

Where Does Music End and Nonmusic Begin? Fine-tuning the “Naturalist Response” Problem for Nontonal Music’s Naturalistic Critics

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Abstract: As to what distinguishes music from other sound, some investigators in both philosophy and cognitive scientists have answered “tonality.” It seems subservient even to rhythm. Tonality is considered to be the central factor around which the piece is oriented; it gives a sense of home, expectation, and completeness. Most important, much of this inquiry builds on naturalistic, evolutionary explanation to account for human nature and behavior. The conclusion of such line of thought is that sounds missing tonality or tonal focus cannot be music. This article challenges such sort of naturalistic criteria distinguishing music from nonmusic. Permitting certain sets of sounds to be considered music does not necessitate denial or approval of naturalistic explanations but does allow nontonal music to serve a part of human and musical evolution.

Keywords: atonal music, evolution and the arts, naturalism, nontonal music, tonality

*How irksome is this music to my heart!
When such strings jar, what hope of harmony?*

—Henry the Sixth, Part I. II, I, 56–57.

The time, moreover, that that a person requires—as I required in the matter of this sonata—to penetrate a work of any depth is merely an epitome, a symbol, one might say, of the years, of the centuries even that must elapse before the public can begin to cherish a masterpiece that is really new.

—Proust, *Remembrance of Things Past, Within a Budding Grove* (tr. C. Scott Moncrieff) (405).

A current strain of naturalism in philosophy and cognitive science promises to solve long-standing problems by looking to the human evolutionary story. Such naturalism in ethics, for example, makes the influence of selective forces a foundation of descriptive and even normative ethics (Bonniolo & De Anna, 2006). Naturalism in art theory and aesthetics explains the arts as universal, evolved human phenomena exhibiting particular characteristics because of natural-selective forces (Carroll, 2004). My concern is that some naturalistic criticisms of nontonal music¹ take too narrow approaches for the naturalistic program’s own good. The article’s main point (Part II) contends that research into musical experience, emotions, and origins does not justify naturalistic contentions that nontonal music is unaesthetic. The secondary point (Part III) is a suggested alternative for naturalistic aesthetics.

1. Introduction

1.1. The “Natural Response”

I consider naturalism in philosophy of music and music cognition to be the approach that, building on (interlinked) evolutionary, biological, and cognitive bases, explains why humans universally and uniquely as a species make music and why such sequences of sounds are comprehensible to us

and move us. Naturalistic musical aesthetics turns to the results of such evolutionary inquiry as bases for assessing the quality of musical works.

In his *Philosophy and Literature* review of *Piano Notes* by pianist Charles Rosen, Dutton (2003) criticizes nontonal music from a “natural-aesthetics” viewpoint. Dutton praises pianist Rosen’s performances, renowned for their limpid interpretations (“non-interpretations,” if you will), which de-emphasize performer interpolations so compositional subtleties may shine. A music scholar in his own right, Rosen understands great masterpieces’ structural intricacies. His repertoire ranges from Bach’s *Goldberg Variations* and Beethoven’s sonatas, through Schumann and Chopin, to Debussy and beyond. Natural-aesthetician Dutton diverges from Rosen at this “beyond.”

Rosen sees his “beyond” composers, including Boulez, Carter, and Berio, continuing the canonic line from Bach. Dutton objects. While Rosen admits such contemporaries have yet to gain the popularity of earlier composers and blames performers for not working harder introducing the modern, Dutton proposes that the nontonal compositions are not high-quality—because of their very nontonality.

Acknowledging, like Rosen, that modernist art of all genres makes audiences uncomfortable, Dutton finds modernist music persistently annoying: “Listeners may not be merely ignorant, tone-deaf conservatives when they exclaim, ‘I say it’s spinach, and I say the hell with it!’ But Rosen is in no mood to be fair and puts the arguments in favor of modernism at their robust best” (291). Dutton explains that modernists like Rosen neglect “the natural response”: “an aesthetic naturalist. . . [asks] what is the partial ‘natural response,’ and how big a part does it play? I wish [Rosen] had directly addressed the topic” (292). Dutton describes what is unnatural and thus unaesthetic about avant-garde music: It runs against our evolved music-appreciation faculties, which prefer, he implies, sweet and fat over “spinach.”

All arts involve experiencing structural relationships, Dutton explains. To experience these, in temporal arts such as music (arts experienced qua arts over time), audiences must remember a work’s earlier parts. They expect what is to come based upon what came before. Such expectation, Dutton contends, is crucial for aesthetic pleasure. However, nontonal composers sabotage the means to those expectations and pleasures: They reject the natural, tonal musical language which cues us into expecting what comes next, according to what came before (as parts of a sentence do). Nontonal compositions involve sounds disconnected from an order natural to humans: The listener, while struggling to construe what has already sounded, is also stripped of clues as to what follows. Listeners would best voice their natural response and protest nontonal music’s intrusions between Schubert and Haydn in concerts.

Dutton overlooks Indian raga music which is not exactly nontonal but, being improvisatory nonetheless is not structured in such a way that audiences can readily predict where it is going next. Which Dutton finds so necessary to defining music apart from noise.

Tonality is Dutton’s critical ingredient distinguishing music from non-music (or, at best, pseudo-music). He notes that our era itself is not debilitating composers: Some neotonal works, such as Britten’s and Shostakovich’s, exhibit complexity comparable to avant-gardists’ yet allegedly attract wider audiences, further evidence that avant-garde composers forsake “what comes naturally.” The evolutionary forces that shaped the creature’s brain presumably shaped the creature’s artifact called music. That brain is what delimits music, much as it delimits language, for which not just any sort of garble can qualify. The brain does not register a sleeper’s random smacks of lips as language, or the slams of car doors or atonal scratches on violins as music. Theorists may fool some brains that those sounds are music, as snake oil salespersons fool some that their concoctions are medicine. Such facts about the human brain are, in Dutton’s summary judgment, why modernism in music has been an aesthetic debacle.

1.2. The Prospect

In *The Art Instinct*, Dutton positions musical experience within his larger evolutionary theory of arts. Composer and musicologist Lerdahl (1988, 2001) also criticizes nontonal music within a natu-

realistic framework, contending it fails to appeal to the requirements of an innate musical “grammar.” He faults composition-theorists:

Much twentieth-century music arose from compositional systems spawned not by knowledge of how the musical mind works (this knowledge is only now emerging)... but by the ideology of historical progress... [which] led to mutually incompatible and largely private compositional codes. Without guidance from study of musical cognition, this result was in retrospect predictable, for the musical mind does not spontaneously learn arbitrary system. (2001, 381).

Both he and Dutton, as well as Raffman (2003, 2011), offer a delimiting or external² critique of what music comprises and contend that, despite nontonal music-theorists’ hypotheses, nontonal music falls outside the delimitations.³ I question whether these critiques take the right naturalistic approach.

Towards that end, I first ask whether the anecdotal evidence provided for nontonal music’s failure with audiences is adequate or accurate. Next, I review recent research into musical experience, emotion, and evolutionary origin which is germane to the criticisms. From this review I derive two observations: 1) theories of musical experience and origins are far from settled as to what are innate, natural, or evolved responses to music and thus what are the essential parameters of music; and 2) even if these theories were more settled and accepted, empirical studies of dissonance and nontonal melodies so far offer little support for the argument that these elements cannot be essential features of aesthetically appealing music.

One attraction of natural-aesthetics theories is that they offer a demarcation between art and non-art, music and non-music. I am questioning whether the way some commentators have made the demarcations is the best way.

2. The Inadequacy of the External Naturalist Criticisms of Nontonal Music

2.1. The Audience Issue

Has audience response indeed exemplified that nontonal music is an aesthetic debacle? Disregard for now that what counts as aesthetic success is a problem (see §2.4). The external criticisms commonly turn to a supposedly empirical fact: Audiences dislike this music. Is this a bona-fide fact? It may seem one could simply query audiences. However: (1) Which audiences? Only “classical” music audiences? These, though, as Boulez (1986) notes, are highly fragmented (“ghettoized”). Which subgroup represents “experienced listeners” (Lerdahl’s [2001] term)? Or should the entire human population be sampled? After all, much television and movie music has adopted nontonal techniques, so the “non-experienced” listener may be better-suited. (2) Which works and questions? Play a well-known movie’s nontonal music and ask the non-experienced listener “Does this succeed as music?” or “Do you like this?” By either question, tonal and nontonal works alike could fall short without revealing whether it was the tonality or nontonality hobbling them. (3) Which time-frame? Audience tastes fluctuate. These three issues involve untangling from taste something universal and innate, which thing comes intimately coated in taste. Furthermore, (4) what percentage of audiences exhibiting dislike signifies aesthetic shortcoming?

An alternative for now is anecdotal evidence, responding to that of nontonal music’s critics. The oft-quoted history of how, soon after arch-avant-gardist Boulez assumed the New York Philharmonic’s helm from Bernstein, subscription sales nose-dived from 100 percent, has a flipside: While Boulez maintained his modernism campaign, within a few years subscriptions remounted to 95 percent (Rosen 2000). Either audiences were masochists—unlikely in such numbers—or learned to appreciate Boulez’s modernism. For his “Rug Concerts” in the season’s final two weeks, 1500 “people were turned away every day, seven days a week.” (Rosen 2000, 311, fn.3). Notably, Boulez’s audience-age declined. There may be a learning factor in nontonal-music appreciation. But it is implausible that these audiences are forcing themselves to sit through what their brain is processing as non-music while a certain, socially cowering brain-region insists they sit anyway, to appear

sophisticated. Otherwise, opera-haters and detractors of nontonal music may be comparably cogent: A case against audiences' favoring nontonal music could apply to those listening to tonal Western classical music, even if tonal-music audiences are larger now. In both cases, someone's delimitation of the genres that comprise good music is pitted against positive audience response.

We may have to grant reasonable sincerity in certain audiences and musicians. Rosen (2000) made firsthand observations of audiences and performers: "conductors and solo performers programmed works they liked to play" (312). Conductors both present and past have faced technical challenges in new works: Composers often stretch the limits of instrumental technique, and orchestra-members balk. Performances suffer. But in time, instrumentalists improve. Once the bar is raised for instrumental technique, the challenging works enter the repertoire hand-in-hand with the new levels of virtuosity,⁴ and musicians find them increasingly interesting and emotionally involving. "The music that survives is the music that musicians want to play. They perform it until it finds an audience," Rosen writes. "The most significant composers are those who gain the fanatical loyalty of some performers" (303).

A number of nontonal composers have gained such loyalty among performers—and audiences. Rosen, alongside notable pianists such as Paul Jacobs, has performed and recorded Carter's piano works. The record catalog reveals recordings of Boulez's piano sonatas and Ligeti's difficult concerti and piano etudes by several pianists. Note that instrumentalists' preparing works is not comparable to a curator's clearing a museum nook for a readymade: Musicians dedicate dozens, hundreds, of hours practicing, memorizing, drilling fingers into uncharted difficulties, work rarely undertaken unless they love the piece. Notably, New York Philharmonic conductor Gilbert directed a May 2010 production of Ligeti's opera *Le Grande Macabre* at Lincoln Center. No less hidebound an institution than New York's Metropolitan Opera has Berg's *Wozzeck* and *Lulu* and Schoenberg's *Moses und Aaron* in its standard repertoire. Operas are not "forced in" between Haydn and Schubert symphonies: The massive Met audiences are unlikely making themselves sit through three hours of what their cognitive-limbic systems are registering as the aural equivalent of car-door-slamming. As Rosen (2000) notes, listener responses to nontonal music can be quite emotional: "To those who admire Schoenberg's music the emotion [in it] can often seem all too intense to the point of hysteria." (304) The analogy—nontonal works : music :: readymades : artwork—is a disanalogy. The readymades may better be considered, as Raffman (2003) characterized Cage's *4'33"*, as works of philosophy; the nontonal works have passionate followings who adore the music itself, theory or not.

General audience response hardly implies modernist music's aesthetic shortfall. A modernist music-culture exists; its critics' brunt is to show this culture is unnatural and wrong (see §2.3). Perhaps experimental and other psychological studies and theories of musical experience can offer empirical evidence of natural-aesthetic response.

2.2. Research: Musical Experience, Emotions, and Evolutionary Origins

In the past three decades, cognitive science has inquired extensively into the nature of music: how we can experience certain sets of sounds as a unified phenomenon "music," why these sounds evoke emotion and what is the nature of this emotion, and how humans evolved a capacity for music. The diversity and inconsistency among these inquiries so far attest partly to the subject's newness, complexity, and challenges. The field's current state, though, hints how empirical research may ultimately bear on naturalist music aesthetics, particularly for nontonal music.

My review of musical-cognitive research could be much longer, but I have space for only the most representative.⁵ Inquiry into how we experience sounds as music extends back at least to Plato's *Republic*, where Socrates discusses the different modes and their psychological effects. An oft-cited contemporary milestone in this inquiry is Lerdahl and Jackendoff's 1983 *A Generative Theory of Tonal Music* (GTTM). Looking to generative linguistics, GTTM explains how apprehension of music involves listeners' breaking down hierarchically structured musical elements. While music

does not communicate semantic content, a piece has a certain organization and much of the aesthetic and emotional pleasure arises from apprehending that organization. As linguistic grammar is organized around the sentence, musical grammar is organized around the tonic. Like the sentence, the tonic tops a generative tree. All other tones in the piece are digressions from that tonic home and derive their “meaning” within the piece through their role in relation to it.

GTTM borrows much from centuries of Western music-theory and from Schenker’s hierarchical musical analysis. But GTTM’s originality is its set of rules that give this hierarchy a cognitive framework. The “music surface” is the perceived acoustic signal. The music grammar involves rules mapping the surface to the deep structure or tonic. The listener applies well-formedness rules (WFRs) to group the notes into regular, hierarchically organized patterns. WFRs also operate on metrical structures to analyze the hierarchy of strong and weak beats. Other WFRs apply to pitches, which listeners subject to “reductions,” that is analyze each note’s pitch-relation to the piece’s tonic. By a “time-span reduction,” each pitch is assigned a structural importance in relation to the grouping and the metrical structures. Finally, WFRs for “prolongation” sort the progress of pitches into a directionality of tension increase or relaxation.

Listeners’ analysis of these four components should not vary greatly among performances of the same work or among (experienced) listeners. More variant are the deeper preference rules by which the listener sorts the groupings, meters, and reductions across the entire piece, noting patterns among them to apprehend more complex structural coherence. Sorting can vary among performances of the same piece, contributing to the richness of musical experience.

The tension/relaxation driven by the prolongation reductions likely influences emotional response. Thus, there is an emotional/cognitive connection in apprehending tonal music. If music developed with our evolving brain over human prehistory, GTTM helps explain why the emotional component is integral along with the higher-cognitive. Cognitive apprehension of music is tied to constant tensing and relaxing, which seem to have an emotional affect. The tonic provides the primary “head” from which to orient the structures which guide our emotional response.

GTTM has made an influential and “important contribution to cognitive science,” DeBellis (1999) notes (471). It has effectively switched psychological musical research into the cognitive track, and much subsequent work is in positive or negative response to it. DeBellis questions whether GTTM can explain more than a subset of music—that based on a type of eighteenth-century Western tonal syntax. Also, as Mithen (2006) states, “few musicologists have accepted that this [GTTM] musical competence is equivalent to a grammar like that of language” as “rules of a musical style and the rules of a language are profoundly different” (20).⁶ Nonetheless, the pivotal role that GTTM assigns to the tonic has been central to much naturalistic criticism of nontonal music, as in Dutton (2003), Lerdahl (1988, 2001), and Raffman (2003, 2011).

Raffman (1993) turns partly to GTTM to explain why musical experience is ineffable. But this explanation leaves unclear whether nontonal music somehow neutralizes or negates the cognitive pathways to such ineffable experience and so cannot properly evoke musical emotions. However, cognitive-science research into musical emotions offers glimmers of how people respond to tonality and nontonality and so may illuminate nontonal music’s emotional nature.

Juslin and Västfjäll (2008) propose a theory of six psychological mechanisms whereby music evokes emotions:

- brain-stem reflexes;
- evaluative conditioning, which associates music to a listener’s emotions;
- emotional contagion, by which a listener perceives that a musical work is attempting to evoke certain emotions;
- visual imagery, which listeners intentionally invoke;
- episodic memory, whereby music evokes specific event-memories from listeners’ lives;
- musical expectancy (much like GTTM’s prolongational-reduction), by which the work’s structure induces the listener to expect certain outcomes and so pulls the emotions different directions.

Each of these mechanisms appears to be not specifically musical but basic psychological or “distinct *brain function*” (568). Musical expectancy, for example, not observed in young children, requires general learning capacities: The listener must learn a musical system’s syntax, which, like language, may involve “a common set of processes for syntactical integration” (568).

This theory promises insight at least into response to musical dissonance. Dissonance, particularly “unresolved,” is a salient feature of nontonal music. If it invokes entirely dis-pleasing emotional responses, the contention that music dominated by this feature is unaesthetic may gain plausibility.⁷ Brain-stem reflexes and musical expectancy are relevant to the effects of dissonance on musical emotions. “Brain-stem reflexes are quick and automatic,” the authors note, and brain-stem responses to “[s]ensory dissonance is suggestive of ‘danger’ in natural environments. . . . Dissonance may have been selected by evolution as a negative reinforcer of behavior” and so is unpleasant to the listener (564). However, in experiments, five-year-olds could not identify chordal dissonances as “wrong,” while nine-year-olds could, indicating a possible learning factor by which cultural influences shape expectations and responses. Yet, cultural traditions may build upon “natural” negative responses to dissonance, and only later-developing learning capacities may prompt the listener as to what to expect in sequences of consonances and dissonances. The authors also mention studies revealing that infants react unfavorably to dissonances, so this empirical issue is still open. Most important, the question remains as to whether strings of unresolved dissonances in music are intrinsically unpleasant to the point of universal aesthetic violation.

Alcorta, Sosis, and Finkle (2008) criticize Juslin and Västfjäll for accounting for the *how* but not the inextricably related *why* of musical emotion—why it evolved. The “close relationship between soci-ality, sanctity, and music offers important insights into emotional responses to music and suggests possible adaptive functions for those responses that shed light on both proximate and ultimate causes” (577). Evolutionary psychology and related research has investigated psychological and emotional responses to music and why it was evolutionarily adaptive. Justus and Hutsler (2005) acknowledge that while some charac-teristics of music may be strictly cultural, others seem to be “programmed into the human genome” (8) thus universal and innate. They propose innate constraints upon music: Humans tend to

- perceive similarities in the octave and simple ratios such as the major fifth;
- arrange pitches into scales and shape melodies into contours that ascend or descend through a scale;
- group notes and find underlying rhythmic regularity;
- divide scales by unequal intervals.

However, the authors conclude that these constraints do not assume cognitive mechanisms evolved particularly for music. Each constraint may be shared with other domains. For example, harmonicity heuristics involved in auditory scene analysis would use the same grouping of tones with overlapping harmonics as required in octave grouping. Further research into innate constraints could as well reveal that attribution of such constraints to cultural phenomena is misguided or vice-versa. In sum, the authors find no evidence that music is a cognitive domain specifically shaped by evolution.

McDermott and Hauser (2005) take a similar approach but more hesitantly conclude it is too early to ascertain whether music is or is *not* an evolutionarily shaped domain. They believe that innate brain features must at least partly constrain music. To determine the degree to which uniquely human innate traits, culture, or generally adaptive traits (shared with other animals) constrain music, they turn to four types of empirical evidence—developmental, comparative, cross-cultural, and neural. The evidence includes:

- Music widely consists of pitch changes and simple pitch ratios.
- The octave has a likely biological basis.
- Musical cues for emotion are culturally invariant.
- Tonal melodies are processed differently in the brain from nontonal ones.

Infant and comparative studies indicate humans uniquely may have a preference for consonance over dissonance. Other findings germane to naturalistic aesthetics are more equivocal. They describe musical intervals as either “natural” (or simple, such as the major fifth) or “unnatural” (or complex, e.g. the tritone). Developmental studies indicate that these interval-types, when played simultaneously or sequentially, invoke differential infant response. However, melodies commonly proceed by such complex intervals as the major or minor second, and there appears to be a universal sensitivity for such melodies (though scant evidence that this sensitivity is due to innate brain structures).

Most germane to this article’s concern are the postulated general preferences for tonal melodies with ‘natural’ harmonic intervals, infant preferences for consonance over dissonance, and findings about differences in tonal and nontonal melody processing.⁸ Assume research firmly establishes transcultural preferences for natural-interval, tonal melodies. That finding may help explain phenomena such as how songs exhibiting these traits, often from the West, attain worldwide popularity (barring, say, cultural hegemony). However, at least three concerns arise: whether 1) such a finding indicates that melodies lacking this trait cannot truly be melodies or that pieces with such melodies are unaesthetic or not music; 2) preferences for consonance mean that heavily dissonant music is unaesthetic; and 3) tonal melodies are indeed processed in different brain structures from nontonal, whether the latter is unaesthetic or not music at all.

While positive responses to these questions may support an argument that nontonal music is unaesthetic (but see §§3.2-3.3), it is unclear whether they would imply that nontonal music is not even music. Transcultural natural-interval preferences, consonance preferences, and differential cerebral-processing of melody types together do not establish that nontonal music cannot be apprehended as music through other cerebral mechanisms. More generally, *has* evolutionary development indeed shaped the human brain so as to rule out certain sounds as music? Hauser and McDermott (2003) propose an evolved “musical faculty” analogous to Chomsky’s “language faculty.” Comparative studies, the authors note, suggest that language builds upon prehuman physiological/perceptual adaptations; other comparative studies indicate that music may similarly do so. Insights into music’s prehuman phylogeny as “protomusic” and other species’ sensitivity to music should help delineate its uniquely human aspects. Just as the stipulated language faculty in infants sorts sounds into language or non-language, the conjectured music faculty sorts sounds into music and non-music. While we share with other species, as phylogenetically distant as birds, some physiological/perceptual adaptations for processing sounds, the uniquely human part of the music faculty seems to have an ability to sort certain sounds as music. Thus, perception of the octave and major fifth, natural intervals, and probably dissonance-versus-consonance has a prehuman basis, whereas our ability to combine certain sound elements and assimilate them as a whole, as a piece of music, is human. This story may put an evolutionary constraint on the kinds of sounds we could call music. But no evidence indicates that these constraints can be stretched so as to exclude nontonal music (see §2.3).

A host of other evolutionary theories maintain that music either builds upon existing adaptive mechanisms or is a specifically adapted mechanism itself.⁹ Despite this division, most of these proposals concur that whatever sounds count as music must be constrained by adaptive biological traits (whether or not those traits are specifically adapted for music). Pinker (1997), Dutton (2010), and Ball (2011) assume such a constraint, while they assign different statuses for music’s adaptation. Pinker’s renowned “cheesecake” hypothesis holds that music appeals to general-psychological adapted traits but is itself adaptively superfluous (a “spandrel”), somewhat as cheesecake appeals to adaptive cravings for sweets and lipids but is nutritionally superfluous. Dutton maintains that all artistic drives are specifically adaptive (and Ball confirms this notion specifically for music). The arts are intrinsic to humans’ survival as social beings with particularly adapted brains. We want to experience music because, as with the other arts, natural or sexual selection has molded our brains to find it appealing. Pinker and Dutton also assert that, whatever cognitive adaptations music appeals to, they have well-defined characteristics (such as the ability to perceive octaves), and nontonal music cannot appeal to them but flies astray of the musical-cognitive net. (Ball is more moderate about nontonal music; see §3.2.)

Other theorists offer yet other scenarios of music's originating from music-specific adaptations, as Dutton proposes, although from different adaptations. Dissanayake (2006, 2008) says music originates from social-bonding, primarily infant-mother bonding, with behavioral modifications ensuring long-term relationships and care. These behaviors—movements and sounds—were ritualized by adults, becoming dance and music. With origins deeply rooted in human psychology, these arts are both universal and easily appreciated cross-culturally. Mithen (2006) looks beyond the mother-infant relationship to sexual selection—namely that of females' choosing mates—which brings the arts to the fore of early-*Homo* social life. He proposes a proto-music/language cognitive domain which later diverges into music and language. These two social “organs” thus have related origins and central functions in society although different characteristics. Brown (2007a and b) similarly postulates a proto-“musilanguage.” All three theorists bring up the possibility that, if music did have such origins and even (as Brown suggests) occupies a cognitive domain that neuroimaging may illuminate, music as a phenomenon has certainly grown and expanded from simpler origins to something more complex (whatever the limit on that complexity may be).¹⁰ Such expansiveness will be significant in my discussion.

2.3. Discussion

A couple of conclusions can be drawn from these studies into musical experience, emotions, and evolutionary origins. One is that, as McDermott and Hauser (2005) persuasively argue, it is too early to decide whether music is a specifically adapted cognitive domain. A second is that, even if the research community becomes more unified concerning these theories of musical experience, emotions, and evolutionary origin, the evidence so far already points to music's having less rigid definitional borders than Dutton (2003), Lerdahl (1988, 2001), Raffman (2003, 2011), or GTTM assumes.

For one matter, the definitional border appears to be broad and hazy, hardly a solid line. Infant and other developmental studies indicate that, much as with language-acquisition, children need to grow into apprehending music as distinct kinds of sound, as well as to react to it fully emotionally (Trainor and Trehub 1992, 1994). But the possibility infants react negatively to dissonance, as Peretz (2008) finds, does not imply such sounds are non-music. After all, tonal music employs dissonance extensively; there is no clear demarcation on how extensively composers may allow dissonance before they lapse into non-music. (Wagner and Debussy abound with unresolved dissonance but their works are no longer labeled “non-music.”) Later, children learn to identify “jarring” dissonances as inappropriate in a piece. It does not seem that the infants' “negative” reaction to dissonance means that “jarring” or “unresolved” dissonance is inherently inappropriate in music. The postulated differences in neural processing of tonal and nontonal melodies points only to these melody types' being processed differently, not to one being a “truer” melody type. Musical-cognitive research into perception of nontonal melodies provides some insight. Krumhansl, Sandell and Sergeant (1987) found wide differences among listeners' ability to detect atonal (dodecaphonic) melody structures, according to listeners' musical training, with better-trained listeners processing structure at levels better than chance. While these results do not indicate whether such melodies are less “true” than tonal, they allow that some listeners can perceive some level of such melodies' structures. Finally, the ease by which certain kinds of simple tonal melodies are transmitted to other people, say by humming, is no evidence that such melodies have an aesthetic advantage; it simply means these melodies are more transmissible. If transmissibility (“humability”) of melody were an aesthetic standard, much of tonal classical music would suffer. (Try humming most of Bach or of Beethoven's piano sonatas.) These findings indicate that nontonicity likely does not mark the line between music and non-music; instead, tonal shades into nontonal and, possibly, nontonal shades into non-music.

For a second matter, the border and so the area within appears to be expanding. Darwin (1952), Dissanayake (2006), McDermott and Hauser (2005), and Mithen (2006) suggest music began sim-

ply, such as pitched moans, rhythmic tapping, or notes on primitive instruments. Over millennia and in different cultures, scales and modes developed, melodies grew complex, harmony was added, rhythms became elaborate, multiple modes and scales became available, major and minor keys and the well-tempered scale developed, dissonance/consonance contrasts grew fuzzier and chromaticism more daring. Whichever theory of the musical-cognitive domain finally prevails should account for this expansion. The theory that there is no dedicated domain but that music builds upon other domains can readily account for the expansion: As music expands and grows more complex, it builds upon more cognitive domains. For example, if the first music were pitched, consonant moans, and if consonance is neurally processed differently from dissonance, then when music added dissonance, it likely built upon another cognitive domain.

The theory of a single dedicated musical-cognitive domain has more difficulty explaining expansion. First, it is implausible that when such a domain first appeared—say via pitched moans a mother sang as a lullaby—the domain contained all that was cognitively necessary to apprehend, say, Wagner's *Ring*. If there is a single musical-cognitive domain, somehow since its inception it had to have expanded to incorporate music's increasing complexity. Either (1) when evolution selected it, it contained the seed whereby it may expand, or (2) through further adaptation (via selection), it expanded. The former is vague at best (and at worst, for nontonal music's naturalist critics, begs the question¹¹), while the latter is unlikely: It is doubtful that in the 18th-Century there was natural selection for Europeans who well-apprehended the well-tempered scale.

My purpose is not to decide between a dedicated-domain or multiple-domain theory.¹² The point, rather, is that hazy broad borders and continual expansion appear to be characteristics of music which any theory of musical experience, emotions, and origins must explain. Indeed, neurophysiology may one day reveal neural architecture accounting for music's hazy borders and continual expansion.

2.4. Problems with the External Critiques

Consider then that music's dimensions have been expanding and human brain-structures allow that expansion. If at least some people can apprehend and appreciate contemporary nontonal music, human brains must be structured to allow that apprehension. Neither Dutton (2010) nor the other investigations into musical emotions, experience, and origins I described, excepting Ball (2010; see §3.2) offer sufficient evidence that contemporary nontonal music does not fall within that expansion. The natural aesthetics of Dutton's (2003), Lerdahl's (1988), or Raffman's (2003, 2011) external critiques of nontonal music then lacks basis.

To the objection that there may be some study somewhere or one to come that may justify these criticisms, I reply that the cognitive research discussed here is so interconnected with other work in the area it is unlikely such a study is lodged in some cranny; the burden rests on the critics to evince it. As for future studies, they are moot for either side.

These criticisms do make intrepid attempts at naturalizing aesthetic judgment. Certainly, across the world are many kinds of music, and likely many people can never appreciate them all. But naturalistic aesthetics so far lacks evidence indicating why some types of music, especially the nontonal, are unaesthetic. In fact, it needs to account for the musical-aesthetic expansion I have been discussing.

Dutton (2003) compares nontonal music to vegetables, but the comparison can backfire. Mozart and Schubert would presumably be the evolutionary equivalent of high-fat, high-sugar foods; we have but feeble, evolutionarily instilled desire for dull old vegetables. Yet, vegetables *are* food, potentially fulfilling, and though they may never attain the hamburger's popularity, some people esteem them as among the greatest foods. It is implausible that aficionados of nontonal music are aesthetically fooled. Instead, it would be more perspicacious, first to acknowledge these tastes' validity, then explain how they fit into the high-fat/high-sugar evolutionary story and humans' expanding tastes, and then critique avant-garde tastes within their category.

A naturalist empirical theory of what is good and “bad” (or simply “mediocre”) music faces a basic challenge. Among many possible ways to proceed with such empirical assessment, three suffice for the present discussion:

- (1) Rely on one’s own judgment and universalize it.
- (2) Declare that whatever appeals to the widest range of listeners is the standard.
- (3) Rely on the judgment of each music culture and subculture.

The external critiques I discuss use a mixture of (1) and (2). These critics observe *they* do not respond well to nontonal music, then justify this response by asserting it appears to be universal since this music does not appeal to most if not all humans. The problem with (1) is its aesthetic egoism can too readily be whimsical; but these critics neutralize it by coupling it with (2). However, (2) begs the question: How do we know that what has the widest appeal is what’s good? Mired in (1) and (2), these critics lose cogency. The advantage of (3) is that it defers the judgment to the subjects themselves and so avoids question-begging. It is naturalistically sound, in that it acknowledges there is aesthetic judgment but lets the judgmental content be determined by the groups of musicians and listeners who fine-tune those judgments. This approach may be accused of aesthetic relativism,¹³ yet acknowledging real groups form the basis of aesthetic judgment still leaves the naturalist with the hard work of determining what is universally good among these groups (and thereby also circumventing “absolute” relativism). I support (3) further in Part III.¹⁴

3. A Suggested Remedy for Naturalism

3.1. Preliminarily, Taking the Positive Response as a Fact

As long as musicians enjoy playing nontonal music, as Rosen notes, they will find audiences, even if these are not the size of those for Puccini. And yet, if recorded car-door-slamming wins a few followers, it still may not qualify as music. Researchers face the challenge of characterizing the hazy, broad border between music and non-music.

Naturalistic approaches may here prove useful for nontonal-music aesthetics. One matter to explore is how listeners process nontonal melodies. Perhaps these melodies are processed by cognitive functions that build upon those that process tonal melodies. That is, nontonal melodies may register in one level of the cognitive apparatus that recognizes well-ordered strings of sound as melodies but, lacking the tonic head, may not undergo certain further processing, while still evoking musical-emotive response. To make progress, then, researchers must acknowledge that many listeners *do* respond positively to nontonal melodies, even if others do not. To continue the music-language analogy, concrete poetry and related styles, such as that of Rene Char, are hardly non-poetry or bad poetry or non-linguistic when they employ words disembodied from the “tonic-head” of sentence or phrase structure. Such styles simply build upon standard cognitive-linguistic functions to evoke new effects.

3.2. The Approach: Recognizing Musics as Aesthetic Cultures

The best way to describe the approach I am suggesting for naturalistic music-aesthetics may be as “anthropological,” studying aesthetic cultures and subcultures as given phenomena. The approach grants that different aesthetic subcultures, whether math-rock’s or classical-avant-garde’s or Indonesian progressive, produce bona-fide music. It would benefit cognitive research by accounting for how music is practiced by *all* humans rather than fencing the field too narrowly in “the fastidious evasion of real music” (Maconie, 2007, 67). The naturalist may then, if so motivated, determine what is good, bad, or mediocre within, say, math-rock. Every genre, including nontonal, will likely have good and not-so-good pieces. (And subcultures sometimes overlap: Someone in the “lullaby” subculture may also be in the “dodecaphonic” subculture.)¹⁵

This approach should withstand charges of relativism, as should anthropology practiced with appropriate judgment. As anthropologist Davis (2009) defends such practice, it is not unnecessary to accept every human behavior because it exists; in reality, no serious anthropologist upholds the elimination of judgment. Anthropology, Davis contends, instead asks that we strive to suspend judgment from our own culture's particular ethical point-of-view in establishing a more catholic viewpoint. In naturalistic aesthetics, we may proceed similarly, by suspending our individual aesthetic viewpoint to establish one more ecumenical. Judgment must be used in determining what counts as a valid culture; Nazi Germany or Taliban Afghanistan would not qualify. A small group that gathers to listen to car-door slamming as "music" may reasonably not be assessed as a valid music subculture. (It is doubtful this group would last long; longevity may prove one reasonable criterion for validity.) What exactly are the criteria for validity is beyond this article's scope. My suggestion is simply that, if anthropology can moderate relativism with reasonable judgment, naturalistic aesthetics can.

In different ways within a naturalistic framework, Ball (2010) and Davies (2009), exemplify such catholic approaches to all musics. Ball is less aesthetically polemical than the cited external critiques. Music is an indelible reality in human life: "*You could not eliminate it from our cultures without changing our brains*" (5, original emphasis). In many cultures, there is no good or bad music; making music is good in itself. So "*music does not have to be enjoyed*" (5, original emphasis).¹⁶ Ball sees nontonal-musical practices as valid music subcultures, even if these often disregard "cognition": "Some modern music is indeed somewhat fearsome in its retreat into hermetic ways of shuffling sound with no regard for cognition. But part of the responsibility for [audience] fears must lie with the [audience] attitude...." (411). Davies likens avant-garde subcultures to esoteric Australian-Aboriginal painting traditions that demand certain arcane knowledge for full appreciation, without thus being less legitimate.

3.3. A Further Step Back: Musics Are Naturally Evolving Phenomena

Exactly what distinguishes the aesthetically worthy from unworthy will continue to intrigue. The suggested approach, if used reasonably, without too fine-grained distinctions among subcultures, should still allow discussions of which musical works are more aesthetically interesting or profound—a Beethoven or a Stamitz symphony, a Ligeti or a "minimalist" movie score. Yet an important fact, easily neglected, is that it is musicians who create new works of music. A handful in history have possessed unusual sensibilities whose effects on a music-culture they could not fully anticipate themselves but that in time strongly influenced other sensibilities. Such evolution, at least in Western art music, has been ongoing for centuries. The effects of these sensibilities' output on the world and on other artists must play out to some degree before observers can even pinpoint these sensibilities, much less their effects.

Can cognitive research guide this evolution? Currently, a few among this creating handful, such as Lerdahl, are also philosophers or cognitive researchers. Lerdahl (2001) notes his cognitive theory, an update of GTTM, becomes "less systematic when explaining atonal and chromatic listening experience... The ambiguities of derivation reflect the uncertainties in listening to atonal music" (381). While he faults nontonal composers, what has fallen short so far may be the cognitive theory that cannot account for positive response to nontonal music.

It is unclear whether the study of music cognition is generally necessary for composers. Certainly, the sensibilities of cognitive-researchers/composers such as Lerdahl may be influenced by their research (and vice versa). The works of these composers may in turn influence other musical sensibilities in the process of musical evolution. Yet, my last point here: at least some time must elapse, and even then it will be difficult to see where musical evolution is going (and difficult to say how long this time may be). Trying to affect it via a cognitive theory will likely not result in the intended or predicted effect. Trying to direct or force this evolution too hard, were the effort even successful, might be too constrictive and stifle some great artistic achievement. (More likely, many strong

artistic temperaments would shirk such limitation.) In this way, as the naturalist in the field is subservient to the ecology, the musical-cognitive researcher is subservient to musical evolution. The evolution continues; the researcher observes and theorizes about what has evolved. But as long as most musicians are not cognitive researchers, and most of them do not request cognitive researchers' opinions before creating, these researchers might best, for their own work's sake, let the creators create. In the meantime, audience members may read the fascinating research to understand their musical cognition better.

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Notes

- ¹ By “nontonal” I refer to a broad set of art music, whether Western, African, or Eastern, that has been developing since the work of Schoenberg, Ives, and Varèse in the early 20th Century. In the West it has continued through Berio, Stockhausen, Boulez, Ligeti, and Carter. I use this term “nontonal” throughout instead of “atonal,” which sometimes specifically describes dodecaphony. Sometimes nontonal music is called “modernist” or “avant-garde.” Admittedly it is not a well-defined set, as heavily chromatic music such as later Wagner or much of Debussy may be called “nontonal.” While this article forgoes the definitional problem, I believe among most readers there would be a reasonably consistent notion of the music I am discussing. The term does not include non-Western music not centered on a tonic, such as Indonesian gamelan. One typifying characteristic of abandoning tonality is the omnipresence of “unresolved” dissonance, specifically trichords and minor and major second and seventh chords without resolution to “consonance.” (I generally do not use “dissonance” in its strict early-19th-Century sense of any stray from standard chord progressions.)
- ² See fn. 14 concerning “internal” critiques.
- ³ Maconie (2007) discusses other external criticisms that take a naturalist perspective.
- ⁴ Witness the gradual rise in technical difficulty of violin concerti from Vivaldi to Mozart, Paganini, Brahms, and Ligeti.
- ⁵ Raffman (2011), working under the assumption that “the artistic merit of 12-tone music” (599) is questionable, offers another, somewhat broader review of the same territory.
- ⁶ Whether music is communication is an integral issue in many of the works cited, but they assume music either is or is not, without discussion, so the issue regrettably remains wide open. Cross (2009) takes a firm (if controversial) stand that music and language are complementary communicative tools.
- ⁷ Such plausibility assumes an aesthetic theory, not one I necessarily assume, but one that appears to run through much of the naturalistic criticisms of nontonal music. Developing a theory of musical aesthetics is not my present purpose, but a naturalistic theory demanding that response to music be pleasurable must establish that pleasure is essential in aesthetic response. See discussion of Ball (2010) in §3.2.
- ⁸ Hauser and McDermott (2003) report that rhesus monkeys process tonal and nontonal melodies differently, indicating “that tonal melodies have a special status even in nonhuman primates.” (665)
- ⁹ Unfortunately I lack space to detail the debate over whether music was a product of group, individual, or gene—or sexual or natural—selection. Some theories I discuss take sides; others do not.
- ¹⁰ *Musicae Scientifica*'s 2009 special issue on “Evolution and Music” offers further theories of music's origins.
- ¹¹ That is, that seed could simply expand to include nontonal music.
- ¹² While multiple-domains can more readily explain expansion, dedicated-domain more readily explains music as a seemingly unitary, distinct phenomenon. Perhaps in the end a fusion of the two will prevail—say one selected-for domain that taps into other domains in such a way that it can expand.

- ¹³ However, any taint from ethical relativism should not carry over to aesthetics until ethics and aesthetics are shown to be equivalent in this respect; also, see §3.2.
- ¹⁴ Raffman (2007) offers an internal critique of dodecaphonic music, which she asserts is undermined by its own criteria. She says that this music relies upon the listener's capacity to process a piece's twelve-tone row in all its permutations throughout the work. Such processing, as Schoenberg theorized, is essential for appreciating the music. However, experiments indicate that listeners, even trained avant-garde musicians, have difficulty following permutations throughout a piece. Therefore, this art is guilty of fraud and so is non-art. I contend her proof is hardly of fraud but of an understandable mistake about listeners' cognitive capacities. Fraud is a deliberate effort to deceive when the perpetrator knows the information given is false. Raffman's internal critique then falls apart.
- ¹⁵ Matthen (2010b) provides the basis for an alternative defense of modernist music, in that "A work... creates an auditory scene that is not natural – it is a range of auditory objects" that a composer selects, and appreciating it involves attending to "accidental relations between different auditory objects in this scene," such as contrapuntal harmonies (86).
- ¹⁶ But see Schubert (2009) for a proposal that music must be pleasure-inducing.

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