and compassion in those they find attractive. Even this concession seriously underplays the nature and role of beauty in intra-human social relations, however. For a start, evolutionary success is measured in terms of the extent of a person's genetic investment in future generations. Attracting a fecund mate is only the beginning of what will be required for success in this project. The goal is to raise healthy children to adulthood with all the attributes, social as much as physical, that will make them beautiful to others. Parents who lack the relevant qualities—such things as cooperativeness and reciprocity, patience, a sense of justice, care and respect for others, neither too much foolhardiness nor too much timidity, gratitude, even-temperedness, self-esteem and self-care, and the like—are not likely to succeed in cultivating them in their children. So, beauty as a measure of mate attractiveness should take as much account of qualities of character and the skills to impart them as of health and fecundity or status and material resources. Children are comparatively easy to conceive, but raising them to be good members of the community who might, as such, be sought as mates, takes a vastly wider range of aptitudes.

Having extended the notion of human beauty in this way beyond the physical to the social, we can now take it further. Choosing a mate and raising children are important aspects of life, but so are work and broader social interactions. A person

might wish to be valued and admired in these domains also. Presenting oneself appropriately, including making the best of one's appearance, is often important in carrying off one's various social roles. To that extent human beauty goes far beyond sexual attractiveness and into the realm of social self-presentation and self-definition (Etcoff 1999; S. Davies 2012). People want to be thought to be attractive, but they do not typically want that to be construed as an invitation to flirting or sexual behaviour. Rather they aim to say something about how they value themselves and their social position, and they hope this esteem will be returned, not as sexual intercourse but as social intercourse of the right kind.

One topic that has not garnered much attention is that of our aesthetic appreciation of non-human animals, both wild and domestic (S. Davies 2012). Among the most sublime or beautiful of experiences can be encounters with animals—the sight of an apex predator closing in on game, of a bird feeding young at the nest, of a troop of monkeys unexpectedly passing overhead.

Finding animals aesthetically attractive could be adaptive, for example, where it inclines us to understand the animal's lifeway better, with the result that we might become more skilled in hunting game or avoiding danger. Equally, though, it could be maladaptive. If, in finding animals beautiful or awesome, we are led to over-anthropomorphize them—taking the owl to be wise, the fox to be devious, and the lion to be proud—we falsify their natures, with the result that we comprehend them and their place in the environment less well. In other cases, there may be no evolutionary advantage or disadvantage engendered by the aesthetic frisson they cause. Their behavioural displays present arrays of colour that chime with our senses in ways we find beautiful or awesome, say, but this does not otherwise affect our behaviour.

The point is this: whatever evolutionary functions might lie behind our aesthetic proclivities, once those aesthetic attitudes and preferences are in place they can be exercised at will. There is no limit to the things or events in which we can seek beauty or sublimity, even if not everything will be equally suited to rewarding that stance. Our search for aesthetic pleasure often involves imaginative modes of engagement that do not narrowly track evolutionary agendas.

Art

What are art's origins? I have already noted that some people think the finest hand axes of 400 kya are works of art. More widely, it is the cave drawing and engravings and the carved figures dating to the Upper Paleolithic (40–12 kya) that are identified unequivocally as art (see Lawson 2012, 10–11). These are associated with Europe, but works of similar antiquity are found in southeast Asia, Africa, and Australia (Henshilwood and d'Errico 2011a; Bednarik 2013; Aubert, Brumm, et al. 2014).

The emergence of art of this kind is frequently associated with the dawn in our species of what is called “behavioural modernity”—art, along with the adoption of symbolic modes of representation, religion, personal adornment, burial with grave goods. (For discussion, see Mellars, Boyle, et al. 2007; Finlayson 2009; Renfrew and Morley 2009; Fagan 2010; Henshilwood and d'Errico 2011b; Stringer 2012; Tattersall 2012.) The current tendency, however, is to push the date of behavioural modernity back (McBrearty and Brooks 2000; Sterelny 2012), prior to the expansion of *H. sapiens* beyond Africa about 60 kya (Wells 2002; Stringer 2012). Along with this, there is a move to identify earlier precedents for art, such as the engraved ostrich shells of Diepkloof rock shelter, South Africa (De Smedt and De Cruz 2011).

One complication is that not all art is artefactual. Song and dance tend not to leave a recognisable archaeological trace. And not all art relies on highly developed tool technologies or on cognitive sophistication. Some art might be more about emotional expression than abstract thought—again, music and dance come to mind. Or again, if art serves as a form of sexual display, it need not require very high skill, but only a level that outperforms that of sexual competitors.

To illustrate the lack of consensus, consider this: Iain Morley (2013) argues that *H. heidelbergensis* had the physiological and neurological resources, along with the behavioural sophistication, necessary for the production of music as much as 500 kya. Gary Tomlinson (2015), by contrast, suggests that the combinatorial and hierarchical thinking necessary for the creation of music with discrete pitches, tonal centres, and metric regularity is apparent only as recently as 30 kya.

One suggestion (Deacon 2010; Chatterjee 2014; Tomlinson 2015) is that art emerged only when the relevant behaviours were freed from practical functions and goals. Only under those circumstances could they become imaginatively creative. An analogy is drawn here with the domesticated Bengalese finch. It is claimed that the bird's song has become elaborated and that this is because the song no longer plays a role in determining which birds mate. The analogy is painful, however. It is surely not

the case that the birds have become aware that their song is no longer relevant to attracting a mate since their mates now are selected by their human breeders and, hence, that they now feel liberated to experiment with it! And the assumption behind this model of art—that art is non-functional—had its origins in eighteenth-century thought. As was explained earlier, most art through most of human history has been viewed explicitly in functional terms. The naïve error of presuming that art must be appreciated for its own sake alone, without regard to any practical functions it might serve, turns up regularly in the scientific literature and (unintentionally?) disenfranchises most non-Western art (Van Damme 1996).

Was art an evolutionary adaptation? In considering this question we could treat the arts as a group or consider them separately.

Ellen Dissanayake (1988, 1995), a pioneer in this field (along with the likes of Grosse 1897, Hirn 1900, and Eibl-Eibesfeldt 1988), identifies the arts in general (along with ritual and play) as forms of “making special” that enhanced the reproductive success of those who engaged in them. The arts may have had their deepest origins in the playful interactions that bond mothers to their babies. In their more public forms, they improve the quality of group life and social interaction. She argues that art behaviours display the characteristic hallmarks of adaptations, being ancient, universal, and a source of intrinsic pleasure. She also thinks that high end Fine Art fails to do for its meagre audience what earlier art did when all in the community participated in it. Her account is complex and sophisticated—for recent refinements see Dissanayake 2009, 2013—but may be more compelling as an account of proto-art-behaviours than of art’s developed forms.

Another generalist is Geoffrey Miller (2000), who maintains that the arts are all forms of sexual display, primarily made by men to attract women. (See also Dutton 2009.) This was their original evolutionary driver and they continue to retain that same purpose.

One concern with this theory is that it lumps the arts with intelligence, humour, a large vocabulary, and all other sexually attractive displays, so what is supposed to make art adaptive is not distinctive to it. And most art takes place in contexts in which mate attraction is not to the fore. Certainly, art (along with much else) can be co-opted for male display, but it is not evident that this is its original, or even current, primary function.

Though variety among the arts--their diverse histories, and their many different functions--does not rule out the possibility that they serve a central evolutionary function, it should give us pause. Not surprisingly, then, theorists often make the case that some specific art form, rather than the arts in general, is adaptive. (Even so, the erratic histories and multi-functionality of individual arts could remain a worry.) Proponents of these views more often come from the art in question than from the biological sciences.

One movement goes under the title of “literary Darwinism.” Its proponents argue that fictional storytelling, especially in written form, is adaptive. They disagree about how it is so. Various it is suggested that it provides status to the storyteller (Boyd 2009), improves mind-reading skills (Zunshine 2006; Vermeule 2010), or “fine tunes” or “calibrates” mind-reading modules (Tooby and Cosmides 2001) or that it otherwise enhances social performance (Scalise Sugiyama 2005; Gottschall 2012). But we can allow the adaptive importance of fictional thinking (which is essential in counterfactual and hypothetical reasoning) and of narrative (which is essential to establishing self- and group-identity and to recording the past) without accepting that fictional literature is the obvious source of the adaptation. Literature could provide valuable information and help hone useful skills without being a biological adaptation to those ends.

A music-specific theory is defended by Ian Cross (2005-6, 2007, 2012; Cross and Morley 2009), who argues that music’s evolutionary function is to assist cognitive development. It is a bearer of non-verbal meaning, and its combination of importance with semantic imprecision allows it to break down barriers between domain-specific mental modules, thereby encouraging the development of general intelligence. As well, he thinks, it models and thereby encourages the development of ethical modes of social behaviour. But not everyone would accept the story of cognitive development that here is assumed, and empirical data on the effects of music on intelligence and social skills suggest that it can make positive but only minor improvements in these (S. Davies 2012).

A fairly widespread view among scientists is that art is more likely a non-adaptive by-product of our evolved nature, rather than adaptive in its own right.

Darwin implied that music is a non-adaptive spandrel: “As neither the enjoyment nor the capacity of producing musical notes are faculties of the least use to man in reference to his daily habits of life, they must be ranked amongst the most

mysterious with which he is endowed” (1880, pt. 3, ch. 19:569-70). More pointedly, Steven Pinker declared that “music is auditory cheesecake, an exquisite confection crafted to tickle the sensitive spots of at least six of our mental faculties . . .” (1999:534), these being language (when the music has lyrics), auditory scene analysis, emotional calls, habitat selection (as expressed in musical tone picturing of the sea, weather, etc.), motor control (when music leads to dancing), and “something else that makes the whole more than the sum of the parts” (1999:538).

It certainly is true that music depends on auditory capacities evolved for ordinary sound processing, but if the musical whole is more than the sum of its derived parts, as Pinker allows, that may be a reason to believe it is not merely an accidental side-effect of non-musical adaptations.

Other, similar suggestions are that music is a by-product of language (Spencer 1966, vol. 14 [1857]; Barrow 2005; Smedt and De Cruz 2010), an offshoot of ancient socio-affective systems (Panksepp 2009), and that it builds on the capacity to understand others as intentional agents with beliefs, desires, and emotions (Livingstone and Thompson 2009).

Now, one might hope that neuroscience could help determine whether music, to stick with that case, is an adaptation or by-product. Some people have argued that there are music-specific neural circuits (for example, Huron 2003; Peretz and Coltheart 2003; Levitin 2006). Others deny this (such as Patel 2008; Ball 2010; Morley 2013). The matter cannot be decided (McDermott and Hauser 2005). The difficulty lies not only in distinguishing regular sound-processing neural structures from musical ones, but also in the considerable overlap between the use of the brain by music and language, given our uncertainty about which came first (Patel 2008; Bannan 2012; Koelsch 2012; Rebuschat, Rohrmeier, et al. 2012; Morley 2013).

In the case of the other arts, neuroaesthetics has become a burgeoning field. (Recent work includes Kandel 2012, Starr 2013, Chatterjee 2013, Luring 2014.) For the most part, the primary focus is on the nature of aesthetic experience, rather than on the role of art in the brain’s evolution. There is obvious value in work on differences in neural responses between art experts and novices, for instance (see Calvo-Merino, Glaser, et al. 2005). However, the common tendencies in this literature to reduce aesthetic appreciation to hormonal secretions, to equate aesthetic enjoyment with any pleasurable stimulation, and to anthropomorphise the brain are disappointing. (For other criticisms, see Currie 2003; Stokes 2009; Minissale 2013; D.

Davies 2014.) Some interpret the apparent absence of art-specific circuitry as favouring the view that the arts are by-products (De Smedt and De Cruz 2010), while others suggest that such an absence leaves the question open (Merker 2006).

One approach rejects the attempt to tie art closely to evolved behaviours, either as an adaptation or as a by-product. (The position is argued for music in Patel 2008, 2010.) This view regards art as a cultural technology that is transmitted for its value in transforming people's lives. In this it might be compared with the control of fire or with reading and writing. These are important, valuable technologies that deeply affect the lives of those who master them, but they depend only distantly and indirectly on evolved general capacities such as those implicated in intelligence, sociality, emotionality, and learning.

It seems plausible to claim that many artistic behaviours—singing, dancing, play-acting, drawing—emerge robustly in childhood with comparatively little instruction as compared to reading and writing. This implies that they have quite strong biological impellers. We might also question the persuasiveness of the analogy with control of fire (S. Davies 2012). Fire-making is plainly valued as a means to further valuable ends rather than being intrinsically pleasurable and self-motivating as many art-behaviours are. And even if they are not adaptive in their own right, the connection between art-behaviours and intelligence, imagination, emotional expression, and the like seems far more intimate than this view concedes. If biology and culture interact in ways that are mutually altering—as is argued convincingly in Richerson and Boyd 2005—it might not be possible to separate technologies readily from the influence of biology on the capacities they presuppose.

Acknowledging that genes and culture co-evolve, as we just did, permits a new perspective on the earlier debate. It becomes easier to understand why there may be no clear answer to the question framed as one about whether the arts are adaptations or by-products, or whether they are primarily biological or cultural. Culture affects our evolved biology, our biology limits what is culturally possible, and the two are in constant interaction, with feedback in both directions.

Above all, we are a niche-constructing species (Odling-Smee, Laland, and Feldman 2003; Sterelny 2012). As a result, there is no clear difference between our adapting to our environment and our adapting our environment to us. This undermines the applicability of the notion of adaptation and with it, the usefulness of distinguishing between adaptations and by-products of adaptations. We make the arts

to serve our interests, and those interests are shaped in turn by the arts, which goes on to explain change and development in what we expect of the arts. Because of this complex inter-play, it is more fruitful to ask how this process operates than to assign the arts to the category of adaptation or of by-product (Menary 2014).

Stephen Davies

University of Auckland.

Bibliography

- Aubert, M., Brumm, A., et al. (2014) "Pleistocene Cave Art from Sulawesi, Indonesia," *Nature* 514:223–7.
- Ball, P. (2010) *The Music Instinct*, London: Bodley Head.
- Barrow, J. D. (2005) *The Artful Universe Expanded*, Oxford: Oxford University Press. Expanded edition.
- Bannan, N. (ed.) (2012) *Music, Language, and Evolution*, Oxford: Oxford University Press.
- Bednarik, R. G. (2013) "Pleistocene Palaeoart of Asia," *Arts* 2, (2):46–76.
- Berleant, R. (2007) "Paleolithic Flints: Is an Aesthetics of Stone Tools Possible?" *Contemporary Aesthetics* 5,
<http://www.contempaesthetics.org/newvolume/pages/article.php?articleID=488>
- Boyd, B. (2009) *On The Origin of Stories*, Cambridge, MA: Harvard University Press.
- Buss, D. M. (1994) *The Evolution of Desire*, New York: Basic Books.
- Calvo-Merino, B., Glaser, D. E., et al. (2005) "Action Observation and acquired Motor Skills: An FMRI Study with Expert Dancers," *Cerebral Cortex* 15:1243–9.
- Chatterjee, A. (2013) *The Aesthetic Brain: How We Evolved to Desire Beauty and Enjoy Art*, Oxford: Oxford University Press.
- Choi, C. Q. (2010) "Heavy Brows, High Art? Newly unearthed Painted Shells show Neandertals were *Homo sapiens*'s Mental Equals," *Scientific American* March, 18–19 a.
- Cook, J. (2013) *Ice Age Art: Arrival of the Modern Mind*, London: British Museum.
- Coulson, S., Staurset, S., and Walker, N. (2011) "Ritualized Behavior in the Middle Stone Age: Evidence from Rhino Cave, Tsodilo Hills, Botswana," *PaleoAnthropology* pp. 18–61, doi:10.4207/PA.(2011)ART42
- Cross, I. (2005-2006) "Music and Social Being," *Musicology Australia* 28:114–26.
- . (2007) "Music and Cognitive Evolution," in R. I. M. Dunbar and L. Barrett (eds.) *The Oxford Handbook of Evolutionary Psychology*, 649–67. Oxford: Oxford University Press.
- . (2012) "Music as an Emergent Exaptation," in N. Bannan (ed.) *Music, Language, and Evolution*, 263–76. Oxford: Oxford University Press.

- Cross, I. and Morley, I. (2009) “The Evolution of Music: Theories, Definitions and the Nature of the Evidence,” in S. Malloch and C. Trevarthen (eds.) *Communicative Musicality: Exploring the Basis of Human Companionship*, 61–82. Oxford: Oxford University Press.
- Currie, G. (2003) “Aesthetics and Cognitive Science,” in J. Levinson (ed.) *The Oxford Handbook of Aesthetics*, 706–21. Oxford: Oxford University Press.
- Darwin, C. (1880) *The Descent of Man and Selection in Relation to Sex*, London: D. Appleton. Revised and augmented edition. First edition 1871.
- Davies, D. (2014) “‘This is your Brain on Art’: What can Philosophy of Art Learn from Neuroscience?” in G. Currie, M. Kieran, A. Meskin, and J. Robson (eds.) *Aesthetics and the Sciences of the Mind*, 57–74. Oxford: Oxford University Press.
- Davies, S. (2012) *The Artful Species: Aesthetics, Art, and Evolution*, Oxford: Oxford University Press.
- Deacon, T. (2010) “A Role for Relaxed Selection in the Evolution of the Language Capacity,” *Proceedings of the National Academy of Sciences USA* 107:9000–6.
- d’Errico, F. and Zilhão, J. (2003) “A Case for Neanderthal Culture,” *Scientific American* 13:34–5.
- De Smedt, J. and De Cruz, H. (2010) “Toward an Integrative Approach of Cognitive Neuroscientific and Evolutionary Psychological Studies of Art,” *Evolutionary Psychology* 8:695–719.
- . (2011) “A Cognitive Approach to the Earliest Art,” *Journal of Aesthetics and Art Criticism* 69:379–89.
- Dissanayake, E. (1988) *What Is Art For?* Seattle: University of Washington Press.
- . (1995) *Homo Aestheticus: Where Art Comes from and Why*, Seattle: University of Washington Press.
- . (2009) “The artification hypothesis and its relevance to cognitive science, evolutionary aesthetics, and neuroaesthetics,” *Cognitive Semiotics* Issue 5:148–73.
- . (2013) “Genesis and Development of ‘Making Special’: Is the Concept relevant to Aesthetic Philosophy?” *Rivista di Estetica* 54:83–98.
- Dixson, A. F. (2009) *Sexual Selection and the Origins of Human Mating Systems*, Oxford: Oxford University Press
- Dutton, D. (2009) *The Art Instinct*, New York: Bloomsbury Press.

- Eibl-Eibesfeldt, I. (1988) “The Biological Foundations of Aesthetics,” in I. Rentschler, B. Herzberger and D. Epstein (eds.) *Beauty and the Brain: Biological Aspects of Aesthetics*, 29–68. Basel: Birkhäuser.
- Etcoff, N. (1999) *Survival of the Prettiest: The Science of Beauty*, New York: Doubleday.
- Fagan, B. M. (2010) *Cro-Magnon: How the Ice Age Gave Birth to the First Modern Humans*, London: Bloomsbury Press.
- Finlayson, C. (2009) *The Humans who went Extinct: Why the Neanderthals died Out and We Survived*, Oxford: Oxford University Press.
- Finlayson, C., Brown, K., et al. (2012) “Birds of a Feather: Neanderthal Exploitation of Raptors and Corvids,” *PLoS ONE* 7, (9): e45927.
- Fisher, H. E. (2004) *Why We Love: The Nature and Chemistry of Romantic Love*, New York: Henry Holt.
- Gottschall, J. (2012) *The Storytelling Animal: How Stories Make Us Human*, Boston: Houghton Mifflin Harcourt.
- Grosse, E. (1897) *The Beginnings of Art*, New York: Appleton.
- Henshilwood, C. S. and d’Errico, F. (2011a) “Middle Stone Age Engravings and their Significance to the Debate on the emergence of Symbolic Material Culture,” in C. S. Henshilwood and F. d’Errico (eds) *Homo symbolicus: The Dawn of Language, Imagination and Spirituality*, 75–96. John Benjamins: Amsterdam.
- . (eds.) (2011b) *Homo symbolicus: The Dawn of Language, Imagination and Spirituality* John Benjamins: Amsterdam
- Hirn, Y. (1900) *The Origins of Art: A Psychological and Sociological Inquiry*, London: Macmillan.
- Huron, D. 2003. “Is Music an Evolutionary Adaptation?” in I. Peretz and R. J. Zatorre (eds.) *The Cognitive Neuroscience of Music*, 57–75. Oxford: Oxford University Press.
- Kandel, E. R. (2012) *The Age of Insight: The Quest to understand the Unconscious in Art, Mind, and Brain: From Vienna 1900 to the Present*, New York: Random House.
- Kant, I. (1951) *Critique of Judgment*, J. H. Bernard (trans.), New York: Haffner. First edition 1790.
- Kaplan, R. and Kaplan, S. (1989) *The Experience of Nature: A Psychological Perspective*, Cambridge: Cambridge University Press.

- Koelsch, S. (2012) *Brain and Music*, Chichester: Wiley-Blackwell.
- Kohn, M. and Mithen S. (1999) "Handaxes: Products of Sexual Selection?" *Antiquity* 73:518–26.
- Lauring, J. O. (ed.) (2014) *Introduction to Neuroaesthetics: The Neuroscientific Approach to Aesthetic Experience, to Creativity*, Copenhagen: Museum Tusulanum Press.
- Lawson, A. J. (2012) *Painted Caves: Paleolithic Rock Art in Western Europe*, Oxford: Oxford University Press.
- Levitin, D. J. (2006) *This is your Brain on Music: The Science of Human Obsession*. New York: Dutton.
- Livingstone, S. R. and Thompson, W. F. (2009) "The Emergence of Music from the Theory of Mind," *Musicae Scientiae* 13 (2 Suppl.):83–115.
- McBrearty, S. and Brooks, A. S. (2000) "The Revolution that Wasn't: A New Interpretation of the Origin of Modern Humans," *Journal of Human Evolution* 39:453–563.
- McDermott, J. and Hauser, M. D. (2005) "The Origins of Music: Innateness, Uniqueness, and Evolution," *Music Perception* 23:29–59.
- Mellars, P., Boyle, K., et al. (eds.). (2007) *Rethinking the Human Revolution*, Cambridge: McDonald Institute for Archaeological Research.
- Menary, R. (2014) "The Aesthetic Niche," *British Journal of Aesthetics* 54:471–5.
- Merker, B. (2006) "The Uneven Interface between Culture and Biology in Human Music," *Music Perception* 24:95–8.
- Miller, G. F. (2000) *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature*, New York: Doubleday.
- Minissale, G. (2013) *The Psychology of Contemporary Art*, Cambridge: Cambridge University Press.
- Morley, I. (2013) *The Prehistory of Music: Human Evolution, Archaeology, and the Origins of Human Musicality*, Oxford: Oxford University Press.
- Odling-Smee, F. J., Laland, K. N. and Feldman, M. W. (2003) *Niche Construction: the Neglected Process in Evolution*, Princeton: Princeton University Press.
- Orians, G. H. (2014) *Snakes, Sunrises and Shakespeare: How Evolution Shapes our Loves and Fears*, Chicago: Chicago University Press.
- Orians, G. H. and Heerwagen, J. H. (1992) "Evolved Responses to Landscapes," in J. H. Barkow, L. Cosmides and J. Tooby (eds.) *The Adapted Mind: Evolutionary*

- Psychology and the Generation of Culture*, 555–79. New York: Oxford University Press.
- Panksepp, J. (2009) “The Emotional Antecedents to the Evolution of Music and Language,” *Musicae Scientiae* 13 (2 Suppl.):229–59.
- Patel, A. D. (2008) *Music, Language, and the Brain*, Oxford: Clarendon Press.
- . (2010) “Music, Biological Evolution, and the Brain,” in M. Bailar (ed.) *Emerging Disciplines*, 91–144. Houston: Rice University Press.
- Peresani, M., Flore, I., et al. (2011) “Late Neandertals and the Intentional removal of Feathers as Evidenced from Bird Bone Taphonomy at Fumane Cave 44 ky B.P., Italy,” *Proceedings of the National Academy of Sciences USA* 108:3888–93.
- Peretz, I. and Coltheart, M. (2003) “Modularity of Music Processing,” *Nature Neuroscience* 6:688–91.
- Pinker, S. 1999. *How the Mind Works*, London: Penguin Books.
- Radovčić D., Sršen A., Radovčić J., Frayer D. (2015) “Evidence for Neandertal Jewelry: Modified White-Tailed Eagle Claws at Krapina”. *PLOS ONE* 10.
- Ramachandran, V. and Hirstein, W. (1999) “The Science of Art: A Neurological Theory of Aesthetic Experience,” *Journal of Consciousness Studies* 6 (June–July):15–51.
- Rebuschat, P., Rohrmeier, M., et al. (eds.). (2012) *Language and Music as Cognitive Systems*, Oxford: Oxford University Press.
- Renfrew, C. and Morley, I. (eds.). (2009) *Becoming Human: Innovation in Prehistoric Material and Spiritual Culture*, Cambridge: Cambridge University Press.
- Richerson, P. J. and Boyd, R. (2005) *Not By Genes Alone: How Culture Transformed Human Evolution*, Chicago: University of Chicago Press.
- Rodríguez, J. (2014) “A Rock Engraving made by Neanderthals in Gibraltar,” *Proceedings of the National Academy of Sciences USA* 111:13301–6.
- Scalise Sugiyama, M. (2005) “Reverse Engineering Narrative,” in J. Gottschall and D. S. Wilson (eds.) *The Literary Animal: Evolution and the Nature of Narrative*, 177–96. Evanston: Northwestern University Press.
- Shelley, J. (2003) “The Problem of Non-perceptual Art,” *British Journal of Aesthetics* 43:363–78.
- Spencer, H. (1966) *The Works of Herbert Spencer*, Osnabrück: Otto Zeller. 21 Vols.

- Starr, G. G. (2013) *Feeling Beauty: The Neuroscience of Aesthetic Experience*, Cambridge, MA: MIT Press.
- Sterelny, K. (2012) *The Evolved Apprentice*, Cambridge, MA: MIT Press.
- Stokes, D. (2009) "Aesthetics and Cognitive Science," *Philosophy Compass* 4/5:715–33.
- Stringer, C. (2012) *Lone Survivors: How We came to be the Only Humans on Earth*, New York: Times Books.
- Symons, D. (1979) *The Evolution of Human Sexuality*, New York: Oxford University Press.
- Tattersall, I. (2012) *Masters of the Planet: The Search for our Human Origins*, London: Palgrave Macmillan.
- Texier, J-P., Porraz, G., et al. (2010) "A Howiesons Poort tradition of engraving Ostrich Eggshell containers dated to 60,000 years ago at Diepkloof Rock Shelter, South Africa," *Proceedings of the National Academy of Sciences USA* 107, 6180–5.
- Than, K. (2012) "World's oldest Cave Art Found — Made by Neanderthals?" *National Geographic* June 14;
<http://news.nationalgeographic.com/news/2012/06/120614-neanderthal-cave-paintings-spain-science-pike/>
- Tomlinson, G. (2015) *A Million Years of Music: The Emergence of Human Modernity*, New York: Zone Books.
- Tooby, J. and Cosmides, L. (2001) "Does Beauty Build Adapted Minds? Toward an Evolutionary Theory of Aesthetics, Fiction and the Arts," *SubStance* 94/95:6-27.
- Trinkaus, E., Buzhilova, A. P., et al. (2014) *The People of Sunghir: Burials, Bodies, and Behavior in the Earlier Upper Paleolithic*, Oxford: Oxford University Press.
- Trivers, R. L. (1972) "Parental Investment and Sexual Selection," in B. Campbell (ed.) *Sexual Selection and the Descent of Man, 1871–1971*, 136–779. London: Heinemann.
- Van Damme, W. (1996) *Beauty in Context: Towards an Anthropological Approach to Aesthetics*, Leiden: E. J. Brill.
- Vermeule, B. (2010) *Why do we care about Literary Characters?* Baltimore: John Hopkins University Press.
- Wells, S. (2002) *The Journey of Man: a Genetic Odyssey*, New York: Random House.
- Wilson, E. O. (1984) *Biophilia*, Cambridge, MA: Harvard University Press.

- Zilhão, J. (2011) “The Emergence of Language, Art and Symbolic Thinking. A Neanderthal Test of Competing Hypotheses,” in C. S. Henshilwood and F. d’Errico (eds.) *Homo symbolicus: The Dawn of Language, Imagination and Spirituality*, 111–131. Amsterdam: John Benjamins.
- Zunshine, L. (2006) *Why We Read Fiction: Theory of Mind and the Novel*, Columbus: Ohio State University Press.