

## The Plural Pleasures of Music

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**ABSTRACT:** Art has no predefined function, which means that it can be harnessed to serve any number of purposes, including no purpose at all. Sometimes art is successful because it educates us, inspires us, challenges us, disturbs us, or even insults us. But if art didn't appeal to some people at least some of the time, it would cease to play much role in human affairs. Music (in particular) commands a prominent place in personal experience, economic life, and collective culture. Music could not have achieved or sustained such prominence without tapping into the biology of pleasure. It is suggested that aesthetic philosophers have underestimated the complexity, richness, pervasiveness, and importance of neurological pleasure. A defense of the "pleasure principle" in music is given from the perspective of evolutionary psychology.

**KEYWORDS:** *music, aesthetics, evolutionary psychology, hedonic experience, pleasure*

**THE** conventional goal of research is to better understand some phenomenon. Among arts scholars, an additional goal of research is to inspire and propel new forms of artistic expression. In the field of music psychology, research has often emphasized the goal of understanding while ignoring the goal of inspiration. Past research in music psychology has often tended to focus on the limitations of human hearing, the constraints imposed by cognitive processing, and the difficulties involved in comprehending complex musical structures. But the psychology of music also holds considerable promise by providing insights that may lead to expanded musical opportunities.

Cognitive musicologists regard the mind as central to music. As Eugène Ionescu's noted, "A work of art is an adventure of the mind." For music, the mind provides the ultimate concert hall. The mind is both the source of music, and music's audience. If this view is correct, then the greatest potential for musical inspiration should come from better understanding the opportunities afforded by the mind. That is, if we want to expand artistic horizons and foster creativity, there are few more promising approaches than improving our understanding of how minds work.

Many artists are apt to question the utility of such knowledge. It is not clear that understanding how the mind works is necessary. Many artists would suggest that it is *intuition* rather than *knowledge* that provides the foundation for artistic creation.

Intuition is indeed essential for artistic production. In the absence of knowledge, our only recourse is to follow our intuitions. But intuition is not the foundation for artistic freedom or creative innovation. Quite the contrary. The more we rely on our intuitions, the more our behaviors are dictated by unacknowledged social norms or biological predispositions. Intuition is, and has been, indispensable in the arts. But intuition needs to be supplemented by knowledge (or luck) if artists are to break through "counter-intuitive" barriers into new realms of artistic expression.

In the past, writers in the arts and humanities have tended to subscribe to a vitalistic conception of the mind as a sort of disembodied mental realm. Like the soul, the mind was regarded as an immaterial substance that acted on the world via the brain. Modern neuroscience raises significant problems for this traditional Cartesian view. Instead of the brain providing a conduit by which a disembodied *will* acts upon the world, the mind is constructed by the brain. In the words of cognitive scientist Steven Pinker, "the mind is what the brain does" (Pinker, 1997). For many philosophers, the mind has been central and the brain has been peripheral. For cognitive scientists, however, the brain is central and the mind peripheral. The preponderance of empirical evidence is on the side of the cognitive scientists: it appears that the mind is a

special sort of brain-state.

Over the past two decades, philosophers have begun to take heed of the findings of cognitive science. Some have begun to apply the lessons of cognitive science to traditional philosophical problems, including consciousness (e.g., Daniel Dennett, 1991), knowledge (e.g., Patricia Churchland, 2002), and aesthetics (e.g., Diana Raffman, 1993).

The cognitive sciences also have repercussions for how we understand music. As Robert Zatorre has noted, there is no musical experience apart from brains. To understand the musical mind, we must understand the musical brain. When we speak about musical experience, we are necessarily talking about a phenomenon of brains.

## THE EVOLVED BRAIN

In exploring the organization of the brain, biologists remind us that neural systems are the product of millions of years of evolution. That is, brains are adaptations. More precisely, brains are the repository for a large number of adaptations. Every sensation that a brain receives is interpreted through the brain's already existing preoccupations. Among other things, brains are designed to: seek food, avoid disease, conserve energy, circumvent danger, seek physical comfort, seek companionship, encourage reproduction, nurture offspring, make sense of sensations, distinguish animate agents from inanimate objects, solve puzzles, anticipate the future, identify friends and enemies, pursue reciprocal altruism, and avoid being deceived or manipulated. All of our experiences are apprehended and interpreted through these and a myriad of other adaptive goals. In some ways, the brain might be regarded as a collection of "filters" in which certain aspects of the world are ignored as irrelevant while other aspects command enormous significance. Like all other stimuli, music is filtered by a large set of evolved predispositions.

In encouraging organisms to pursue adaptive goals, the brain has assembled a system of rewards and punishments. We experience these rewards and punishments as positively- and negatively-valenced feelings or emotions. In Silvan Tomkins' apt phrase, emotions are *motivational amplifiers*. Pain is nature's way of dissuading us from behaving in a way that is presumed to reduce our adaptive fitness. Conversely, pleasure is nature's way of persuading us to behave in ways that are presumed to increase our adaptive fitness. Emotions are vivid incentives to pursue certain states and avoid others (Tomkins, 1980). Emotions are compelling and vivid precisely because their purpose is motivational.

## QUESTIONING AESTHETIC PLEASURE

Contemporary biology tells us that the only emotions we experience are emotions that have arisen through natural selection as adaptations that enhance survival. Jealousy, embarrassment, hunger, disgust, ecstasy, suspicion, indignation, sympathy, itchiness, love — all are adaptations. They are psychological states that encourage us to behave in adaptive ways. All emotions are evolved phenomena. Said another way, *there are no non-adaptive emotions*.

This claim is in direct opposition to a common view in aesthetic philosophy. Western philosophers have posited the notion of "aesthetic pleasure" — a special sort of enjoyment or relish that is presumed to be independent of the "base" emotions related to survival. For these philosophers, the essence of art is that it serves no particular purpose, and the essence of artistic enjoyment is that it is above or beyond mere corporal or biological pleasure.

This view has held enormous sway, especially in Western art circles for the past three centuries or so. However, there is no psychological evidence that such an independent "aesthetic pleasure" exists. Moreover, from a biological perspective, the idea of an aesthetic sense or aesthetic emotion independent of survival is implausible. Nature doesn't build mental devices whose purpose isn't related to adaptive fitness.

To be sure, the neurophysiological machinery involved in pleasure is highly complex. Research implies that there are a number of discrete "pleasure centers" in the brain, and there are dozens of neurotransmitters and hormones implicated in the experience of pleasure (Pert, 1997; Berridge, 1999; Ito & Cacioppo, 1999; LeDoux & Armony, 1999). Exogenous opiates (such as heroin) are able to evoke pleasure because they are similar in chemical structure to various endogenous endorphins, which belong to a larger

class of pleasure-inducing chemicals known as enkephalins.

The point is that there is no pleasure apart from brains, and since brains are the product of natural selection, there is no pleasure outside of the mechanisms provided by natural selection. For the biologist, the existence of an independent “aesthetic emotion” unrelated to survival is a highly problematic idea.

This is not to say that there might not be an “aesthetic emotion.” That is, the biologist would not, in principle, discount the possibility of a unique pleasure that is evoked solely by art or by music. But such an aesthetic emotion could arise only if art or music was an evolutionary adaptation. That is, it is possible that music-making serves an adaptive purpose, and that music-related behaviors enhance human biological fitness in some way or other. While this view is entirely speculative, it is not a wholly implausible possibility. Elsewhere, I have reviewed both the scientific evidence and various proposed evolutionary theories concerning music (Huron, 2001/2003). Summarizing this literature is beyond the scope of this brief article. However, the principal message to be drawn from this literature might be expressed as follows. There are a number of tell-tale signs that biologists look for that either imply or preclude the possibility of an evolutionary origin. While there is no direct (genetic) evidence establishing an evolutionary basis for music, music-related behaviors are not inconsistent with the classic evolutionary signs. In short, whether music-related behaviors have an evolutionary origin (and so improve adaptive fitness) remains an open question. In light of the rapid advances propelling the field of genetics, it is possible that this question will be resolved one way or another within a decade or two.

### **PROXIMAL AND DISTAL CAUSES**

In promoting adaptive behaviors, nature practices a sort of “tough love.” Short-term rewards and punishments are regularly dispensed in order to promote long-term survival and procreation. Consider, for example, the pain evoked by cutting your finger. The principal danger arising from cutting yourself is the long-term danger of infection (and possible death) rather than the short-term danger of blood loss. But the principal emotional experience (pain) is generated by the immediate act of cutting yourself. Consequently, we fear cutting ourselves more than we fear getting an infection, even though the infection is the more serious threat to good health.

In accounting for behavior it is useful to distinguish between more immediate or “proximal” causes and more remote or “distal” causes. Positive or negative emotions are intended to promote behavior that increases an animal’s fitness in the long run. Our emotional lives are lived in an immediate world of proximal causes, but the physiological mechanisms that produce these emotions are shaped by long-term (evolutionary) goals.

Notice that sometimes the link between proximal behaviors and distal goals is broken. Occasionally, the feelings evoked by some circumstance fail to conform with the long-term adaptive goal. For example, a family pet may experience acute distress when being taken to the veterinarian, even though the medical attention objectively increases the animal’s health. In this case, the negative emotions fail to promote fitness. The animal’s experience is dominated by other adaptive emotions, such as fear of leaving one’s home territory, or fear of being confined.

Another example of breaking the link between proximal feelings and distal goals can be found in human sex. The pleasurable experiences are intended to promote the long-term goal of reproduction. However, with the advent of contraceptive technologies people can enjoy the proximal pleasures of sex while circumventing the distal goal of reproduction. Evolution has not yet caught on to this recent human penchant to usurp the reproductive purpose. But evolution will ultimately prevail: in the distant future, it is possible that the mere sight of contraceptive devices will strike terror in the hearts of our descendants.

Whenever an animal is placed in an environment that differs from the historical environment in which its species evolved, such proximal/distal mis-matches may be commonplace. In non-traditional environments, it is possible for animals to engage in non-adaptive pleasure-seeking (NAPS) behavior: behaviors that engage the proximal causes of pleasure without necessarily serving the distal goals.

In general, evolutionary dispositions underlie behaviors, but they do not dictate proximal actions. For example, evolutionary logic cannot be used to explain why you had spaghetti for dinner last night or why you parked in a particular parking spot this morning. Evolutionary tendencies might account for why you prefer to eat cooked wheat rather than uncooked grass, and it might explain why you prefer to

minimize energy consumption by selecting a near rather than distant parking spot. But these are only background dispositions. Similarly, evolutionary accounts will never be able to explain why you chose to listen to Beethoven's symphony No. 3 rather than Schumann's symphony No. 4.

In short, evolution explains only the *mechanisms of pleasure*, not the individual *pleasurable events*. The mechanisms of pleasure must necessarily be adaptive, even though the *pleasurable events* themselves need not be. This principle applies to musical pleasure whether the enjoyment is a non-adaptive consequence of other pleasures, or whether the enjoyment is an adaptation in its own right. Whether or not music is an evolutionary adaptation, it is always possible to engage in non-adaptive pleasure-seeking. That is, it is possible to evoke pleasure, even though the experience is not objectively adaptive.

Evolution inclines, but does not compel. As humans, we can choose to engage in activities that subvert nature's designs. But while we can subvert these designs in the short term, the underlying pleasures owe their origins to natural selection.

## MUSICAL GOALS - BIOLOGICAL TOOLS

In art, we are free to pursue any goals we wish. There is no boundary around art, and few people would argue that the arts should be hemmed in. But we must recognize that the pleasures evoked by art, like the pleasures evoked by sex, originate in one or more already existing adaptive plans that we are largely powerless to change. Humans create art, but not just as we please.

Pleasure remains important in the arts. We cannot make music that fails to engage the machinery of human pleasure and expect that people will find the music compelling in some mysterious way.

Musicians may be free to define their own goals, but all of the tools for evoking various psychological states are ultimately biological. Artists have no choice but to construct their art with the tools provided by physiological psychology.

In order to illustrate this, I will describe three examples of how biology shapes the experience of sound. My examples will include:

1. The phenomenon of *auditory cuteness*.
2. The role of voice-leading in *auditory scene analysis*. And
3. The role of expectation in evoking the *prediction effect*.

Later I will hint at other possible biologically-influenced musical pleasures.

The examples I put forward here may be viewed as a speculative contribution to an evolutionary psychology of music. In proposing any evolutionary account, it is appropriate to consider some of the intellectual dangers that await. Not all of the pertinent dangers can be noted in this brief proceedings article, but let me at least identify six of the more important ones.

1. In his well-known work on epistemology, *The Logic of Scientific Discovery*, Karl Popper (1935/1959) argued that the theory of evolution by natural selection lacks a scientific status because the theory as a whole cannot be directly falsified. No scientist has formulated the theory in such a way that a set of observations could, in principle, be used to falsify it. Popper consequently referred to the theory of evolution as a *pre-scientific* theory. This "non-scientific" status did not significantly diminish the importance of the theory in Popper's eyes. Popper argued that the theory remains scientifically important because of its hypothesis-generating capacity. Individual hypotheses arising from the theory of evolution are often testable.
2. A second problem associated with evolutionary accounts is the problem of *post hoc* reasoning. Gould and Lewontin (1979) have noted that it is relatively easy to concoct theories to explain pre-existing data. For example, since we already know that camels have humps, we can generate all sorts of plausible explanations as to their origin. Like Rudyard Kipling's *Just So* stories, there are innumerable opportunities for unfounded "story-telling" (Lewontin, 1991). Philosophers refer to after-the-fact theories as "*post hoc* theories." *Post hoc* theories are properly regarded as inferior because they use the facts twice: first as a basis for formulating the theory, and second as "evidence" in support of that theory. Good theories, by contrast, are *a priori*; that is, the theory suggests or

predicts certain facts or phenomena before these facts are ascertained or observed.

It should be noted, however, that *post hoc* theories can sometimes develop into *a priori* theories. The transformation of a *post hoc* theory into an *a priori* theory occurs when some unexpected prediction is seen to be a logical outcome of the theory. (In many cases, such *a priori* formulations are also, in principal, falsifiable, so these theories also become “scientific” in Popper’s terminology.)

As Tooby and Cosmides (1992) have pointed out, Lewontin and Gould’s critique of evolutionary reasoning is too sweeping. Although many evolutionary accounts are clearly *post hoc*, a large number of evolutionary accounts are *a priori*. For example, evolutionary theory has led to remarkably abstruse and counterintuitive predictions such as the Trivers-Willard hypothesis (Trivers and Willard, 1973). One prediction arising from this hypothesis is that human male offspring will be breast-fed longer than female offspring by mothers from high socio-economic backgrounds, while female offspring will be breast-fed longer than male offspring by mothers from low socio-economic backgrounds. In a study of North American families, this and related predictions have been confirmed (Gaulin and Robbins, 1991). Other tests have similarly proved to be consistent with predictions from the Trivers-Willard hypothesis (see Ridley, 1994, and Wright, 1994, for reviews).

3. An important issue is how we interpret the repercussions of naturalistic accounts of phenomena. Philosophers refer to the belief that ‘the way things are in nature is the way they ought to be’ as the *naturalist fallacy*. This view conflates what *is* with what *ought to be*. The *naturalist fallacy* is a sort of double-edged sword, however. Whereas we properly blame sexists for failing to recognize the is-ought distinction, we don’t typically blame environmentalists (for example) for their reliance on this same mode of argument. We tend to be attracted to “natural” accounts that support our views and refute the views of others. Yet when others use “nature” to support their views, we point to the *naturalist fallacy*. Most of us are rampant hypocrites when it comes to the *naturalist fallacy*. Moreover, not all philosophers are convinced it is a fallacy.

It is entirely legitimate to be suspicious of anyone purporting to offer evolutionary accounts for musical behaviors. Our fear is that some people will be tempted to use such accounts to buttress arguments concerning musical taste: music *X* is more natural, and therefore superior to music *Y*. However, I think these suspicions are often overblown. Artists are not especially receptive to being told what to do — especially if they are told that art *must* be a certain way. Nor are listeners especially susceptible to being told what to like. At the same time, most artists and listeners are happy to learn about possible phenomena that might underlie human experience. That is, people seem to have a healthy combination of curiosity about how things might work, and skepticism about what they ought to do.

4. Evolutionary theory has been used to defend all sorts of nefarious ideologies, from racism to sexism. There is a voluminous and distinguished literature on genetic diversity and human equality, which we won’t review for reasons of space. However, this literature provides important guidelines for interpreting how evolutionary arguments carry over to moral and esthetic discourse (see for example Dobzhansky, 1973). The fact that a theory may be used to support nefarious moral ideologies does not make the theory false; rather it establishes that we need to be vigilant about how theories are interpreted.
5. By discussing biological issues, an author runs the risk of being misconstrued as believing that cultural factors are unimportant. Minds are the product of both biology and culture. My own empirical research has suggested how learning and enculturation figure prominently in musical experience (e.g., Aarden & Huron, 2001; Huron & Ollen, 2003; Huron, 2004a; Huron, in press; Simpson & Huron, 1994). Like most other music scholars, I believe that culture is the principal factor influencing music. However, our belief in the preeminence of culture does not give us license to dismiss possible biological foundations.
6. If music is an evolutionary adaptation, then it is likely to have a complex genesis. Any musical adaptation is likely to be built on several other adaptations that might be described as pre-musical or

proto-musical. Moreover, the nebulous rubric “music” may represent several adaptations, and these adaptations may involve complex co-evolutionary patterns with culture (see Durham, 1991). In biological matters, things are rarely straightforward.

Given the possible dangers, why bother with efforts to discuss music from the perspective of evolutionary psychology? First, my goal is exploratory: my aim is to stimulate thinking about possible evolutionary bases that might influence musical experience. Second, in the spirit of Popper, my hope is that evolutionary speculation will ultimately lead to testable hypotheses. As long as my accounts remain *post hoc*, Gould and Lewontin’s criticisms raise justifiable and paramount difficulties. However, I expect that in the future, it may be possible to test some of the ideas discussed below.

## 1. Auditory Cuteness

There are innumerable ways to describe sounds. Sounds can sound raspy, warm, metallic, distant, disgusting, dry, feeble, or funny. Sounds can sound clear or muddy, confident or tentative, mellow or harsh. In a simple experiment, I had listeners judge the “cuteness” of a range of sounds. My sounds included various squeeze toys, instrument tones, music boxes, tuning forks, plus a number of sound effects, including animal calls, electrical appliances, closing doors, and other sounds. Listeners were unanimous in distinguishing those sounds that are “cute” and those sounds that are “not cute.”

In general, the sounds judged “cutest” exhibit high pitch, high spectral centroid, and weak amplitude. These included little bells, small musical instruments like the ocarina and soprano recorder, certain bird calls, and animal calls produced by smaller animals. But the best sounds were generally those generated by various squeeze toys I purchased at a local toy store. Disassembling the squeeze toys, the sound-producing mechanisms are typically rubber or plastic air bladders with a tiny aperture. Sounds are evoked by squeezing the air bladder with air passing through the aperture. Using the method of water displacement, I found that the “cutest” of the sound resonators were roughly 20 milliliters in volume. “Cute” sounds appear to arise when a small resonant cavity is activated using a small amount of energy through a small aperture.

Interestingly, the 20 ml volume is similar to the volume of the vocal tract of an infant. Of course infants are capable of generating sounds that are most certainly not cute. However, the screams and bawls of infants typically involve large amounts of energy. When an infant simply gurgles or “coos,” most people readily agree that the sound is “cute.”

The experience of auditory cuteness is accompanied by the positive feelings. Auditory cuteness also evokes a distinctive psychological state that includes *nurturing* and *protective* behaviors. While the squeeze toys used in my study are simply inanimate objects, they seem to invite holding and cuddling. Were a person to step on these toys, the act would seem callous or cruel compared with stepping on a newspaper or a rock. Of course the toys were visually cute as well as evoking cute sounds. But as sounds emitted by inanimate objects, the sounds alone seemed to evoke feelings of preciousness, fragility, and attractiveness.

By evoking nurturing and protective feelings, cute sounds seem to be tapping into a disposition for “parenting” behaviors. Whether learned or innate, the experience of auditory cuteness is consistent with an evolutionary adaptation that promotes parenting. What is interesting, is that this disposition generalizes beyond the sounds produced by an infant’s vocal tract. Small animals are also capable of evoking the same feelings. More unusually, inanimate objects like music boxes, soprano recorders, ocarinas, and small squeeze toys are similarly capable of evoking the nurturing or protective feelings characteristic of parenting. By contrast, sounds such as tubas, timpani, closing doors, and car horns are less able to evoke such feelings.

Note that the proximate cause of auditory cuteness appears to be a particular combination of acoustical features involving high spectral resonances and low amplitude. But the distal cause of auditory cuteness is the promoting of parenting behaviors—presumed to be directed at human infants.

From a psychological perspective, the most important point is that “cuteness” is not an objective property of sounds. Instead, it is an imposition of the mind designed to enhance adaptive fitness. As in the case of sexual pleasure, the distal purpose of nature’s design can be subverted by individuals to serve the

goal of proximal enjoyment. Human listeners can experience an adaptively-evoked sense of pleasure in cute sounds even though the objects of our enjoyment probably serve no adaptive function.

In other words, the distinctive feelings associated with auditory cuteness provide a brain-based resource that can be deployed and shaped by composers and performers. Whether arranging a work for soprano recorder or selecting the vocal timbre for the Betty Boop cartoon character, the ability of musicians to evoke auditory cuteness is made possible only because of a preexisting evolved sensory filter.

## 2. Auditory Scene Analysis.

One of the principal purposes of the auditory system is to reconstruct and interpret acoustical signals. Part of this “sense-making” is to infer the various sound sources present in the environment. Bregman (1990) has referred to this function as *auditory scene analysis*. One component of auditory scene analysis is deciphering which concurrent spectral components belong together. For example, if the environment contains two complex sound sources, then auditory scene analysis attempts to segregate the partials so that each component is correctly assigned to the actual acoustical sound source.

Another task is deciphering whether two successive sounds are emitted by a single sound source or two different sources. For example, if the environment contains one sound source that emits first one tone, and then another, then auditory scene analysis attempts to recognize that the two sounds are connected and so represents the events as successive states of a single vibrating object.

Elsewhere I have suggested that successful (i.e., coherent) parsing of the auditory scene is rewarded by the brain. That is, assembling a self-consistent and coherent representation of an auditory scene produces an experience of mild pleasure (Huron, 2001; pp.56ff). Renaissance polyphonists, I suggest, discovered that the pleasure of parsing the auditory scene is enhanced by increasing the number of concurrent sound sources. That is, when the parsing task is made more challenging, the mental reward for successful source separation is increased. In Huron (2001) I showed that the traditional rules of voice-leading facilitate auditory scene analysis. By ensuring successful voice segregation in polyphonic textures, the rules of voice-leading contribute to a sense of pleasure. Without implying that polyphonic music is in any way superior to other forms of music, the rules of voice-leading can nevertheless be plausibly traced to an evolutionarily-adaptive pleasure-evoking mechanism.

A similar argument can be made for the pleasure evoked by stereophony. When listening to recorded music, a marked increase in pleasure accompanies switching from monophonic to stereophonic reproduction (Huron, 2001, p.57). Why does this occur? If, as I have proposed, the auditory system rewards itself for successful parsing of the auditory scene, then improved localization cues or improved source separation should be mentally rewarded. That is, stereophonic source separation evokes pleasure for the same reason that voice-leading evokes pleasure.

One further component of “scene sense-making” is the ability to recognize and identify sound sources. When we hear a sound, the auditory system seems obsessed with the task of identifying its source or cause. When at home, for example, you may encounter many sounds including creaking floors, buzzing lights, dripping taps, the hum of the refrigerator, etc. But amidst this cacophony, it is the *unrecognized* sound that grabs our attention and leads to an obsessive preoccupation with identifying its source. A quiet scratching sound may leave us mystified until we are able to determine that it is the sound of a sparrow building a nest outside a window. Auditory scene analysis often culminates in the conscious or unconscious “labelling” of different sound sources. Successful sound-labelling can also evoke a weak sense a pleasure.

## 3. Prediction Effect

When we expect some stimulus, a mental reward is generated when our expectation is fulfilled (Mandler, 1975). In the psychology of expectation, this predictive reward has been referred to as the “primary affect” (Olson, Roese & Zanna, 1996), but I prefer the more mnemonic moniker—the *prediction effect*.

In my book, *Sweet Anticipation*, I provide a detailed argument explaining why expected sounds might tend to be preferred over unexpected sounds. In general, accurate predictions are more likely to

enhance survival, so the brain provides a system of rewards and punishments to encourage predictive accuracy and discourage inaccurate expectations. Predicted stimuli evoke a positively valenced limbic reward. While it is accurate prediction that leads to a limbic reward, the pleasurable feelings evoked by expected sounds are commonly misattributed to the stimuli themselves. Accordingly, in a (highly-predictable) cadential passage, the arrival of the tonic is experienced as pleasurable. The tonic pitch is not inherently a more “pleasant” sound than other pitches. But it is more predictable in the cadential context, and the predictive reward tends to become associated with this sound.

Similarly, the downbeat is not inherently a more pleasant temporal moment than the off-beat. But, in a conventional metric context, downbeat events are more predictable, and the limbic reward arising from accurate prediction tends to become associated with the downbeat event. The downbeat “sounds nice.”

This is not to deny that novelty is also important. Listeners habituate to highly expected sounds, and stimulus repetition can lead to boredom or irritation. Apart from the desire for novelty, however, there is ample experimental evidence that listeners generally prefer familiar and expected sound stimuli (e.g., Burges & Sales 1971; Bornstein 1989; Meyer 1903; Mita, Dermer & Knight, 1977; Moreland & Zajonc, 1977; Szpunar, Schellenberg & Pliner, 2004; Thompson, Balkwill & Vernescu, 2000; Wilson, 1979).

Expectations acquired through passive exposure to a sound environment can lead to positively valenced limbic responses that are misattributed to the stimulus itself. Composers make use of this prediction effect in all kinds of ways. Many musical devices, from the appoggiatura and suspension to the ostinato and motive, can be understood as promoting the prediction effect (see Huron, in press).

## OTHER MUSICAL PLEASURES

Above I have offered just three speculative cases: one pertaining to timbre, a second pertaining to part-writing, and a third pertaining to musical structure/expectation. I have suggested that the pleasures typically evoked by auditory cuteness might be plausibly linked to the adaptive goal of nurturing offspring. The pleasures evoked by clear voice-leading might be plausibly linked to the adaptive goal of perceptual sense-making. The pleasures evoked by accurate prediction might be plausibly linked to the adaptive goal of accurate prediction.

But these are just three examples of many music-evoked pleasures that might be plausibly traced to various evolutionary adaptations. The pleasures evoked by the “aha” or “insight” phenomenon might be plausibly linked to the adaptive goal of encouraging puzzle-solving. The pleasures evoked by empathy and sympathy might be plausibly linked to so-called “mirror emotions” whose adaptive goal may be to encourage altruistic behavior. Even the preference for “authenticity,” “honesty” or “genuineness” in music might be plausibly linked to the adaptive goal of avoiding social deception.

In *Sweet Anticipation* I suggest that the pleasures of musically-induced laughter may be plausibly linked to the adaptive goal of social cohesion (see also Huron, 2004b). Similarly, the tendency for members of a peer group to share common stylistic preferences might be plausibly linked to the adaptive goal of avoiding social isolation and building a network of reciprocal support. I also suggest that the pleasurable experiences of awe (gasping) and frisson (chills or shivers) might be plausibly linked to positive appraisals of an unrealized danger.

While consonance and dissonance are highly complex phenomena involving many factors, the sensory component of dissonance known as “sensory dissonance” is strongly linked to tonotopic masking and temporal disruption —suggesting that the negative limbic experience can be plausibly linked to the adaptive goal of avoiding sensory-induced degradation of the auditory system. Similarly, the negative phenomenal experiences evoked by certain sounds such as coughing, wretching, vomiting and flatulence can be plausibly linked to the *disgust response* —a response whose adaptive goal is the avoidance of disease.

Further cases might be made for the preference for novelty, the avoidance of habituation, the preference for oral wetness cues, the preference for acoustic intimacy, the preference for moderate amounts of reverberation, and other musical phenomena.

Admittedly, these suggestions are wholly speculative. Once again, my point here is not to suggest that the relationship between musical pleasures and biological adaptation is an established fact. Rather, my point is that a music research program inspired by evolutionary psychology is not unworthy of pursuit.

## THE FLOWER AND THE BEE

In understanding the relationship between music and pleasure it may be helpful to consider a simpler and more familiar biological analogy — such as the relationship between flowers and bees. Sexual reproduction first appeared in plants. But since plants have a limited ability to move around, the transporting of pollen from plant to plant raises formidable challenges. One of the most successful strategies employed by plants has been to make use of the mobility of insects. Foremost among these insects has been bees.

The “flower” is a specialized organ whose purpose is to encourage insects to help in the process of sexual reproduction. Flowers are adaptations whose function is to facilitate reproduction by harnessing insects (like bees) to do the “heavy lifting” of pollen transport. But this can be achieved only if the flower proves to be an effective bee attractant.

Hundreds of millions of years of evolution have transformed flowers into consummate “bee attraction devices.” Flowers exhibit at least four design features that are consistent with this goal: (1) Flowers provide food in the form of nectar. (2) Flowers provide a distant lure in the form of smells that make use of volatile aromatics. (3) Flowers provide distant lures in the form of color (reds, yellows, and violets are popular). (4) Flowers provide a convenient “landing strip” for insects. In the case of color, the best strategy is to employ colors that form marked visual contrasts. Since the world is full of green-colored chlorophyll, the worst color to use for a flower is green. The most spectrally distant color is red, followed by orange and yellow — colors that occupy the low-frequency end of the visible spectrum. If one selects a contrasting color at the high-frequency end of the spectrum, then violet is the result.

A moment’s thought tells us that the most “successful” flowers will appeal to bees in as many ways as it is possible to be attractive to bees. That is, flowers are structured according to the pleasures afforded by bee brains. Whatever a bee likes, provide it.

## HEDONIC PLENITUDE

Music appeals to humans in a similar fashion to the way flowers appeal to bees. The most “successful” musical works appeal to people in as many ways as it is possible to be appealing. Like the flower, successful musical works are structured according to the pleasures afforded by human brains. These pleasures are not limited to a single pleasurable dimension. There are sensory pleasures, cognitive pleasures, social pleasures, kinesthetic pleasures, and other domains of appeal. Moreover, within each of these domains (such as the realm of social pleasures), there may exist many distinct ways of evoking pleasure.

Neuroscience has begun to map the variety of pleasure-evoking channels in the brain. It is unlikely that music evokes pleasure through just one of these channels. In the normal course of events, musical pleasures are likely to be *plural* pleasures.

Notice that even if there were a unique “aesthetic pleasure” — as advocated by some Western philosophers, the most successful musical works would inevitably expand their appeal beyond this single pleasure. That is, if music could also evoke social pleasure, or kinesthetic pleasure — or even sexual pleasure — then musical works would tend to do so. By definition, the most pleasurable works would be those that catered to as many (human) pleasures as possible. We might call this tendency to expand the pallet of pleasurable appeals *hedonic plenitude*.

This is not to say that a specific musical work (or musical genre) might not “specialize” so as to better cater to one specific pleasure-evoking channel. Rather, I am suggesting that once a work has been optimized for a given pleasure, the natural tendency will be to expand its appeal by evoking other pleasures as well — at least to the extent that pursuing one pleasure doesn’t interfere with or compromise the capacity to provide some other pleasure.

Like the flower, musical works (and other art forms) have a tendency to mirror the pleasure-inducing structures of the brain. For mature genres, artistic structures will reflect neurological structures.

The phenomenon of hedonic plenitude is well illustrated in the consumption of food. After creating a delicious dish, we then attempt to add to the pleasure through other (non-gustatory) pleasure channels. For example, we might serve the food in a visually appealing way — creating pleasant table settings, using

fine china and silverware with floral arrangements. We may add background music, or we may arrange to eat in a beautiful setting —perhaps while watching a sunset.

Apart from these sensory appeals, we may also endeavor to cater to non-sensory hedonic channels. Rather than eating alone, we may add social pleasure by dining with close friends or invite socially interesting guests. Rather than allowing others to prepare the food, we might tap into the pleasure of accomplishment or a sense of skill by creating the food ourselves. Perhaps we will experience a sense of pride because the food was prepared using an old family recipe —a gastronomic heirloom. Perhaps we will eat on a day that has a special meaning, such as an anniversary. Perhaps there is a thematic unity between the menu and the music, and recognizing this relationship will give our guests’ ‘puzzle-solving’ channel and little thrill. We may also take pleasure in our altruism: that is, we may take pleasure in giving pleasure to others. Through a process of hedonic plenitude, the simple consumption of food is transformed into the elaborate dinner party. This, I would suggest, is the model for musical pleasures.

## WHENCE AESTHETIC PLEASURE

Why, we might ask, have many aesthetic philosophers in the West rejected the idea of the ‘pleasure principle’ as the main motivation in the arts? For those philosophers who have accepted the importance of pleasure, why have they tended to insist on a distinction between ‘base’ pleasures and ‘higher level’ aesthetic pleasure divorced from the function of survival?

In addressing these questions one must begin by noting that aesthetic philosophers are not of one mind. There is a considerable diversity of views evident, and some philosophers are apt to agree that human biology plays a role in artistic organization. Nevertheless, most Western aesthetic philosophers have followed Kant, and have insisted on distinguishing ‘higher’ from ‘lower’ pleasures, and have accepted the view that art is distinguished from non-art by the absence of practical or instrumental value.

In the first instance, modern Western philosophy was highly influenced by the Cartesian notion of the separation of mind and body. Even before Descartes formalized the idea, Western thought largely assumed the existence of an immaterial mind or soul that was only loosely connected with a corporeal body. It was the body (rather than the mind) that engaged in gluttony and debasement. It was the mind (rather than the body) that engaged in the contemplation of creation.

Part of the reason why many aesthetic philosophers have resisted the idea of a ‘pleasure principle’ may be its association with crude or unrefined elements of human behavior. There are two factors, I think, that may have contributed to the rejection of the pleasure principle.

In the first instance, there are pleasurable experiences that do indeed relate to bodily functions whose products are repulsive. The base act of urination provides an instructive example. No matter what activity one is engaged in, a full bladder will ultimately command attention and usurp all other priorities — displacing even the most noble of intentions. The sense of ‘relief’ that can accompany relieving oneself is universal, if pedestrian. As with many behaviors, nature deploys both irritation and pleasure as incentives that encourage animals to attend to important biological functions.

Moreover, the feelings of irritation and relief are not the only adaptive feelings involved. The waste products themselves are experienced as repulsive, and for good reasons. Waste products have, by definition, no utility, and are commonly the source of disease. It is typically adaptive for animals to be repulsed by their own waste products. While the expulsion of such wastes may be accompanied by notable feelings of relief, the products themselves have no redeeming properties and so may be the legitimate source of feelings of disgust. In addition, to the extent that others may be disgusted, our own waste products may also be a source of shame or embarrassment.

Surely (we may think) the pleasures evoked by musical tension and release are qualitatively different from the feelings of tension and release experienced during urination or defecation. Surely the musical experiences are more noble and relate to a higher set of values. This is a difficult claim to make. Bathroom functions may be unfairly denigrated because they are ‘tainted’ by their capacity for disgust, shame, or embarrassment.

A second factor, I propose, encourages some aesthetic philosophers to make a qualitative distinction between aesthetic pleasures and other pleasures. This relates to the social dynamics of taste. Research in the sociology of fashion suggests that fashion manifests complex social dynamics. Quentin Bell famously

distilled the dynamics of fashion to two principles: (1) imitate those to whose social group you aspire, and (2) distinguish yourself from those you wish to exclude from your social group (Bell, 1947). These two principles alone are able to account for much of the complexity and seemingly irrational vicissitudes of fashion.

Many of those who have written about aesthetic quality are at pains, not just to distinguish base pleasure from aesthetic pleasure, but also to make refined distinctions between inferior and superior aesthetic taste. Writers on aesthetics rarely claim or celebrate the discovery that their own taste is indistinguishable from the taste of the ordinary *hoi polloi*. Suspiciously, superior taste always seems to reside in the products of the social circle to which the writer belongs. The artistic products of other classes are typically characterized as appealing to a baser or more corrupted pleasure. While not all aesthetic writings are motivated by a self-serving social psychology, many are suspiciously consistent with Bell's fashion principle: distinguish yourself from those you wish to exclude from your social group.

At first blush, an appreciation for the arts seems worlds away from many of life's pleasures. But this is an illusion: nature is rarely far away.

## CONCLUSION

Pleasure is more pervasive and fundamental to the arts than many scholars care to admit. I hasten to add that my claim here is descriptive rather than normative. I am not arguing that music *must* or *should* evoke pleasure. As noted earlier, art has no predefined function, which means that it can be harnessed to serve any number of purposes, including no purpose at all. Sometimes art is successful because it educates us, inspires us, challenges us, disturbs us, or even insults us. But if art didn't appeal to some people at least some of the time, it would cease to play much role in human affairs. Music (in particular) commands a prominent place in personal experience, economic activity, and collective culture. Music could not have achieved or sustained such prominence without tapping into the biology of pleasure.

Aesthetic philosophers have underestimated the complexity, richness, pervasiveness, and importance of neurological pleasure. At least some philosophers have interpreted the sometimes crude or disgusting products of certain human pleasures as a broad indictment of all bodily pleasures, and have incorrectly characterized corporeal and mental pleasures as qualitatively different.

For those of us who want music to be all that it can be, recognizing the role of pleasure in music provides new opportunities. Since pleasure is an evolved capacity, the most fruitful place to look for musical opportunities is in a better understanding of the adaptive functions of different forms of pleasure. By better understanding the human capacity for pleasure, we will better recognize those realms of musical experience that have yet to be explored.

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