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**The beauty of sound:
Timbre as grounds for aesthetic and artistic
value in music**

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Abstract

This thesis explores the concept of timbre through the lens of analytic philosophical aesthetics and philosophy of music. I argue that timbre should be thought of as providing the grounds for artistic and aesthetic values in music. To this end and firstly, I critique the physical sense of timbre in favour of two anti-realist senses of timbre. These two are the qualitative and the semantic senses which are developed from two of Siedenburg and McAdams' four senses of timbre (Siedenburg & McAdams, 2017). I argue that the qualitative sense of timbre is the experience of the unique qualities of sounds. The semantic sense is that which associates timbres to objects and concepts. Within the semantic sense, I argue for what I call a genealogical sense of timbre which relates timbres to sources and concepts through a history of built up associations. Secondly, these two senses are situated within the artform of music by demonstrating the functions they may fulfil there and how these ground artistic and aesthetic values. Regarding these values, I employ Robert Stecker's definitions of artistic and aesthetic value. (Stecker, 2019) Finally, I summarise the two arguments for why we should think that timbre can provide grounds for aesthetic and artistic value in music.

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*“All art is at once surface and symbol.
Those who go beneath the surface do so at their peril.
Those who read the symbol do so at their peril.
It is the spectator, and not life, that art really mirrors.”*

– Oscar Wilde, Preface to *The picture of Dorian Grey* (Wilde, 1891)

Introduction and methodology

Sounds are all around us. We use them to tell us when we can cross the road, to communicate, and to make and listen to music. But what are they? Phenomenologically, sounds are things that we audibly perceive, and the ear is identified as the primary human organ which fulfils this duty. Despite this simple definition, various metaphysical theories identify sounds with different things. In these, sounds can take the form of the audible properties of objects, be identified with events, sensations themselves, waves travelling through a medium or a combination of one or more of these, depending on the scope of the theory or the object of inquiry. Regardless of which theory one adopts, sound theorists agree on the fact that we do experience sounds. Just what they are remains up for debate.

But what do sounds consist of? What’s in a sound? musical descriptions speak of sounds as having properties such as *pitch*, *amplitude*, *duration* and *timbre*. On a basic level, *pitch* is usually described as how high or low some sound is; *amplitude*, how audible or loud; and *timbre*, the sound colour or ‘tone’ of a sound.

In addition, timbre is also usually described in a negative sense as the quality of sound which is not pitch or loudness. This ambiguity of timbre is also evident in the various descriptions by composers, musicians and philosophers of music. I will mention a few of these.

One kind of description for timbre is a qualitative one. This takes the form of general descriptions of the shape or specific quality of a sound. Such examples describe timbre as “the distinctive quality of a particular sound” (Blake, 2020), “the audible difference [between different instruments playing the same notes at the same volume]” (O’Callaghan, 2007), “a sound/noise axis” (Saariaho, 1987), “a general, sonic physiognomy” (Smalley, 1994) after (Chion, 2011/1986), “musical sound colours” (Fineberg, 2000), and – more generally – as “tone colour (Klangfarbe)” (Schoenberg, 1978).

Another description suggests that sources or the acoustics of sound production are taken to constitute timbre. These descriptions label it as “those qualities of a musical sound which relate it most directly to its source” (Hamilton, 2007), “a product of the overtones” (Scruton, 1999b) and perhaps, in a more obscure sense, as a “non-approachable but physically knowable no-Thing” (Elferen, 2017).

A third sense focuses on specifically musical descriptions of timbre. Some examples of this state that timbre is “directly bound to the constitution of the musical object” (Boulez, 1987), an “aesthetic attention [of music] itself” (Dolan, 2013) and “the thing that makes music interesting” (Parker, 2009). This sizeable range of descriptions paints timbre as a number of things. The term timbre casts a wide net, which may account for the difficulty in finding a singular positive definition.

In addition to these descriptions, there is the intuition that timbre is the means through which we come to recognise which instruments are playing in our favourite song, which part of the cello string is being bowed, and who is talking to us when we answer the phone. So, it seems that in addition to its important role in music it is also an everyday quality that requires attention. Given these aspects, that it can provide us with information and contribute to musical enjoyment, timbre would seem like a fundamental part of how we audibly experience the world and a quality which is relatively unexplored in philosophical aesthetics, despite the abundance of definitions.

This lack is somewhat surprising, given the apparently uncontroversial aesthetic dimensions of timbre in the case of music. However, these aesthetic dimensions and descriptions are often underdeveloped and there has been more work done on the relations between timbres and their sources within the tradition of analytic philosophy and philosophy of music. The latter work on timbre is often framed in relation to metaphysical theories of sound, with the concept of timbre providing support or reasons to doubt these (See Isaac, 2018 for a survey of this). Despite this work on the relations between sound sources, sounds and timbre, I will instead address timbre’s role in artistic and aesthetic value within the context of music.

The goal of this paper is to philosophically explore the concept of timbre and how it relates to sound by arguing that timbre has two senses: a qualitative sense of timbre, which takes timbre to be quality of experience which is based on the unique properties of sounds and a semantic sense of timbre, which relates the perception of timbres to sound-sources and concepts.

To go about this – and in order to frame the discussion – a common standard definition for timbre will be utilised, in addition to a criticism of this definition. The American National Standards Institute (ANSI) definition, states that timbre is an auditory sensation that allows a listener to label two sounds as being distinct, despite the fact that they may share a similar loudness and pitches (Sonn, 1969) and (O’Callaghan, 2007).

The criticism of the ANSI states that the timbre of a sound is difficult to pin down and all the ANSI definition tells us is that timbre consists of the properties of sound which are not loudness nor pitch (Bregman, 1990, p. 93). The latter is often described as the *wastebasket* or *negative* definition of timbre. According to this, timbre is merely that which is left over from sound when we remove loudness and pitch (Ward, 1965, p. 55). This would suggest that timbre is somehow distinct from the latter properties but lacks a description of what the properties of timbre are.

With these definitions mentioned, I will now expand on two general approaches about timbre which I will use to frame this paper. These are the realist and anti-realist approaches. A realist description of some phenomenon states that the phenomenon in question exists independently of human cognition, as some empirical property of the world. In contrast, an anti-realist description of the same denies the independence from human experience but maintains that human cognition may be focused on empirically observable properties, which are themselves realist.

If we apply these descriptions to timbre, we can say that a realist position in relation to timbre states that timbre is merely some observable and identifiable property of sound waves. An anti-realist position – in contrast – states that timbre is not merely a reducible property of sound waves, but one which is dependent on a human perceiver having an experience of physical phenomena. To summarise, timbre in the former sense is a mind independent property or product of sound waves. Alternatively, timbre in the latter sense is identified as having some mind dependant property based on sound waves.

In section one, I will develop a case for the realist position on timbre before ultimately rejecting it as a viable option. Following on from this, in section two, I will develop a version of timbral anti-realism and compare two dominant positions within this. These are the semantic and qualitative senses of timbre. In section three, I will argue how timbre can provide the basis for aesthetic and artistic value in music.

Finally, a word on sound and timbre in relation to sound. I hold that the experience of sounds is dependent on medially distributed sound waves. In addition, the terms ‘sound’ and ‘sounds’ will be identified with those objects which we ordinarily speak of when we use the

word sound. That is, a sound is a perceivable temporally bound object which may be experienced aurally by one or many listeners. Sounds are thus events in a basic sense. Events which consist in bundles of sound waves which emanate from sources.

Furthermore, I maintain that timbre should be thought of as conceptually distinct from sound. As Fales writes: “[T]imbre is a *dimension* of sound, not the sound itself.” (Fales, 2018, p. 30, author's own emphasis) I argue that this ‘dimension’ is the qualitative experience of the distinctive properties of sounds and their associations to sounding objects.

Section 1. Timbral realism introduced: Timbre as a physical property of sound

This section will explore the physical basis of timbre as a property or product of sound waves. This will be done firstly by giving an account of the acoustic properties of sound as sound waves which will provide the foundations for the following section on the potential acoustic properties of timbre as a physical property of sound waves or collections of such. In section 1 the realist account of timbre will be developed, subsequently critiqued and discarded in favour of the anti-realist account which will be developed in section 2.

1.1 An acoustic description of sound waves

Acoustic descriptions of sound identify sound with longitudinal compression waves which pass through a medium. These are created when physical objects are set in motion and thus interact with the surrounding medium – most commonly air. Sound waves travel in all directions from their vibrating source at the speed of sound, which is relative to air temperature and pressure.¹

When a vibrating physical object creates a train of medial compressions and rarefactions, the air is pulled apart and pushed together in a similar manner as the air is displaced by the object. Vibrating air particles at the wave source transfer their vibrations onto neighbouring air particles, given the elastic properties of air. This elasticity aids in the push and pull effect by which the sound waves travel. As air particles are pushed at the source, they in turn push

¹ A more thorough and comprehensive description of the acoustics and psychoacoustics of sound can be found in (Howard & Angus, 2009). In addition, a more philosophically interesting however rather quick and condensed tour through this can be found in O’Callaghan’s book: Sounds (O’Callaghan, 2007).

neighbouring particles. These are then pulled back before returning to their original position. These compressions and rarefactions can be illustrated by imagining a series of golf balls connected by springs. When a vibration occurs, a golf ball is pushed towards a spring which is then compressed, this compression is released and is transferred onto the following golf ball. At this stage, the first spring is pulled back to its original position. This pattern of vibrations is repeated by the following spring, golf ball, and so on.

It is important to note, at this early stage, that it is not the same air particles that have travelled through the medium from the source, but the sound wave which has been transferred by the energy enacted and elasticity of the medium. Thus, sound waves may be glossed as a way of describing the pressure changes of medial particles.

The identity conditions of sound waves at this stage are the vibrations of a sound source which are converted into the vibrations of air particles. This sound wave may be traced by analysing whether the properties of a similar vibration at a distance correspond in some way to the vibrational properties of the source.

It would be therefore incorrect to say that any object has travelled, apart from that a vibration of a medium has begun in some spatiotemporal location, expanded in all possible directions, and has ceased in those reached locations, sometime later.

To return, when the air pressure returns to a normal state, i.e. when the pressure is idle relative to the compressions and rarefactions, this is considered the beginning of a sound wave. A return to this state after one sequence of push and pull is considered a full cycle. This cycle is then repeated until the wave runs out of energy after a certain distance travelled. The measurement Hertz (abbreviated Hz) is used to measure the number of full cycles per second. In the case of reliably periodic waves (i.e. those that repeat in a regular manner) as used in music, this Hz number is used as a measure of a sound's *frequency* which aids in determining *pitch*.

When the object ceases to vibrate, compression waves cease to be created, and the air is still at the source, then the air returns to its normal state in all directions after the waves have ceased to vibrate, given that no other sound waves are present. As waves expand through air, they experience an energy loss and their distance of travel is proportional to the amount of air that is displaced through the vibration and the properties of the medium. This displacement is most commonly called *amplitude* or *loudness*. The more air that is displaced – i.e. set in motion – the higher the amplitude the waves will have and the louder they will be perceived.

We may add to these basic wave properties the term *phase*. Phase describes a position of measurement within a wave cycle and can be described through a Sine function. Phase is

measured in degrees or radians as fractions or multiples of π . For example, the beginning of a Sine cycle would have a degree of 0° , the first compression described as the top (or maximum amplitude) of the first peak is 90° , the first normal state after peak is 180° , the bottom of the first trough as a rarefaction is 270° , and a complete wave cycle is 360° .

Finally, the length of a complete wave cycle may be measured in meters and is inversely proportionate to the frequency of a wave cycle. For example, the wavelength of 440 Hz in air, with a sound speed constant of 343 m/s at a temperature of 20 degrees Celsius and normal sea level pressure, is circa 0.78 meters. This is especially important when we take into account constructive interference due to sound waves in small spaces. In these cases, certain frequencies may be more prominent given that they are acoustically reinforced by the size and shape of a space. If the length of an acoustic space is similar in length to the wavelength of a certain frequency, the returning reflected wave may be summed with the non-reflected wave and cause both to increase in amplitude. In this case they match in phase. The opposite of this is destructive interference where two waves may acoustically cancel each other out or sum to a reduction if the amplitudes of the peak of one (A) and the trough of another (B) coincide in the same physical space. For example, if A has a phase of 90° and B one of 270° . These cases of destructive interference are called phase cancellation and are most often found in experimental or digital contexts. Basic interference which contributes to a slight modulated reduction or decrease in amplitude is more common in real world, acoustic contexts.

1.2 The prospects for a realist description of timbre

Now that I have explained the properties and identity conditions of sound waves in relation to their medium, it is time to look at how timbre may be explained in relation to sound waves. If we recall, the realist conception identifies timbre with some property of sound waves or collections of waves. The goal for a realist is then to point to which of the properties of waves may be potentially identified as the timbre of a sound: such a description must be specific. Another constraint is that it must consistent or at least not conflict with extant definitions of timbre. A third constraint is that any description of timbre must be able to distinguish timbre from sound. I will call the failure to do this the separation problem. With these constraints mentioned, it is time to address some of the candidates for a realist description of timbre.

1.3 Timbre as a static aspect of sound: the vertical theory of timbre

One realist description is to identify timbre as being a product of the overtones (Scruton, 1999b). This is based on Helmholtz's own definition which states that: "[t]he quality of the musical portion of a compound tone [as timbre] depends solely on the number and relative strength of its partial simple tones" (von Helmholtz, 1875, p. 126). Although Scruton's and Helmholtz's descriptions lean more toward an anti-realist description of timbre – as they ultimately shift the focus onto the perceiver instead of the overtones themselves – the timbre bearing properties of sonic experience may be identified with the physical description of multiple sound waves which contribute to a sonic experience.

With this said, there is some controversy around the etymology of the technical term overtone which, in the English language at least, comes from a mistranslation of Hermann von Helmholtz's *On the Sensations of Tone*. (Ibid)² This translation is correct in the Helmholtz quote above. Due to this, I will instead be using the term 'partial' to refer to the unique frequency components which may make up complex sounds and not overtone as Scruton does. To summarise, single partials refer to simple sinusoidal sound waves with a single frequency component. Scruton's adjusted claim with this change in terminology is that timbre is a product of the partials of a sound. A realist thus identifies timbre as being identical to the sum of sound waves as partials. This will be called the vertical theory of timbre.

The term partial refers specifically to the individual sinusoidal parts of what is collectively called a sound *spectrum* (plural *spectra*). A spectrum encompasses the frequency, phase and amplitude of each of the partials in a given sound. A sound can be made of many partials or few depending on the material properties of the objects involved in the sounding event and the method of articulation. Thus, partials may be loosely described as simultaneous resonances which may be summed to form the basis of a perceptually grouped sonic event as a sound. This is due to the fact that sounding objects vibrate in many different places, producing these multitude of resonances.

In the musical case, tones, with their regular repeating fundamental frequency can be said to be made up of partials which are multiples of the fundamental frequency. A tone may have

² This is expanded on in the translator Alexander Ellis' introduction to the second English edition of von Helmholtz's work, where the terms *obertöne* as a contraction of *oberpartialtöne* or *upper-partial-tone* is compared with *übertöne* as *overtone*. There also is some criticism by the same author of the term *timbre*, but I will leave this to one side for the purpose of this thesis.

a fundamental frequency of 200 Hz (which is considered the first partial) a second partial of 400 Hz, and a third of 600 Hz and so on. In the musical case, regarding pitched sounds as described above, partials are often called harmonics of the fundamental frequency. Upper partials which are not multiples of the fundamental frequency are referred to as being *inharmonic*. Not all sound waves have multiple partials, however. In the case of artificially generated sine tones by a synthesiser, these may only have one partial: the fundamental frequency.

In the case of string instruments, partials are relatively easy to conceptualise as the divisions of a resonating string between two fixed points. These partials are delimited by the nodes where no vibration occurs. For example, if we were to take a violin string tuned to the common concert pitch tuning of note A = 440Hz and halve the string, we are left with a note which has the frequency 880 Hz. If we divide the string into thirds, we arrive at a note with the frequency of 1320 Hz, and so on. This is due to the fact that strings vibrate within nodes which are located at divisions of the string's length.

As introduced in the section on the properties of sound waves, the relationship between string length and frequency is an example of the fact that the wavelength of a sound wave is inversely proportionate to frequency. Therefore, the halving of a wavelength would mean a doubling of the frequency of the full wavelength. As the length of the vibrating string is reduced, the frequency is increased. This relation is due to the speed of sound reaching the ear. A shorter wavelength would take up less acoustic 'space' in the train of sound waves traveling from a source and would thus allow for more cycle repetitions to be compressed into this window. When we perceive higher frequencies, we perceive at the same time shorter wavelengths, relative to the speed at which sounds pass through the medium.

If we return to the open resonating A string, then a vibration of this would include multiple smaller vibrations along its freely vibrating length. These simultaneous vibrations as multiples of the open string's frequency are the partials.

However, it is not only the abundance and frequencies of the partials which may contribute to a realist conception of timbre in the case of individual sounds. The amplitude may also play a part. Higher amplitude upper partials contribute to descriptions of rich, bright or harsh sounds, while lower amplitude higher partials may generate timbral descriptions of dull, mellow or muted sounds.

Complex sounds with several partials may be analysed by means of Fourier analysis and computationally using Fast Fourier Transforms (FFTs) which provide an analysis of the partials of a recorded sound wave in a sound file. The perhaps, most interesting, point regarding this

reduction of complex sounds into simpler parts is that it mirrors, in part, the way the ear picks up and dissects sound waves. However, FFT cannot discern which partials belong to which fundamentals and often these relationships have to be guessed or deduced from context by the analyst.

Regarding the ear, when sound waves reach the ear's tympanic membrane, these vibrations are then transferred to the cochlea which acts as a frequency analyser for any input signals. Inside this is the basilar membrane which is covered in tiny hairs that are bent at certain frequencies depending on their position along the membrane. Higher frequencies displace the earlier parts of the basilar membrane while lower ones are picked up towards the end of the structure.

Given that the hairs are bent at different frequencies depending on their position along the membrane, and are attached to nerve firings which ultimately culminate in electrical signals sent to the brain, it is safe to say that these hairs represent a frequency analysis of input sounds which are summed so as to be experienced as sound sensations by a perceiver. Frequencies and the spectral makeup of sounds are experienced through the activation of these nerve firings. Thus, the human ear can be seen as a frequency analyser. Before objecting to this vertical theory of timbre which states that timbre composed of the partials of a sound, I will introduce a horizontal theory of sound and take both objections together.

1.4 Timbre as a temporal aspect of sound: the horizontal theory of timbre

The experience of sound is thought of as possessing a temporal nature. That is, of consisting in a temporally bounded sound event. (O'Callaghan, 2007) and (Scruton, 1999a) In addition, we individuate sounds in time and use the terms before, at the same time, and after. Sounds may also be perceived as having beginnings and endings, and as overlapping and fading in and out of each other. Therefore, if timbre is a property of sound or sound waves, it is something that occurs in time.

Given this temporal description, a horizontal theory of timbre would instead shift the focus on the nature of sound events and identify timbre with some temporal property of these, rather than of some static property such as stacked partials. A morphological approach is one example of this. The composer Denis Smalley describes the temporal lifespan of the partials (or spectral envelope) of a sound as the *spectromorphology* of a sound. (Smalley, 1994) Thus

morphological accounts of timbre take into account changes in partials or sound spectrum over a sound's duration.

Just what these changes are may be hard to pin down. One approach is to say that changes in the overall amplitude, number and relative strength of the partials throughout a sound's duration may account for the sound's spectromorphology. This account identifies the timbre with the spectromorphology of a sound.

This will become clearer if we look at ways in a sound is created. If we take a percussive method of sound generation, we have on the one hand an impulse generator and on the other a resonator. As Kulvicki writes, “[a]n object's sound depends on the way in which it vibrates in response to being thwacked.” (Kulvicki, 2008)

A common example of this in the case of music is that of a drumstick striking a cymbal. When a ride cymbal is struck by a wooden drumstick the energy latent in the stick is transferred over to the cymbal causing the latter to resonate in certain ways depending on its material properties, shape, how hard it is struck, and the angle and pressure of the contact-point between the two objects. In this common example, we have a quick spectrally complex impulse followed by a slow, resonant and spectrally rich decay.

What does this tell us about spectromorphology? Well, given that cymbals are tuned to resonate at specific frequencies, we may assume that the noisy impulse and its excitation of the cymbal provides the energy for a sympathetic resonance in the cymbal body. A sympathetic resonance is the transference of a resonance between similarly tuned resonating objects via a shared medium, in this case the material of the cymbal.³

To summarise this point, the frequencies that are resonated in the cymbal are an elongation of the impulse, these then decay at differing rates, and may reveal other partials over the resonance's duration. No new partials are created in the duration of this sound, and the spectromorphology of this sound is a gradual filtering of the impulse over time. This is an example of the horizontal theory of timbre.

1.5 Objecting to the vertical and horizontal theories of timbre

³ For example, if one were to depress the sustain pedal on a piano and clap into its body, one would hear a sort of echo of the clap produced. The same is also true of guitars although the approximation is cruder given fewer strings that may sympathetically resonate. In the latter two cases the shared medium would be air.

The above-mentioned facts regarding the apparatus of human hearing and the vertical theory of timbre – as the partials of a sound – pose a compatibility problem if we are to distinguish timbre from sound and make the claim that timbre is an isolated property of sound or sound waves. Indeed, Siedenburg and McAdams state that this realist conception of timbre inadvertently ignores the perceptual aspect of timbre. That is, the realist sense of timbre would look like a ‘shorthand for a sound event or a complex tone’ thus equating the sound with its timbre. (Siedenburg & McAdams, 2017). This provides the grounds to query the vertical theory of timbre.

If we take the claim that the ear is a type of frequency analyser, and timbre is defined as a product of the partials, then the sensation of sound itself is a sensation of timbre. If sound is synonymous with timbre, then it is difficult for one to distinguish between sounds and timbres on the basis of the partials alone. Thus, there seems to be no difference between that which is picked up by the ear and a sound’s timbre. The case for calling timbre a property of sound is weakened on the vertical account.

The case for the horizontal theory also falls prey to a similar objection to the vertical theory outlined above: one of distinction from other non-timbral properties of sound, in the former case, amplitude and in the latter, partials. More clearly, the problem with the horizontal theory is that the filtering mentioned above involves changes in the amplitude (loudness) of the partials. To elaborate, a common method of subtractive synthesis involves the creation of a spectrally dense sound which is subsequently filtered at certain partial frequencies. This filtering results in an amplitude reduction of these partials in such a sound (for example white noise). If we take it that the timbre of a sound is distinct from its amplitude, then including amplitude in the description of timbre poses a problem for the negative definition of timbre which intentionally excludes these.

To summarise this objection to the horizontal theory of timbre, a filtering throughout the sound’s decay necessarily involves changes in amplitude, which goes against the idea that a sound’s timbre is distinct from amplitude and pitch.

1.6 Onset transients and the envelope theory of timbre

Another possibility for a realist description of timbre is to say that the start of a sound is crucial to the identification and distinction of timbre. Indeed, in timbre dissimilarity experiments, it is often the case that sonic distinction is largely dependent on this starting portion of a sound. In

an experiment of instrumental recognition, Thayer noted that when these attack transients of sound are removed, instrumental recognition is significantly reduced. (Thayer, 1974). The goal for the timbral realist then is to state the physical basis and relevant properties of such attack transients as a sense of timbre.

The temporal shape of a sound is described as the sound envelope. The most common way of describing a sound envelope in the case of music is the ADSR model. These ADSR stages are *Attack*, *Decay*, *Sustain*, and *Release*. *Attack* being the time it takes for an amplitude to increase from silence to a maximum value for the sound in question. The second stage in the envelope model is *decay*. This is the time it takes to move from this maximum amplitude to a stable sustain portion. The *sustain* stage has a more or less constant amplitude – in this case as an amplitude value expressed as a ratio of the maximum attack amplitude. In addition, sustain may – in the case of synthesised string sounds – be temporally infinite. Finally, – in our synthesiser case – there is the *release* stage when the synthesiser key is released and the sound decays back to silence. In percussive sounds, where a shorter sustain immediately follows the attack, an envelope with the segments of ASR is more appropriate.

1.7 Objections to the envelope theory of timbre

However, as Thayer notes, the envelope and more specifically attack portion of a sound is not uniform in accounting for dissimilarity judgements between instruments and concedes that “It is obvious that no one specific definition of timbre can be applied to all of these instruments. On the basis of this study, timbre may be defined only as those qualities that differentiate the tone of one instrument from another.” (Thayer, 1974, p. 46)

This, of course passes the buck back onto a description of the qualities which determine timbre of which we have no unified realist description. For Thayer, in certain cases the attack was a determining factor in dissimilarity, and in others, the sustain portion fulfilled a greater role.

Handel, in a similar vein when focusing on attacks and decays as distinctive properties of timbre, writes that: “[t]he transients can provide a rich source of cues. Nonetheless, the same cautions that apply to spectral shape [spectromorphology] are relevant here. The onset and offset transients can be used to distinguish among single-sound objects or among one fixed set of instrumental sounds. But, for a given instrument or voice the pattern of the transients will vary across sounds.” (Handel, 1995, p. 431)

Thus, distinct timbres within instrumental groups and subsets of such may be dependent on spectral content, while in other cases amplitude or the envelope is more crucial in distinction. However, Krumhansl is cautiously more optimistic when she writes that “timbres may well have unique characteristics although there remain a few common dimensions in terms of which all timbres differ.” (Krumhansl, 1989, p. 48). Nevertheless, as a unifying realist theory of timbre, the envelope one is inconclusive as a basis for all cases of dissimilarity.

1.8 Summarising the prospects for a realist description of timbre

Given the problems with the vertical theory, I am inclined to side with Isaac in holding that “[t]he fact that we can’t point to any systematic, or invariant, feature of a waveform that specifies its timbre plausibly counts against the identification of timbres with spectral composition.” (Isaac, 2018, p. 514) In addition, with reference to the horizontal theory of timbre just put forward, I am inclined to also agree with Handel when he writes that “due to the interactive nature of sound production, there are many stable and time-varying acoustic properties. It is unlikely that any one property or combination of properties uniquely determines timbre. The sense of timbre comes from the emergent, interactive properties of the vibration pattern.” (Handel, 1995, p. 426). So, while the above developed realist theories may be intuitive descriptions of timbre, they are nevertheless not specific, consistent with other definitions or distinct enough from sound to count as live candidates for a description which identifies timbre as a property of sound waves or collections of these.

With this said, I will now look to the anti-realist sense as a possible alternative to the realist sense of timbre. Given that we cannot identify timbre with one singular physical property of sound waves or of individuated sound events, an anti-realist description of timbre which identifies timbre not with the physical properties of sound waves but with some aspect of our sonic experience may be a likely alternative. Timbre would seem to be the experience of the many properties of a sound as timbre bearing properties which aid in providing a distinguishing character. (Chion, 2011, p. 237) The ANSI definition above seems suited to this pursuit, in that it takes timbre to be an auditory sensation that allows a listener to perceptually distinguish between two sounds.

If timbres – despite the lack of clarity on the physical side – are nevertheless conceptualised and individuated perceptually, then the anti-realist alternative would seem more plausible. It is to this option that I now turn.

Section 2. Timbral anti-realism introduced: The perceptual dimensions of timbre

This second section addresses the anti-realist options for timbre. If we recall, a basic anti-realist definition holds that timbre is some facet of perceptual experience based on acoustic properties. I will start by introducing the four perceptual options as described by Siedenburg and McAdams and reduce these to two alternatives for the anti-realist definitions of timbre. These reduced alternatives are the semantic and the qualitative definitions. I will develop these in the third section in relation to music and argue that they respectively provide grounds for artistic and aesthetic values there.

2.1 Siedenburg & McAdams' four anti-realist senses of timbre

In a recent article in the field of timbre studies, Siedenburg and McAdams argue for an anti-realist sense of timbre and suggest four conceptual senses within this. (Siedenburg & McAdams, 2017).

Firstly, the timbre as quality sense – akin to the ANSI definition highlighted in the introduction – states that timbre distinguishes two or more sounds as being perceptually dissimilar to a perceiver, in the absence of information as to their sources or material construction. These perceived dissimilarities are also thought of as having acoustic bases. This is the timbre as quality sense.

The second sense is where timbre is tied to perceptual attributes associated with source identification. Timbre, in this sense, is the product of an inference whereby the audible properties of the sound are analysed as clues to the material properties and identities of audible sources⁴. This is the semantic sense.

The third sense is that timbre functions in different levels of detail. That is, differences in timbre may be subtle and perceptually difficult to distinguish (as in the case of perceptual differences within the one instrument or with similar types of musical instruments) or great (between instrumental groups) and readily apprehended by untrained listeners. This is the

⁴ For a version of this which specifically relates to musical instruments see (Davies, 2010).

granular sense of timbre. I will not treat this sense separately as it can be accommodated by both the timbre as quality sense and the semantic one.

The fourth is the sense in which timbre may refer to the perception of perceptually fused events. A timbre in this sense can be considered as either, the product of multiple sound sources which contribute to an emergent texture or as single sounds depending on the qualities of the sounds.

This sense is based on the concepts of modes of attention and hierarchies in auditory scene analysis. Auditory scene analysis (henceforth ASA), as developed by Bregman, states that we perceptually group certain audible events either temporally, as horizontal streams (dubbed sequential grouping) or as vertical (dubbed simultaneous grouping) ones, based on frequency or timbral information (Bregman, 1990). These sequential and simultaneous groupings may nevertheless have an ecological basis and associations and inferences based on context and convention play a large role in these groupings. This will be called the textural sense of timbre.

I will now address the viability of the first, second and fourth of these senses as anti-realist accounts of timbre. I will begin by objecting to the textural sense.

2.2 Objections to the textural sense of timbre

The sense of timbre as perceptually grouped events presents some problems when we look at musical phenomena. In the case of chords or harmonies as simultaneously grouped entities, these may nevertheless be composed of the combined timbres of individual instruments as chordal voices which contribute to simultaneously grouped events (Bregman, 1990, p. 31).

The question arises as to whether it is the combined timbres or the harmonic function itself that is the basis of the grouping? ASA doesn't seem to provide a singular answer for this. If it is both, then a collection of grouped timbres – as a perceptually fused texture – could nevertheless constitute a single timbre. Although the chord case here does not strictly conflict with the sense of timbre as texture – as Siedenburg and McAdams do not dismiss the possibility of a fluidity in timbral perception (based on differing modes of attention) – simultaneous grouping as an example of timbre nevertheless presents an identification problem with regards to timbre. It is not clear, in this case, whether timbre is the experienced chord or the single voices or notes which make up the chord.

If we move to the case of sequential grouping, we may find use again in the Smalley term of spectromorphology for critiquing a textural sense of timbre. The case of a continuous

changing sound produced by a single source poses the question of whether we are to label such sound events as examples of morphological timbres (fluid changes in one timbre over time), or as unique (based on some dissimilarity principle) timbres which seamlessly blend into other ones. A further complication is added, in musical cases, when presented with overlapping spectrally similar but nevertheless distinct sound producers. If these contribute to one elongated timbre, then it would seem that attention to their own individual timbres is not possible because of this sequential grouping which groups timbres based on spectral similarity.

Given the difficulties in the paragraphs above and my definition of sound, I conclude that the textural sense does not provide a useful description of timbre. An alternative here would be to look to the semantic sense of timbre outlined above and its usefulness in tying timbres to individual sound producers. I will focus on this, in more detail in the following section by developing the semantic sense of timbre and comparing it to the qualitative sense. In section 3, I will argue that these fulfil separate roles in the case of music: the semantic sense grounding an artistic value and the qualitative an aesthetic value.

2.3 Two senses of semantic timbre

The semantic sense of timbre identifies timbre with audible qualities which contribute to sound source identification. This is a standard definition of timbre in philosophy and one that has been used to support the event account of sound (O’Callaghan, 2007) and argue against Scruton’s acousmatic theory of music (Hamilton, 2007). In the latter, Hamilton describes timbre as those qualities of a musical sound which relate it to its source. In a sense, this ties the apprehension of the perceptual properties of sounds to an identification task for determining their sources. (Siedenburg & McAdams, 2017)

What is the nature of this sound-source relation? The timbral semanticist has several options to explain this. Firstly, she may state that the pairing of sound and source is a product of prior sonic experience and previous correct inferences in the past. This may be given even in cases of no knowledge as to the physical properties of such sound producing objects. Furthermore, this may be based on some sort of sensory recognition and confirmation principle. For example, connecting what is heard to what is seen.

In the case of musical instruments, students of music theory are often taught to recognise the common sounds of different instruments and families of such through repeated exposure and identification. Common questions such as “which instrument is playing the melody?” and

“how many different instruments can you hear?” are examples of testing this knowledge. Indeed, in more advanced levels of such recognition, it is possible for trained listeners to discern where on the neck a cellist may be bowing, the relative thickness and stiffness of vibrating reeds in the case of woodwind instruments, and the texture and material properties of mallet heads in percussive cases. The above two paragraphs regarding ordinary sounds and musical instrument sounds will form what I call the *genealogical account* of semantic timbre. The genealogical account of timbre is the process of linking a sound to a source through prior experience, a process which is built up and further refined over time.

Chion summarises this by writing: “[timbre] links to an auditory image formed in the memory [...] this image is often the result of an extratemporal –as it were, carved up – apprehension of sounds that, once heard, are reassembled and grasped in the form of their overall unfolding.” (Chion, 2011, p. 237)

The second option for accounting for the basis of timbral relations to sounding objects – and one which is more prominent in the philosophical literature – is what I call the *direct correspondence account*. Although this leans more toward realist definitions of timbre as it identifies timbre with the stable resonant properties of sounding objects (O’Callaghan, 2007), an anti-realist account of this relation locates the reasons for such judgements in the perceptual and cognitive apparatus of the perceiver.

To make this sense of timbre clearer, we can look at a statement by Hamilton. He writes that “when listening to a piano concerto or a jazz pianist, one cannot help thinking ‘piano’, and so it is essential to the musical experience that one attends to its causal origin.” (Hamilton, 2007, p. 104). With direct correspondence, we have a link between the hearing of a typical piano sound and the timbre of a piano. The timbre being a mental representation of those physical properties which classify an instrument as sounding the way it does when it is played in common or standard cases. The timbre of the piano directly corresponds to the heard sound of the piano. That is, the experienced sound of the piano counts as the timbre of the piano when experienced by a perceiver. The direct correspondence account differs from the genealogical account on the basis of a need for prior experience in the genealogical case.

2.4 Objections to the direct correspondence sense of timbre

However, direct correspondence has a number of downsides. These are a lack of explanatory potential and the failure to avoid the separation problem. Explanations of direct timbre correspondence to sound relations often take the form of ‘an X sounds like X because this is

the way Xs sound'. Or to put it another way, 'an X has the timbre of an X because Xs have this timbre in standard cases.'

These take a similar form to those of dispositional arguments of colour. Where an object is disposed – or has the power – to cause the experience of a certain colour in certain perceivers under certain conditions. A timbral version of this would be to say that a piano is disposed to cause the experience of a certain timbre in certain perceivers under certain conditions⁵.

However, these explanations regarding timbre provide little information as to why we should label a certain sound caused by an object as its timbre other than the fact that this sound is somehow seen as standard or characteristic of the object. This provides a weak footing for timbre as it is difficult to identify which sound should be counted as characteristic. Regarding this, Chion writes that – depending on the method of articulation or attack – an instrument's timbre can mean anything that is acoustically possible on the instrumental body – the list being potentially endless (Chion, 2011, p. 238). This is supported by Siedenburg and McAdams when they write, "it is misleading to suggest that one sound-producing object or instrument yields exactly one timbre." (Siedenburg & McAdams, 2017, p. 3).

To elaborate with a musical case, there may be a set of piano sounds but not all pianos are capable of producing the same timbres. The pianos may share many sounds in common and produce specific sounds which are unique to each instrument, but it is not clear that there is a specific *standard* timbre to which these characteristic sounds reduce. The term 'standard' is vague in this sense.

In addition, and in a similar fashion to that of the realist definitions which I rejected above, the direct correspondence sense would seem to have too strong an identity relation between the sound of an object and its timbre. That is, if we say that a perceived sound is equivalent to *the* timbre of an object (that there is some direct relation) then the experience of sound as timbre would be an example of the separation problem. If we recall, this problem is based on the need for a distinction between sound and timbre. Having said that, this variation of the separation problem is perceptual rather than physical or acoustical, in contrast with above examples of the problem. To summarise this point, direct correspondence perceptually equates an object's sound with its timbre. Which goes against the goal of isolating timbre from sound.

Given that direct correspondence is not a viable anti-realist option, as it fails to isolate a specific characteristic timbre of an object, and falls prey to the separation problem, the genealogical sense may be seen as a better candidate of the two as it provides a clearer

⁵ For more in depth treatments of dispositional theories of value, see (Smith et al., 1989).

epistemic relation between timbres and sound sources, a relation based on the built up associations between sources and their various sounds.

2.5 The case for the qualitative sense of timbre

Unlike realist attempts at defining timbre, the anti-realist definition can deal with cases where it is difficult to pinpoint the physical basis for dissimilarity judgements. Timbre as an experienced dissimilarity between two sounds can accommodate differences based on disparate timbre bearing properties such as static spectra, spectromorphology, attack and sound envelopes. The differences between timbres can take the form of perceived changes of these timbre bearing properties in isolation and in combination.

Chion summarises this by writing “the perceived timbre of an instrument encompasses, depending on the individual instance, many other constituents, such as the curve of the global intensity of the sound, the feeling of a more or less rough grain, the presence of a certain vibrato, certain characteristics of attack, and a multitude of givens that are always particular to a specific sound.” (Chion, 2011, p. 237)

In addition, in the temporal dimension, given the fact that no two sounds are ever physically the same – apart from repeated playbacks of pre-recorded sounds – there may be a perceptual difference grounded in the properties that one chooses to focus when attending temporally to such sounds. As Siedenburg et al. write “timbre lives not in the audio signal or in a musical score but in the mind of the listener.” (Siedenburg et al., 2019) The qualitative sense of timbre thus involves the experience of attending to sounds and focusing on their properties.

Before going into the reasons why this sense of timbre should function as an aesthetic value, it is important to address the concept which provides the grounds for this, namely timbre’s identity as a qualitative part of experience. I will start by asking what it is to be a qualitative part of experience.

One approach is to take a minimal concept of qualia as a potential candidate. Perceptual qualities as qualia can be thought of as the subjective experiences of external properties. Qualia are the what-it-is-like experiences of such properties. On hearing the soprano high C in a performance of Allegri’s choral work *Miserere* one can have a type of Soprano high C quale. That is, a subjective experience of the sound heard. One may be able to describe the sound, or even attempt to replicate it with one’s own voice. Through this process, it is not just the note ‘C’ that is replicated as an isolated ‘C-ness’ but a certain ‘Soprano-High-Cness’. There is an

emulation of not just the note itself but the way the sound is produced and the character of the voice or the person who is singing it.

In this sense quale may be remembered and even their objects replicated or at least attempted at imitation. One may have similar qualia on hearing one's own imitation or it may have a different character, what may differ between these two? Certainly, there is a difference of source: first my headphones then my throat; one head voice, the other a crudely attempted falsetto. Although we may say that the note is the same (or at least an octave lower depending on the singer), there is certainly both a difference between the bare sounds and the experiences of them. It is this which is qualitative timbre: the experienced uniqueness of sounds. Given the difficulties with the realist definition of timbre highlighted earlier, I argue we should align timbre with qualia of sound. Although this brings with it the question of what should the nature of this alignment be? Furthermore, how does this idea of timbre qualia differ from the experience of timbre's lower level conceptual base: sound (the separation problem)?

These are difficult questions; one certainty is that it seems strange to say that a timbre is *identical* to an experience and more natural to say that there is a such a thing as an experience *of* timbre. Timbre being the perceived qualities of sounds. If we take the example of a metaphorical description of some sound as being 'coarse', then this 'coarse' sound when experienced may provide the basis of an experience of sonic coarseness, or a coarse quale. Thus, moving from the physical sound side to an experiential timbre side. This is one solution to the timbre separation problem: that timbre forms a qualitative experience of sound, for the purposes of description and evaluation. Furthermore, it seems difficult to distinguish sounds and classify them without some element of qualitative experience. Such experiences - as exercises in distinction - would need a memory and recall component, something which a basic sensory input would seem to lack.

However, if we have settled with a quale *of* timbre, does this mean that timbre is an external property out in the world, given my loose definition earlier? I suggest that the physical basis for timbres are what I have called timbre bearing properties (TBP). These being the properties of sounds and their constituent sound waves such as partials, spectrum, envelope, phase and combinations of such. These properties are summed perceptually in an emergent fashion. In addition, some metaphorical aspect may be used to classify the experience of these (roughness, smoothness, light, dark etc.). Or, in the case of knowledge as to the exact TBP, a description based on the latter may be more useful for distinction (exact frequencies, number of partials, contours of spectra etc.).

Given that we tend to identify the experiences of sound in relation to the sounds themselves, and for the purposes of this paper, this minimal description of quale as sonic distinction and identification will form the qualitative sense of timbre. So, one can have qualia of the timbre bearing properties of sounds. Timbre in the qualitative sense is the experience of these properties of sounds.

However, before moving on to the aesthetic dimensions of qualitative timbre, it is important to address the reasons behind the common tendency to relate qualitative timbres to sources. In ordinary descriptions of timbre, it is common to confuse source, sound, perception and experience. In addition, linguistic descriptions of qualia – for the purposes of communication – seem unnecessary in situations where one does not need to share information, or when a description is not requested. Perhaps that is why the objects of such experiences (in our case sounds) as publicly available and accessible properties are most readily referred to when such descriptions are called for, and not the experiences themselves.

In addition, these public properties may play a role in the support of aesthetic judgements. When referring to aesthetic properties or those properties which contribute to aesthetic value, it is common to refer to public properties of artworks that may be readily experienced. (Sibley, 1965) We point to the sounds and their properties in order to say why they are worthy of our attention and to explain their roles in the music at hand. Nevertheless, I argue that it is the experiences of these sounds which provide the true value.

Given the intuition that descriptions of publicly available sources and sounds are used instead of descriptions of the experiences of such would seem to explain the difficulty with coming up with purely subjective and clearly developed linguistic descriptions of timbre-qualia. Should this be attempted at all? For the purposes of this paper, it seems sufficient to state that timbre may be conceptualised as an experience based on the properties of sounds. To go beyond this and venture into the difficulties of subjective description would take us too far from timbre's use in music and the aesthetic values there.

2.6 A linguistic distinction between the genealogical and qualitative senses of timbre

As suggested above, the genealogical account presupposes a genealogy of listening and the ability to recognise sounds as belonging to certain objects involved in sounding events. The acoustic properties of the sound waves are taken as clues which are interpreted by a listener

and subsequently compared to prior cases of similar previously heard sounds in order to form associations. Genealogical timbre is this associative relation which is built up over time. In contrast, the qualitative sense individuates timbres and separates them from associations with sounding sources. Qualitative timbres are identified as the subjective experience of the distinctive qualities of sounds.

With the two chosen senses of timbre introduced – the genealogical and the qualitative timbre senses – in this section I will briefly deal with these two senses of the word “timbre” and how they relate to the word “sound”. This will be done to show that both senses play different roles in linguistic descriptions and explanations of timbre. The first of these is the ‘x-of’ relation and the second is the ‘a-x’ relation, specifically the timbre-of relation and the a-timbre relation. Both senses are used when speaking about timbre, but each reveals different aspects. The ‘x-of’ relation attaches timbre to sounding objects, as in the genealogical sense and the ‘a-x’ relation isolates timbre to some quality of sonic experience, as in the qualitative one. To summarise, the timbre *of* something can be thought of as distinct from *a* timbre.

In order to illustrate this distinction, I will focus on the example of a dog’s bark. Acoustically, the typical vocal utterance of a dog is usually quite short with a steep attack and decay and complex spectra. And hearing this sound in some way tells me that it is a bark coming from a dog.

Hearing several different barks may also lead me to pick out different dog sizes by associating size with different spectral centres concentrated around different frequencies. Larger dogs, lower frequencies; smaller dogs, higher.

This familiarity aids in building a ‘sounds-like-a’ relation. The statement, ‘The sound of the bark sounds like a dog’ provides us with a common test case. If we look closer, the word sound seems to have two different senses here. ‘Sound’ and ‘sounds’ are functioning in different ways. The ‘sound of the bark’ as a specific event, refers to a physical disturbance of a medium apprehended by a listener. The ‘sounds like a dog’ part is a statement of the nature, ‘has the sound of a dog’, ‘dogs produce this sound when they bark’ or ‘this is the way dogs sound’. This is based on the hearing and classification of previously experienced dog sounds. Thus ‘sounds like’ provides the relation from experienced timbres to sound sources and is an example of genealogical timbre. Furthermore, if we go from ‘the timbre of the bark sounds like a dog’ to ‘the timbre of the bark reminds me of a dog’ we have an example of a statement which also fits in with the genealogical account. The a-timbre in this case being the initial experience of a bark sound which may lead to an association, given a genealogical explanation.

Regarding the a-timbre relation, it is the case that the word ‘timbre’ is usually invoked to refer to the experience of unique sound events. This leans more closely to the qualitative sense of timbre which perceptually isolates sounds and their properties from sounding objects. However, as I have argued, it is more common to refer to the timbre of objects than to describe the experience of their acoustic basis. Referring to a-timbre without a source would seem to be theoretically possible – and indeed necessary – in cases where sources are unknown, nevertheless it is linguistically uncommon in everyday contexts. In music, metaphorical descriptions of qualitative timbre are more common.

These examples prove to show the linguistic differences that are used when speaking about timbre. Both of these are common and highlight different senses of timbre. Speaking about the timbre of objects and instruments highlights the genealogical sense and speaking about isolated timbres highlights the qualitative sense. I suggest that the qualitative sense is more basic than the semantic sense and thus grounds the latter. Given the desired goal of this section in developing these latter two points, the following section will focus on some conceptual examples of timbre’s function in music and its uses in value there.

Section 3. Timbre as a basis for two types of value within music

In this section I will address the two aforementioned senses of timbre in relation to music. Musical timbre will be addressed from two value angles: those of aesthetic value and artistic value. Given this, I will argue that timbre in the qualitative sense described may be aesthetically valuable by providing the grounds for an aesthetic experience of music. In addition, I will argue that timbre in the semantic sense may provide the grounds for an artistic value through its use as a vehicle for musical meaning. This meaning is discovered when attempting to understand works of music through interpretation.

Before developing the reasons why timbre should be considered as a basis for aesthetic and artistic value in music, I will introduce in more detail the value concepts and the distinction which I hope to use between these two values.

The definitions used above of aesthetic and artistic value are taken from those defended by Robert Stecker (Stecker, 2019). More precisely, Stecker argues that aesthetic value is the value of a type of experience which is object directed. That is, it includes a phenomenological

element directed at one or several objects and their properties. The experience of these properties is aesthetic if the resultant experience is for its own sake, i.e. it does not serve another purpose apart from the act of having such an experience. In addition, these focused on properties may be real or imagined, the latter imagined properties being those which may be fictional properties which require imagination in order to be experienced.

Regarding artistic value – and for Stecker – in order to find out if a property of an artwork provides the basis for an artistic value, one has to experience the artwork with understanding. Such understanding can be developed through interpreting the artwork and assessing the relevant property's role in work meaning.

For example, a moral value as artistic value could be identified through interpreting an artwork and assessing the role it plays in the meaning of the work. This can be done by asking questions such as: in which ways does this moral aspect or viewpoint affect the plot; how should we think of the characters and their actions in light of this property; is the treatment or are their actions believable in response; and how we should judge the work in light of this moral aspect?

To briefly summarise, aesthetic value is the value of the experience of attending to properties for their own sake. Artistic value is determined through understanding the properties of an artwork through interpreting their roles in work meaning. Now that I have given a basic introduction of these value concepts, I will address the two senses of timbre and how they may fit with these value concepts.

3.1 The artistic values of semantic timbre

To recall, the semantic sense of timbre associates the experience of timbre with sound sources. The timbre of an object is that which aids in its identification through linking the acoustic properties emanating from a sound source and the perceptual apparatus and cognitive faculties of a listener. In addition, when we hear a sound, we identify the timbre as the specific way in which the sounding object is audible to us. The timbre can be that which reveals clues as to its material properties. This leads to comparisons with previously heard timbres and familiar or unfamiliar sources.

I will now introduce three types of relations which tie timbres to sources or concepts before giving examples of how these are used in music. These are based on the genealogical sense of timbre. Firstly, there is the relation which associates timbres and sound sources through prior

hearing and identification. This is the *timbre-source relation*. In turn, this may provide the basis for further relations.

Secondly, we have the relation which expands on this first sense by not merely relating timbre to the instruments themselves, but also to concepts associated with such instruments. This is the *source-concept relation*.

Thirdly and lastly, we may introduce a further variation on the genealogical sense, that of linking timbres directly with concepts distinct from sound sources. This is the *timbre-concept relation*.

For these latter two relations (source-concept and timbre-concept), it is necessary that the use of such concepts be familiar to or established within a group of listeners in order to be acknowledged as legitimate or count as an interpretative possibility.

In addition, such concepts may also be culturally or genre-specific and operate at different scopes depending on the role they play in the musical work at hand. I will now highlight some possible examples of these relations and how these are examples of artistic value.

In the case of music, the three above-mentioned relations can be utilised in many ways. One such relation is the use of the off-stage or muted trumpet. This timbre is often employed to signify a distant call and evoke war both by means of the spectral properties associated with distance (higher frequencies are dampened through distance) and sound reflections based on where it is placed – in addition to the connotations associated with the trumpet and the historical use of the similarly timbred bugle on the battlefield.⁶ This is an example of the source-concept relation.

A second method of employing genealogical timbre is that of the use of percussion to imitate storms or wind, particularly in theatre and dramatic contexts. But these are predominantly sonically imitative rather than overtly semantic, as the timbres of the instruments and what they mean to represent are quite similar. This would suggest a more qualitative comparison rather than that of overtly semantic links. However, this maintains an external connection to objects and events distinct from the instruments and sounds employed. This is an example of the timbre-concept relation.

Thirdly, there is the case where an instrument may metaphorically imitate another sound or emulate the suggested character of an object. In this case, the original instrument's timbre is infused with the character of another object or concept. For example, the timbre of a bassoon or low brass instrument may be used to evoke a sense of clumsiness, high string timbres the

⁶ One example of this is within the fifth movement of Gustav Mahler's *second symphony* 'Resurrection'.

idea of grace and simplicity, sitar timbres orientalism or alterity and the oboe timbre pastoral moods, spheres, or characters. (Elferen, 2017, p. 616) These various uses are also particularly prevalent in cinematic and nature documentaries, where certain timbres on instruments are used to convey or suggest certain concepts which may mirror an on-screen narrative or mood. This leads to a semantic network where timbres may be interpreted in several ways with reference to established links, metaphorical allusion, and the dramatic context that is suggested. In addition, these links may be further complicated through the particular way in which the links attempt or fail to comply with already existing tropes to allow further interpretations. This is another example of the timbre-concept relation.

However, it is not only specific sounds, their sources, and related concepts which may be treated artistically, but the specific way in which sounds are transformed and how the listener may respond to these transformations. For Denis Smalley, timbre in electroacoustic music⁷ may form the basis of a value through the use of source play. He defines this as a play on the source-bonding relation. For Smalley, source bonding is “the natural tendency to relate sounds to supposed sources and causes, and to relate sounds to each other because they appear to have shared or associated origins.” (Smalley, 1994) The use of source bonding as a musical value, in Smalley’s sense, refers specifically to the practice of electroacoustic music where sources are not visible or given to the listener⁸.

When timbres are bonded with their sources, this creates the conditions for bonding play. Bonding play may include a play on the recognition of manipulated sounds as transformed sources and the attempts at the identification of sources. A common method in the composition of electroacoustic works is the process of setting up a continuous manipulation of an isolated recorded sample. Such a sample may be anything from the sounds of synthesised, vocal or ordinary objects. These are often introduced in their unaltered form at the beginning of works and successively undergo various transformations through the use of technical processes such as re-pitching, reversal, distortion, by situating them in virtual spaces through reverb, spectral

⁷ Electroacoustic (EA) music is a method of music creation which may involve recorded and synthesised sounds which may be processed by various means. Previously EA music predominantly involved the use of magnetic tape (fixed media EA music is still often called Tape music) and later digital methods. The common performance setting for fixed media or static EA music is through playback loudspeakers in a concert environment. This may be contrasted with the practice of live electronics which may involve the combination of real-time processing and sound creation with fixed media and other ‘acoustic’ instruments.

⁸ This reduced epistemic access to the sources of sounds is referred to as *acousmatic* in the Schaefferian sense. (Schaeffer, 1966)

filtering of partials, and so on. In addition, these transformations may be further transformed themselves creating a large number of combinations.⁹

This process may culminate with completely unrecognisable timbres which only have a causal relation to their source sounds through the processing. A way of cashing out this value would be through a game of guesswork whereby the act of trying to figure out how the source was processed and to what degree subsequent timbres are related to the introduced source's timbre is of value. In summary, the semantic sense of timbre – whereby sounds are associated with their sources – provides the conditions for evaluating bonding play.

If we take the source-concept, timbre-concept, and timbre-source relations, one could arrive at a complex web of potential interpretations and possibilities for the apprehension of artistic value. The act of attempting to understand a work of such music for artistic value could take the form of an analysis of such causal links through the experience of the timbres and their transformations, in addition to taking into account the development of such transformational techniques, associated tropes and common semantic links with regard to objects and concepts.

Timbre, when linked with sounding sources and concepts – as in the semantic sense – may provide the basis for an artistic value in the Steckerian sense. Uncovering such a value requires understanding the musical work by interpreting the timbre of the sounds presented for work meaning through their relations to sources and concepts. Given the examples above and relations discussed, my argument for semantic timbre as an artistic value is as follows:

1. Timbre in a semantic sense is the association of sounds with sounding objects, the concepts related to them, and to concepts unrelated to sources.
2. Genealogical timbre is the associative relation between sounds and sounding objects which is built up over time through the experience of sounds and their sources.
3. In music, these associations between sounds, objects and concepts may be built into the meaning of the musical work.
4. Uncovering and interpreting such meanings enhances the understanding of a musical work.
5. Artistic value is the value of understanding an artwork through interpretation. This understanding takes the form of interpreting the properties of an artwork and assessing the roles these play in work meaning.

⁹ An example of a work in which a sample is transformed in various ways is Trevor Wishart's electronic fixed media work *Tongues of Fire*.

- C. Therefore, timbre in a genealogical sense may ground artistic value by providing a means for interpreting music.

Now that I have proposed the reasons why the semantic sense of timbre contributes to artistic value; it is time to move on to how timbre may also ground aesthetic value.

3.2 The aesthetic values of qualitative timbre

This section will address the aesthetic possibilities of timbre and argue that timbre in a qualitative sense can provide the basis for an aesthetic experience. In addition, this aesthetic sense of timbre will be situated within the artform of music. I argue that qualitative timbre as a musical value may play a role as an in-itself aesthetic value and one which may ground other musical values.

In musical descriptions of timbre, it is not merely specific instruments which are described as having unique timbres, but also different possible ways of manipulating such instruments or sounding objects. Given the plethora of historical and possible techniques for extracting specific sounds from musical instruments, it would then seem as if the specific qualities of sounds as the basis for timbres would serve to provide a certain musical purpose also. Otherwise, the practice of specifying such parameters through a score or performance practice would seem unnecessary.

With that said, timbre is not merely isolated to and determined by musical notation. Musical performers as timbral agents play a substantial role in cases where timbral ambiguity in notation is present. Instrumentalists and singers endeavour to produce the most suitable timbres for the task at hand, given the historical and taste conventions required. Producing appropriate timbres and going beyond these to explore the latent possibilities of instruments and voices may provide the basis for musical values. Such values may consist in an aesthetic value which considers the beauty or fittingness of such timbres and a relational value which takes in to account the skill and dedication required to develop and produce such timbres given the limitations imposed by the instrument.

Moving on, in the case of musical harmony which typically employs timbres with clear pitches and discernible fundamental frequencies, the value of the timbres of the sounds in question is often *prima facie* secondary to that of harmonies or melodies. In this cases, melody and harmony are at the forefront of the musical narrative. As Scruton writes “timbre, and tone-

colour generally, presents no parallel system of musical organization, on a par with rhythm, melody, and harmony.” (Scruton, 1999, p. 77)

Scruton is correct here in a music theoretical sense that there exists no established temporal organisation of timbre to the same degree as is the case with other properties of musical sounds.¹⁰ However, as I will argue, timbre in the qualitative sense can indeed ground aesthetic experiences and one which may aid in the aesthetic appreciation of other musical properties. I will now develop some examples to argue this case. I will begin with pitch, then harmony, and finally mixing.

A basic example of qualitative timbre supporting musical parameters is the case of pitch. For correct pitch perception, partials need to be harmonically aligned as closely as possible to the mathematical series of $(f * 1, f * 2 \dots f * n)$ (f = frequency). That is, there needs to be a harmonic relation between the fundamental or perceived fundamental frequency and the upper partials. Timbres which have partials that are not multiples of a fundamental frequency cannot be perceived as having pitches. In addition, although there may be some relation between the upper partials, without a grounding fundamental, pitch determination is difficult if not impossible.¹¹ Thus, in contexts where discernible pitches are favoured for the purposes of melody or harmony, timbres which reinforce pitch perception are favoured over those which do not. Qualitative timbre – as the perception of the physical properties of sounds – may then determine the perception of pitches.

A second example of qualitative timbre informing other musical parameters is that of harmony. For the purposes of clarity and balance, certain timbres are selected and encouraged in order to allow for the hearing and blending of certain harmonies. Timbres with complex inharmonic spectra are often deemed unsuitable for the purpose of voices in harmony and often serve to limit the amount of individual tones that can be used in a single chord. In addition, the spacing or distance between the chordal voices or notes is also determined in a similar fashion. Complex bass notes are preferred over complex higher notes, given a more fundamental like role for the bass notes which tend to support the chord and may contain the higher notes as partials within their spectra.

¹⁰ The practice called *klangfarbenmelodie* or *tone colour melody* was suggested and employed by Schoenberg and his student Webern. Tone colour melody consists in the use of the different timbres of different ensemble instruments sequentially organised as if to serve a melodic role. However, it has not been systematically adopted or developed to the same degree as similar structures in pitch or harmony.

¹¹ Missing fundamentals may be filled by the imagination through inferences based upon the relations between the partials. This happens in cases where the production of such low fundamentals is not physically possible on the instrument employed.

This vertical organisation of timbre forms a fundamental part of orchestrating harmony. (Adler, 2002) Orchestration being, the writing and organisation of musical material for instruments through the employment of their specific sounds. Indeed, Dolan summarises orchestration as: “the art of manipulating instrumental timbre.” (Dolan, 2013, p. 89)

A further case for qualitative timbres as a valuable part of music is the case of distorted electric guitars, where the abundance of harmonic upper partials which are emphasised by the distortion create a perceptually denser sound. When harmonic tones are distorted, musical chords with intervals of an octave or fifth are usually preferred over thirds and seconds as the abundance of higher partials ‘clash’ more so in the latter cases than in the former. In the former, combinations of octaves and fifths share many more partials in common throughout their spectra. As these are deemed more consonant than in the case of thirds or seconds. To summarise, distorted spectra would seem to determine distinct harmonic possibilities and their own avenues for expression and exploration, given the distortion’s effect on the spectra. I argue that these examples serve to give reasons for why qualitative timbre may influence pitched and harmonic content.¹²

This list of the ways in which qualitative timbre may inform other musical values shows that timbre in this sense may fulfil an important role within music. However, timbre can be seen as a musical value in its own right and not merely as support for other higher-level musical values. This possibility is summarised by the composer Schoenberg, when he wrote:

“[O]ur attention to tone colours is becoming more and more active, is moving closer and closer to the possibility of describing and organizing them. [...] For the present we judge the artistic effect of these relationships only by feeling. How all that relates to the essence of natural sound we do not know, perhaps we can hardly guess at it yet but we do write progressions of tone colours without a worry, and they do somehow satisfy the sense of beauty.” (Schoenberg, 1978)

This suggests that timbres may be organised and appreciated qualitatively for the purpose of musical beauty. This leads us to the third example in support of timbre as an aesthetic value in music, this example is the case of mixing.

¹² For a more in depth description of possible relations between timbre and harmony, please see (Hasegawa, 2018).

The act of mixing and post-production is a way in which sounds – and their timbre-bearing-properties – are considered malleable for aesthetic purposes. Although the roles and professions within the music industry of mixing engineer, mastering engineer and producer are considered separate and well defined, for the purposes of this paper and section I will be taking a basic stance to the artform of post-production with recorded sound and call it therefore mixing.

Just as a meal or a fragrance may contain many layers or notes to be balanced and manipulated for a certain end, so too can an audio recording. The methods of sculpting and highlighting certain sounds and dampening or deemphasising others are done so that a satisfactory result from the viewpoint of the mixing engineer may be obtained. This manipulation may involve – but is not limited to – that of timbre bearing properties such as attack or articulation, static and morphological spectra, their partials (and the relative amplitudes of such), and envelopes. This can be done through the filtering of partials, compression of amplitude and editing and sculpting of envelopes.

Indeed, the novel and skilled contributions of mixing engineers are often considered achievements and certain engineers may be sought after in order to deliver a certain artistic vision or overall sound. I argue that mixing is an integral part of how we listen to and appreciate recorded music, albeit one that is often overlooked. The act of mixing involves the perception, dissection and subsequent manipulation of timbre as a basic qualitative property.

Qualitative timbre is a means of attending to and evaluating sounds by considering the shape of a sound and attending to its parts and those parts which make it unique: its timbre bearing properties. This attending also involves assessing how these sounds and their properties relate to others in their vicinity and in the scope of inquiry, i.e. the work or works in question. Mixing is the manipulation of the properties of sounds to create beautiful timbres that can be aesthetically appreciated by listeners.

To summarise this section, qualitatively appreciating timbre may aid in the aesthetic appreciation of several musical values, in addition to grounding an aesthetic value in its own right. This latter value is formed by positively evaluating qualitative timbre. This will be developed below.

3.3 The relation between qualitative timbre and aesthetic experience

Stecker argues that value of aesthetic experiences is based on the appreciation of the properties and meanings of the objects of such experiences for their own sake and for the sake of such experiences (Stecker, 2019). As I have argued above, qualitative timbre is a means by which we may attend to and subjectively evaluate the properties of sounds. The question then remains as to the nature of qualitative timbre's role in aesthetic experience.

The relation between qualitative timbre and aesthetic experience is that of contribution and not identity. It may be the case that – in the examples outlined above – to listen to timbre qualitatively is a necessary condition for having an aesthetic experience of sound, it is nevertheless not sufficient.

I am cautious to argue that to experience timbre qualitatively invariably leads to an aesthetic experience. This is too strong a claim. Indeed, due to the inherently non-valanced nature of qualitative timbre, it is the case that qualitative experiences of timbre do not by themselves constitute valuable aesthetic experiences. So, what is missing? Certainly, with reference to the latter, there is the absence of positive appreciation.

When one experiences timbre qualitatively, it is not always the case that one will appreciate timbre in a positive sense. However, in certain circumstances, such as in the case of music, the listener is encouraged to evaluate the experienced timbres in an appreciative manner.

Recall the stipulation of instruments and playing techniques for extracting specific sounds from musical instruments. This is based on an appreciative principle which states that sounds and their properties are intentionally selected and manipulated in music by some agent for the purpose of listener appreciation. Positive evaluation of timbre in music is encouraged. In other cases, where timbres are experienced outside of such a musical context (as in everyday cases of qualitative timbre), the valanced or non-valanced nature of such timbres is not prescribed or encouraged. Appreciation, in those cases, is fully dependant on the subjectivity of the listener. Given this weak claim, that appreciation of musical timbre is encouraged, this would suggest that qualitative timbre's role in an aesthetic experience is therefore not fully dependant on an ontology of music, but also on the listener's appreciation of such timbre.

However, this encouragement is not always taken up. Failure to notice and appreciate timbre is common. In addition, in music, timbral variety can be either neglected or not seen as a vital parameter in the value of a work. In music written for piano, the relative homogeneity of the spectrum of the piano would suggest that music written for this instrument would have

quite limited envelope and spectral variety and thus less possibilities for morphological variation.¹³

Recall also Scruton's statement that timbre does not present a system of musical organisation akin to melody and harmony. Timbres may be fundamental to pitch perception and harmony, but timbres are not always the objects of appreciation, given a musical focus on these latter aspects as bearers of musical meaning. In addition, Schoenberg's claim that timbre may satisfy a sense of beauty would seem to depend on the case in which timbres are explicit, that is, they are readily apprehended and evaluated for themselves and not only as vehicles for other musical values.

Fales argues that for most listeners timbre is implicit and that in many cases focusing on timbre as an aesthetic property requires perceptual learning (Fales, 2018, p. 30). Perceptual learning is the enhanced perception and discernment of qualities through repeated experience. Does this mean that perceptual learning is necessary for appreciation? I would argue not. Just as how a beautiful melody or harmony is constructed is a mystery for most listeners, this does not preclude aesthetic appreciation. In this case, mere identification and description does not provide the necessary conditions for positive evaluation. With that said, perceptual learning of the properties of timbre would seem to enhance appreciation by further opening up possible avenues for positive evaluation of music.

Indeed, listening out for timbre and being able to perceive timbre bearing properties that aid in timbral distinction would seem to be aid in evaluating music. Fales, writes about the perceptual learning of timbre in techno by observing: "To the SFRavers, mainstream commentators criticized their music because they didn't "know how to hear it." It was not that they disliked it; it was that they didn't "get it." In the majority of before-and-after accounts, evidence that the narrator has undergone successful perceptual learning is the realization that they have come to "like" music that was decidedly unappealing before." (Ibid, p. 34)

To enhance appreciation of timbre in music, one should have a certain familiarity with the concept of timbre. That is, one ought to be able to listen explicitly for timbre and not only implicitly. Listening explicitly requires repeated perceptual experiences and attempts to discern and individuate the properties of such experiences, in our case timbres and their acoustic properties. With time, the learning becomes more refined and more subtle variations in properties may be discerned. Recall the granularity of timbre introduced above where timbre

¹³ A notable exception to this is the prepared piano music of John Cage, where the sounds of individual keys may differ greatly, due to individual alterations inside the piano body.

functions on various scales of detail. Perceptual learning aids in the perception of subtle timbre changes, which in turn opens up further possibilities for aesthetic value. In addition, in order for qualitative timbre to ground the aesthetic value of music, it ought to be appreciated for its own sake, and not merely as a means for other musical values such as melody and harmony to emerge. In light of this section and the preceding one, what follows will be a summary of the argument for qualitative timbre as the grounds for an aesthetic value:

1. Timbre in a qualitative sense is the perceptual experience of the overall distinctive acoustic properties of individual sounds.
 2. When one apprehends and appreciates timbres in a qualitative sense, one appreciates them for their own sake and for the sake of the experience of doing so.
 3. An aesthetic experience involves positively evaluating properties or meanings for their own sake and for the sake of the experience of doing so (Stecker, 2019).
 4. Aesthetic value is the value of an aesthetic experience.
- C. Therefore, positively evaluating timbres in a qualitative sense may ground an aesthetic experience of sound. The value of this positive timbre experience is aesthetic.

Conclusion

In this paper I have argued that the concept of timbre as an experience of aurally perceiving sound may be separated into two senses: the qualitative and the semantic. To do this, I argued against a realist conception of timbre which identifies timbre with the physical properties of sound waves or collections of such. I have shown that this realist definition of timbre fails to provide satisfactory identity conditions for timbre, in addition to failing to distinguish the properties of timbre from those of sound.

Instead of this, I argued for an anti-realist conception of timbre which identifies timbre as both a basic qualitative experience of acoustic properties and a means of relating sounds to sounding objects, concepts related to such objects and concepts external to those objects.

Furthermore, I argued that timbre in a semantic sense – the relation of sounds to sounding sources, concepts attached to such sources and external concepts – may form the basis of an artistic value. This value is uncovered through interpreting the role timbre plays in musical

meaning. Such meaning may consist in interpreting semantic relations between timbres, sources and concepts. Artistic value is found through attempting to understand music in light of these meanings.

In addition, I have argued that the qualitative sense of timbre – when positively evaluated – may contribute to an aesthetic experience. The value of which is an example of aesthetic value. Timbres-as-qualia are mental representations of the perception and apprehension of timbre bearing properties of sound: those properties which aid in perceptually individuating sounds. Timbres – when positively evaluated, through explicit listening – may contribute to aesthetic experiences due to their focus on sound and its individual properties for their own sake.

While there is much more to say about timbre and its uses in music apart from those I have mentioned, there is not enough space to go through these here. To summarise, in this thesis, I have developed on two of Siedenburg and McAdams' senses of timbre and have argued the ways in which these provide value in music and how timbres – according to Schoenberg – can come to satisfy a sense of beauty.

The pursuit of musical beauty is no easy task. However, with this thesis I hope to have described why timbre should be viewed as a vehicle for such beauty by way of its supporting role in other musical parameters and, in addition, to being capable of beauty in its own right.

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