HARMONIA

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Congratulations to Bradley G. Robin, whose paper "Transformation and Recontextualization: States of Sound in Gérard Grisey's *Periodes*" was the winner of the 2015–2016 Graham H. Phipps Paper Award.

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Harmonia

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Transformation and Recontextualization:
States of Sound in Gérard Grisey's *Periodes*

BRADLEY G. ROBIN

Composers have searched for new ways to identify and categorize various characteristics of sound in the service of new aesthetics. Since the advent and introduction of the computer, endless new resources have become available. In Paris in the 1940's, composers such as Pierre Schaeffer and Michel Chion began creating "acousmatic" music, played through loudspeakers, instead of by live musicians. By recording sounds found in the world, then splicing and editing them together, sounds do not exist for their melodic properties nor necessarily for their contextual meanings. Instead, these sounds were important because of their texture, timbre, and transformative qualities. In his *Traité des objets musicaux,* Schaeffer introduced the concept of "sound object," later referred to in Chion's translation as "a perception worthy of being listened to for itself."[1] In nearby Germany, composers such as Stockhausen and Ligeti were exploring Musik Elektronische in which all sounds are created in the studio. As a precursor to spectralism, an emerging music based on principles and manipulations of the overtone series, Ligeti was already thinking of the transformation of sound objects through process as a result of his exposure to the studio and its techniques. One of his famous orchestral pieces, *Atmosphères,* would realize his visions of processes of being explored, interrupted, and layered.

In 1974, Gérard Grisey completed *Periodes*, the second piece in his cycle, *Les espaces acoustiques*. *Les espaces acoustiques* represents a series of six pieces written by Grisey between 1974 and 1985. Instrumentation varies throughout the cycle with each piece calling for a subsequently larger ensemble, starting with *Prologue* for viola and optional live electronics. Grisey wrote the second and third pieces for chamber groups: *Periodes* for flute, clarinet, violin, viola, cello, bass, and trombone followed by *Partiels* for chamber orchestra. The last three are for full orchestra: *Modulations* for orchestra, *Transitoires* and *Epilogue* for "large" orchestra.

Appropriate to the nature of *Periodes*, Grisey approaches composition not from the traditional hierarchy placing melody and rhythm first; instead he deprioritizes those elements in favor of a compositional approach similar to that of acousmatic composers, such as Pierre Schaeffer, Michel Chion, and Francois Bayle. In the

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[1] Michel Chion, *A Guide to Sound Objects: Pierre Schaeffer and Musical Research* (Paris: Buchet/Chastel, 2009), https://monoskop.org/log/?p=536.

program notes of *Periodes*, Grisey describes the evolution of a sound object regarding *Periodes*:

> To take account of the relativity of perception: if the music is the becoming of the sound, rather than the sonoric object proper, the metabolism will have to be controlled – what I call its 'degree of transformation' – in other words its voyage in time and its adventure. [2]

Other examples of sonic objects include *Gondwana,* in which Tristan Murail acoustically orchestrates the transformation of a previously analyzed bell spectrum into that of a synthesized brass. Grisey began with the creation of a sonority consistent with tones within the same overtone series, which are manipulated and transformed to fulfill its acoustic evolution. *Periodes* ends by seamlessly transforming into the beginning of *Partiels,* the third piece of his cycle. Though numerous analyses have been done on pitch content of these pieces, I will instead look at the development of textures and timbres.[3]

Goals of this paper include describing and applying some tools of analysis typically used in conjunction with computer music. Denis Smalley's description of sound objects, though originally designed to describe electro-acoustic music, will be used in the analysis of the acoustic music of spectral composer, Gerard Grisey. I will then offer new tools, some based on the ideas originally offered by Grisey regarding the organization of his piece, *Periodes.* One of the tools, contextual transformation, will show how Grisey accomplishes the transformation between the two movements. Analysis will also illuminate how Grisey manipulates textural momentum by creating, satisfying and thwarting musical expectations within *Periodes* and *Partiels.* I will also propose an answer to an emerging question: in what new directions might these typographies point?

States of Sound

At the onset of acousmatic music in the 1940s, Michel Chion provided a *Guide to Sound Objects* in which he organized Pierre Schaeffer's previous treatise, *Traité des objets musicaux,* into a catalogue of ideas on acousmatic sound. Years later, based on the ideas originally introduced by Chion and Schaeffer, Denis Smalley developed a number of parallels that can be made between the physical world and the "states" of sound he describes in his "attack-

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[2] Gérard Grisey, *Periodes* (Paris: Ricordi, 1978).
[3] François-Xavier Féron, "The Emergence of Spectra in the Gerard Grisey's Compositional Process,"*Contemporary Music Review* 30, no. 5 (2011): 343-75, accessed October 2, http://articles.ircam.fr/textes/Feron11b/index.pdf.

effluvium continuum."[4] He defines the extremes of these states as particle vs. solid; the former he calls an attack "impulse" and the latter the "effluvial" state. Example 1 shows Smalley's continuum between the two extremes, including intermediate states, where perceivable periodicity and individual notes no longer prevail; the sound exists as an unstable, "granulated" state.

Example 1. The Attack-effluvium continuum.[5]

∧ ∧ ∧	Separated attack-impulses
ᴎᴎᴎᴎᴎ	Iteration
(grain marking)	Grain
▬▬▬▬	Effluvial state
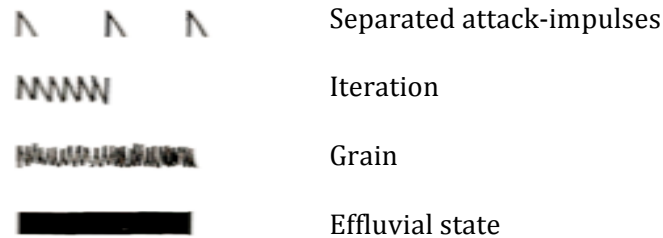
An attack impulse can be any single point of sound, or a single waveform. Examples include short bursts of noise, like the striking of a woodblock, or a hammer on a nail. A "pure" attack impulse does not have an identifiable "sustain," but exists merely as a point in time.[6]

The "threshold of hearing" is 20 Hz, under which the human ear cannot discern a perceivable pitch. Iteration could best be described as repetitive individual impulses below the threshold of hearing. On the Bösendorfer Imperial grand, the lowest note C (16.35Hz) is barely identifiable. At higher frequencies, the "effluvial" state is no longer perceptible as a series of single events, as is the case of the "iterative" state. Instead, the sound congeals into a fluidly constant, possibly identifiable pitch—or in the case of a cymbal crash, a sustaining flow of noise.

The iterative state, however, may contain variation within it, such as the change in the frequency of repetitive attack impulses by either accelerating or decelerating. There also exists a state between these two states: "granulation," not recognizably iterative nor fluidly constant, exists as an erratic cross between the two. Within the "granulated" state it is possible to move to either extreme: just before the congealing of an effluvial state, or to the point just before the sound becomes noticeably iterative. I call the transition from one

[4] Dennis Smalley, "Spectro-morphology and Structuring Process," in *Language of Electroacoustic Music*, ed. Simon Emmerson (New York: Harwood Academic Publishers, 1986), 72.
[5] Smalley, 72.
[6] Smalley, 72.

state to another a "state shift." Though written initially in reference to computer music, Smalley's concepts may be universally applied.

Grisey uses another word for iteration, "periodicity." Periodicity can exist on micro, middle, and macro levels. On a micro level, it may be the internal texture of a sound, perhaps an exploration of the phenomena of "beating." On a middle level, it may be perceived as repetition of musical materials, motor rhythm, metric regularity, or tempo variance. On a macro level, it may be perceived in the rising and falling of energy from phrase to phrase, section to section, and movement to movement. Depending on how it is used, periodicity, or the lack thereof, can create engagement on the part of the listener. In a talk during the Darmstadt summer music course, which would later become an article called *Tempus ex Machina*, Grisey described some of his views on periodicity:

> We do not consider periodicity as either basic material nor as the unit of rhythmic structure, but the most simple, most probable phenomenon; it is tempting to see it as an ideal point of reference for the perception of time, as is a sinusoidal sound for the perception of pitches, but not at all the a priori foundation of a hierarchical system. We would as well have the same attitude to consonance.[7]

From this statement, we can conclude that Grisey's subsequent classifications of materials in the following table are meant to apply not only to rhythms, but to musical materials of all kinds: tonal, non-tonal, timbral, pitch, and noise-based. As intervals, rhythmic profiles, textures, and timbres change, Grisey describes effects on predictability and expectations. Table 1 illustrates Grisey's classification procedure.

Dynamic periodicity (i.e., deceleration and acceleration) can refer to frequency, tempo, additive or subtractive rhythms, gradual compression (or decompression) of time signatures, and gradual changes in as many parameters as one can imagine and manipulate, including density and temporal transformations of texture. Changes in periodicity will be easily recognizable in the case of continuous acceleration or deceleration. Predictability will be less so in the case of statistical acceleration as the pattern is more irregular, but overall trajectory remains perceptible nonetheless. Example 2 shows an example of dynamic periodicity.

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[7] Gérard Grisey, "Tempus ex Machina: A composer's reflections on musical time," *Contemporary Music Review* 2, no. 1 (1987): 245, accessed September 11, 2013, http://dx.doi.org/10.1080/07494468708567060.

Though jagged, the overall trajectory increases; in contrast with a smooth acceleration. Example 3 shows an example of acceleration by elision, in which the leaps in the rate of increase disrupt predictability, and thus provide an opportunity to reengage attention.

Table 1. Classification of intervals and of timbre.[8]

|		
a) Periodic	Maximum predictability	ORDER

b) Continuous – dynamic
   1) Continuous acceleration
   2) Continuous deceleration
	Average predictability	

c) Discontinuous – dynamic
   1) Acceleration or deceleration by stages or elision
   2) Statistical acceleration or deceleration
	Slight predictability	

d) Statistical
   1) Complete re-division
   2) Unpredictability of divisions
   3) Maximum discontinuity
	Zero predictability	DISORDER

e) Smooth – rhythmic silence		

Example 2. Statistical acceleration.[9]

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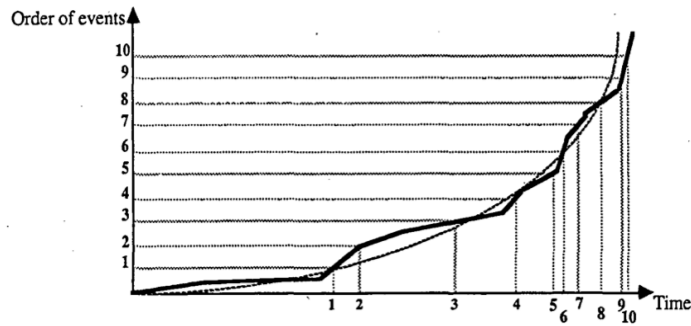
[8] Grisey, "Tempus ex Machina," 244.
[9] Grisey, "Tempus ex Machina," 253.

Example 3. Acceleration by elision.[10]
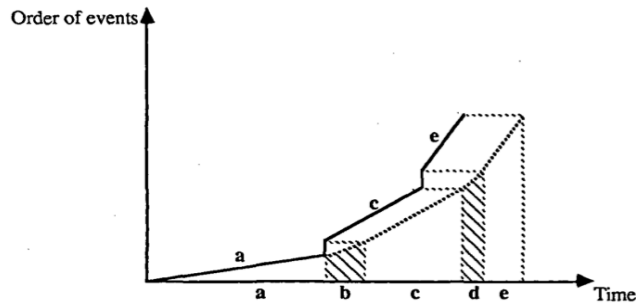
In both cases, the overall phenomenological effect is that of rising tension. In the latter, momentum is gathered through increasing acceleration and thwarted expectations as result of **a**, **c**, and **e** being disrupted by the "interruptions" **b** and **d.** The lengths of each section **a**, **c**, and **e** become progressively shorter, and the rate of acceleration continues to be heightened in each subsequent segment. Grisey goes on to conclude that:

> All sounds can be given a duration...dynamic curves, changes in timbre, sound quality and vibrato, or, more generally, the actual form of a sequence or sound, constitute as much material as one can rhythmically express.[11]

He speaks of these trajectories as vehicles for composition, which can be sculpted to express a composer's aesthetic needs and desires. John Cage might refer to them as "containers" composers can fill with musical material.

Respiration (Macro-Periodicity)

In the program notes for *Periodes,* Grisey introduces the use of periodicity as a formal device, governing the overall structure of the piece. Grisey uses "respiration" as a means to describe how momentum and materials are organized compositionally. As a way to organize the form of *Periodes,* Grisey refers to a "three-part cycle" in his program notes regarding periodicity and the concept of "respiration." According to Grisey, *Periodes* explores the compression and expansion of periodicity. In so doing, the music expresses the perceptions of various respiratory "states." Example 4 shows the pattern of how Grisey integrates inhalation and exhalations.

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[10] Grisey, "Tempus ex Machina," 252.
[11] Grisey, "Tempus ex Machina," 244.

Example 4, Respiration in *Periodes*.[12]
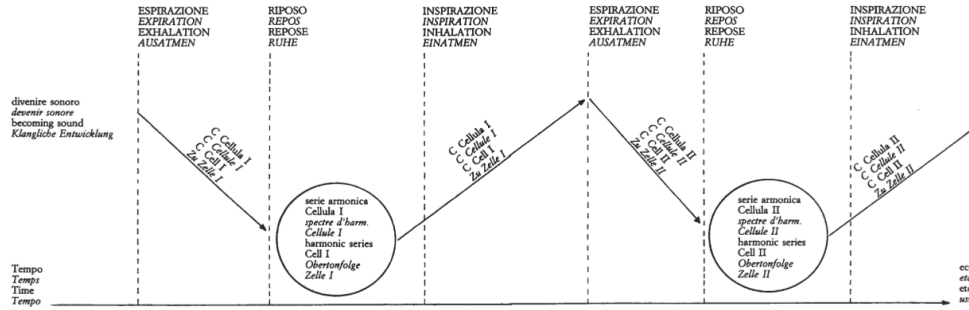
> Each rest area . . . exercises an authentic force of
> attraction and repulsion on the development of the
> sound. Each cell contains microphonic elements which
> . . . become altered . . . up to maximum tension and
> complexity. This first stage corresponds to *inhalation.*
> A different direction follows . . . we gradually enter
> into the sphere of attraction to the next cell; to return
> gradually to calmness and simplicity. This second
> stage corresponds to *exhalation.*[13]

Grisey has re-contextualized the notion of periodicity
to include a non-tonal harmonic procedure.[14] In this case,
periodicity includes a harmonic oscillation of increasing and
decreasing complexity. Grisey creates pillars of harmonic
stasis and the intermediate state of harmonic complexity as
sonorities transform between these two states. Within
Periodes, there are four such cycles.[15]

Though Grisey describes three states (inhalation, exhalation,
and "repose"), I argue that there are actually four. Respiration, as a
bodily function, is a complex example of periodicity comprised of up
to four phases: inhalation, retention, exhalation, and suspension.
Due to its cyclical nature, each stage possesses its own characteristic
energy, momentum and implicative set of expectations. An
inhalation requires storing energy, represented by a particular
dynamic curve—like climbing up a hill, which can ultimately go only
so high. As the peak of the inhalation is reached and momentum
subsides, it transforms into the next stage of respiration. Retention
exemplifies stasis with high potential energy, as the breath is stored.
Even as the breath is retained, tension builds as the expectation of

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[12] Grisey, *Periodes*.

[13] Grisey, *Periodes*.

[14] Francois Rose, "Introduction to the Pitch Organization of French Spectral
Music," *Perspectives of New Music* 34, no. 2 (1996): 6-39, accessed March 4,
2011. http://www.jstor.org/stable/pdf/833469.pdf.

[15] Grisey, *Periodes*.

(and need to) release increases. Release of the breath represents a transformation from potential to kinetic energy, while generating momentum as the breath builds, peaks, and subsides. Suspension, the last stage of respiration, embodies stasis with low potential energy. Following an exhalation, a longer suspension may build tension through the expectation of a subsequent inhalation. Grisey's "repose" demonstrates musical stasis, in which tempo neither increases nor decreases, nor exists at all.

Combining the two aforementioned categorizations begins to approach how these materials can be used with compositional intent. The following table compares the various states of momentum, as described by Grisey and Smalley. With this in mind, musical materials can be logically applied to generate momentum as needed within a respirational model. In this paper, the aforementioned terminology will be used to analyze musical materials in *Periodes.*

Table 2, Integration of Smalley's textural categorization and Grisey's periodic table.

Grisey	Smalley	Momentum
Periodic	Statically iterative	Static (holds potential energy)
Continuous – dynamic	Iterative with change in rate	Yes
Discontinuous – dynamic	Quasi-iterative/granular	Yes
Smooth	Effluvial	Static

Grisey also uses the process of respiration to create momentum. Within the periodic cycles, Grisey respects the innate energetic attributes of each respirative phase while varying the timbral and textural characteristics. In this case, the respirative periodicity and the timbral variation of materials within each phase (exhalation, rest, and inhalation) create a visceral experience of the cycle, one that is not boring or predictable, and with enough variation so as to continue to engage the audience.

Between the cycles, Grisey inserts "repose(s)," which serve as static interludes. In each, segments of musical material repeat. In the first, second and last reposes, traditional musical materials are repeated. In the third Grisey integrates theatrics, a phenomenologically effective tool in this case integrating a theatrical element with a musical one, in which he has the string players intentionally tune" their instruments, repeatedly.

Periodicity can apply to timbres and textures as well. Grisey describes a term called "magnification" as applied to musical texture:

> Let us imagine ourselves . . . contemplating the water at the edge of the river, then progressively, mentally reduced to the size of the molecules of water until we ourselves become molecules; we would certainly be surrounded by an unheard of landscape, but would we still feel the force which sweeps these molecules of water out to sea?[16]

As an example of dynamic periodicity, Grisey describes a metaphor of changing natural states: the phenomena of "magnification" as applied to water. While looking at water and magnifying it to an atomic level, perception passes through different levels as the states become clearer: first a homogenous substance, then a differentiation into particles – molecules, atoms, subatomic particles – and finally, quarks. Later examples will show how Grisey uses magnification as a way to achieve changes in texture.

Transformation is used to refer to a gradual metamorphosis from one state to another or, within a granulated state, a progressive and systematic movement from one side of the continuum to another. An example would be a primarily iterative texture transforming gradually to predominantly effluvial state. In contrast, the term "state shift" will be applied to an abrupt change of state. All these techniques I consider variations on the same compositional tool, "re-contextualization." For example, timbral transformation in computer music is a form of re-contextualization in which a computer musician applies an algorithm to a pre-existing sonic material enabling it to morph into something new. As this is possible in acoustic music as well, I will also show how Grisey, through periodicity and textural transformation, "re-contextualizes" the materials at the end of *Periodes* seamlessly to become the beginning of *Partiels.*

Semiotics of Sound in Grisey's *Periodes*

The beginning of *Periodes* demonstrates how Grisey introduces the musical language of the piece and how changes of state and timbre occur. Grisey establishes the aesthetic and idiom of this piece by beginning with blocks of effluvial stasis. Though synchronized and contrapuntally static within each chord, subtle internal activity exists. For example, following the first attack, the contrabass begins *alto sul tasto* moving towards *ordinario* in the second chord, whereupon the contrabass continues to modulate between *alto sul tasto* and *ordinario*. Additionally, both the violin

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[16] Grisey, "Tempus ex Machina," 268.

and the viola slightly bend (microtonally) their respective highest notes over the course of each chord before re-attacking the next chord. Thus, each sound block moves with an internal waver, the result of the beating created through microtonality. This waver serves as the seed (from which more will grow) or the "first words" of a language, which Grisey will continue to "teach" to the listener as the work progresses. The following example illustrates how Grisey opens *Periodes.*

Example 5. Establishment of sonic identity, *Periodes*, p.1.

With a *pizzicato* attack in the viola followed by additions of the bass and violin, Grisey establishes the sonic identity. Applying Smalley's classifications, the *pizzicato* attack can represent an impulse followed by the effluvial state. The gradual microtonal bends provide a subtle internal waver to the sonic composite. After numerous iterations, he adds clarinet, then flute. On page five, the bending pitches are staggered as a means of extending and pushing the material farther.

Example 6. Staggered pitch bends, *Periodes*, p.5.

In contrast with Example 5, the staggered and shorter bends effect a heightened and accelerated textural density. Grisey follows the bends with a "new word," the color trill in the viola at rehearsal two. On page six, he introduces the parameter of dynamic swell, which establishes a sort of temporal amplitude motive, shown in Example 7.

Example 7. Dynamic swells as a composite sonic entity, *Periodes*, p.6.

All elements are integrated into a single pulsating composite entity, in contrast to the opening static chords. On the static end of the continuum, sustained tones establish the effluvial state. On the opposite, active extreme are flutter tongue and tremolo as examples of the iterative state. The dynamic swells, serving as an intermediary between the two states, stagger throughout the ensemble in the following example. Just as the bends were earlier, these staggered attacks themselves become a textural motive. The trombone emphasizes the attacks of the swells by accenting abruptly upon each iteration, just before rehearsal 3. As the moment of expected saturation is reached right before rehearsal three, the new element appears, in the form of chaotic string noise in the viola, as shown in Example 8.

Example 8, Timbral development, *Periodes*, p. 7.

At this point, Grisey has introduced core materials and a basic developmental strategy. The waver, initially a microtonal bend, has individuated and become a color trill, then a flutter-tongue and further morphed into the introduction of the chaotic string noises. Each modification represents the morphological trajectory in progress, wherein a state of being turns into a heightened version of itself, as in the case of a pitch bend turning first into a color trill, and

later into a flutter-tongue.   The following example clearly
demonstrates timbral transformation within a single instrument.

Example 9. Transformation of flute articulation, *Periodes*, p.11.

Pitch bend---speed of waver increases   →   quick tongue attacks (iteration/granulation?)
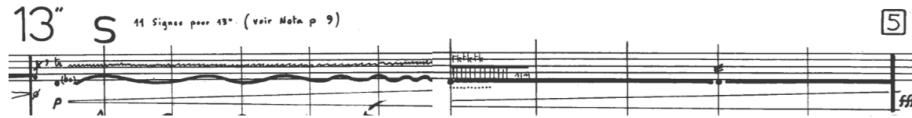
A direct timbral modulation would be to move the flute
flutter-tongue to a viola tremolo. The chaotic string noise, however,
is a type of "timbral granulation" – not exactly a trill or a flutter-
tongue, or even a tremolo (the string equivalent of a flute flutter-
tongue). More so, it is an integration of new elements, chaos and
noise.

Grisey continually and logically builds on specific aspects of
the sonic composite. The piece teaches the listener how to
understand its musical language. Logic functions as an important
element, allowing a listener to make connections either consciously
or intuitively. The development of the material proceeds coherently,
transforming it into somewhat similar versions of itself through re-
contextualization.

In the same way a sonata merges multiple ideas in a
development, Grisey continues to resynthesize and integrate
previously presented materials. The chaotic string noise of the viola
marks the point where the material phenomenologically emerges
out of the previous stasis to achieve a sort of composite identity
comprised of the previously introduced elements such as trill, flutter
tongue, bends, and dynamic swell. After establishing itself as a
composite entity, the entity has become aware of its need to develop
further, essentially pushing its own material farther. The use of the
ensemble dynamic swell introduces an idea of a segregated event,
and a sort of composite entity has emerged.

**States of Sound (Transformation of the Attack-effluvial
continuum)**

Although Grisey may have never intended for this parallel to
be made, Smalley's textural categorization can be effectively applied
to *Periodes*, pages 10-11. After a few attack impulses, a noticeable
silence, and four seconds of sustained pitch representing the effluvial
state, the music begins an iterative phase. Notice the fusion of an

attack "envelope," where there exists a brief crescendo from *pp* to *fp* at the beginning of the first sustained pitch. This momentary fusion connects the unified composite amplitude swells with the individuated attack impulses before the preceding silence. In this way, Grisey has taken the ensemble from a number of individual particles and brought them together to form a unified composite. Once unified, it again begins to iterate at an increasing rate until the individual iterations are no longer perceptible, as the players switch to tremolo.

The glissandi, at this point moving "outwards" in contrary motion, become rapid enough to transform into tremolo. Flute and trombone join with their analogous flutter-tongues.

Example 10. States and transformation, *Periodes*, p. 10.

Example 11. States and transformation, *Periodes*, p. 11.

By nature of the consistent pitch content inherent in the tremolo, the unified tremolo can be heard as effluvial, though by another perspective it would yield a blended state: effluvial with an iterative layer. The granular state exists between the iterative and the unified tremolo, not clearly one nor the other. Grisey creates this state by staggering the attacks between the instruments, thus avoiding simultaneities: increasing the density and thwarting the perception of individual events aids in creating the perception of blur. Following the homogenous tremolo composite, the sound begins to diffuse to its individual components again, thus returning to an iterative state.

Magnification

Alternating between states in this way transforms between them, representing what Grisey refers to as "magnification." In *Periodes,* Grisey continues expressing these states musically, as well as gradual transformations between them. At times, Grisey combines discernible layers of more than one state. Details become clearer through magnification, as a transformation between states occurs. At the point where the current materials' trajectory reaches its climax and saturation point, the composite texture transforms and

re-contextualizes the glissando gesture. While crossing an arbitrary "state threshold," long pitch bends transform into shorter, fingered gestures.

Example 12. Magnification, *Periodes*, p. 12.

Previously, the glissandi were generally used in contrary motion "inward," with a few notable exceptions where they began to move "outwards." In those instances, the predominant hierarchical event was not the direction of the glissandi, but the quickening periodicity towards the climax. On page 12, all glissandi now ascend in staggered attacks throughout the ensemble, as the density gradually becomes sparser.

Composed of a tapestry of multiple threads, each moving at independent rates, the composite gradually relaxes and provides a denouement for the previous climax. Beginning with the flute and followed by cello, contrabass, clarinet, viola, and violin, Grisey introduces the more articulated texture. By staggering the entrances, he ensures a gradual transformation between these two states. The differing number of notes, durations, and subdivisions in each gesture prevent noticeable simultaneities between the layered ascending waves. The revealing of details can be seen more clearly as the "surface" of each of the notes, perceivable earlier only as sustained bends.

Example 13. Magnification (continued*), Periodes***, p. 13.**

Continuing through the attack-effluvial spectrum, the blurring once again produces a dynamically transforming, granulated state—one that starts dense and closer to the threshold of the effluvial state, though not crossing over. Example 14 shows the target texture, that of a somewhat sparser representation of the previous example.

Example 14. Static periodicity, *Periodes*, p. 15.

Grisey stretches time between attacks as well as intervals between pitches. Previously scalar passages have had notes removed to become arpeggios. This transformation began at a quasi-iterative/granular state and progressed through a gradual decrease of rhythmic and harmonic content. Arriving at a texture wherein the instruments fuse into a repeating homogenous effluvial composite, Grisey marks the reiteration with "*quasi-pizzicati*" in the flute. In this case, periodicity occurs on a middle-ground level—applying to a segment of material—rather than to micro-level elements of a texture. The resulting effect is that of the materials repeating like a broken record.

Between the cycles, Grisey inserts "repose(s)," which serve as static interludes. In each, he repeats segments of musical material. In the first, second and last reposes, traditional musical materials are repeated. In the third Grisey integrates theatrics, a phenomenologically effective tool in this case integrating a theatrical element with a musical one, in which he has the string players intentional "tune" their instruments, repeatedly.

Transformation through Reiteration

The iterative material described in Example 14 reaches an even more elongated state near the end of the movement. At this point, various states blend and mix, existing in an "in-between" transitory state. Depending on perspective, a slow repetition of sustained attacks could be considered as an effluvial composite, or as a slow iterative state. The material serves as what could be described as a pivot state, convincingly arguable as one or the other. If the material speeds up, it reveals an iterative nature. If slowed down further, the material would distinguish itself as definitively effluvial. The rate of change as well as the curve of the rate of acceleration contributes to the momentum in the change of state.

More than augmentation, magnification refers to the aesthetic qualities of sound rather than duration and placement in time. For the purposes of this discussion, reiteration will be applied to a segment of material that is repeated, like a broken record, as in the case of the opening gesture of *Partiels.* In terms of transformation, if magnification is a way of "stretching the surface" of compositional materials, reiterational transformation changes the nature of the repeated material at an atomic level. *Periodes* prepares through reiterational transformation the beginning of *Partiels* by magnifying the material further.

Example 15. Continued stretching of iterative material, *Periodes,* p. 41.

In the previous example, the addition of an aggressive amplitude envelope (beginning with the trombone) differentiates individual effluvial elements from within a gradually decelerating iterative texture. In this passage, the material transforms slowly back from iteration into attacks. Additionally, the loud attack of the trombone followed by loud iterations of string attacks foreshadows the distinctive opening of *Partiels.*

On the following page of the score (page 42), the effluvial nature of the previously elongated iterative material asserts itself further with the addition of multiple loud attacks in the accompanimental, staggered attacks of the strings. This material does not have an identifiable periodicity, that being a necessary quality of iteration; thus I hear this as an elongated and stretched state of granulation.

Example 16. Transformation from iteration into attacks, *Periodes*, p.

44.

Transformation from one state to another continues on page 45, where the trombone declamation remains. Alongside this, multiple iterations of brief overpressure in the contrabass complement its decay, which, along with the trombone, continues to develop into the opening of *Partiels.* The following figure shows the development of the iterative/effluvial composite.

Example 17. Iteration amidst an effluvial composite, *Periodes*, p. 45.

Notice how the contrabass continues layering iterative *pizzicati* over sustained and gradually increasing overpressure, followed by two *sfffz* bowed attacks, before returning to the layered iteration amidst an effluvial composite. Formally, iterative attack impulses of the bass transform from points of attack into sustained sounds. In so doing, they extend and cross over into re-articulations of the effluvial state as a primary voice, which functions as a means of perfectly transforming into the beginning gesture of *Partiels.* The first page of *Partiels* replicates the same material on the final page of *Periodes.*

Figure 18. Periodicity, *Periodes*, p. 46.

The previous overpressure iterations of the contrabass transform into three sustained *fff* attacks in quick succession, accompanied by the loud trombone statement. Grisey follows the trombone and iterative contrabass composite with an emerging spectrum orchestrated with strings and winds.[17] The combination of both the trombone/contrabass statement and the emerging string/winds answer result in a larger form of iteration; in this way Grisey reframes periodicity within a larger context.

The iterative/effluvial composite at the beginning of the page shifts to a re-contextualized version at the end. By changing the contrabass pizzicato/overpressure iteration to sustained attacks along with another sustained trombone declamation, exactly the

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[17] Rose, 6-39.

same as what follows at the onset of *Partiels.* Grisey's transformation seamlessly connects the two movements. [18]

Future Studies

As analysis has progressed, new tools have emerged as well as evidence of their application. There now exist a multitude of ways to describe and categorize textures and "sound objects," as well as describe the trajectory and energetic content of the transformation of musical texture. In combining Smalley's and Grisey's tools, new approaches become available. These include defining the nature of the texture, categorizing the ways it transforms, and finally the trajectory of its transformation over time.

Though it is impossible to "control" a listener's experience, how can a composer provide opportunities for building expectations through repetition and predictability? Leonard Meyer describes the "structural gap," wherein a musical expectation is thwarted for the listener. Meyer posits that emotion experienced by a listener is induced as a result of opening these gaps, as well as by subsequently "closing the gaps."[19] As all these factors affect perception and emotions, consciousness of these dimensions becomes essential in crafting a composition.

In order to create a cohesive work, one of the first things I do as a composer is look at possible combinations of dynamics, textures, timbres, and various states of periodicity. Within a given texture, there are two overarching categories, each with its own subcategories: the first category is one of predictable periodicity of a recognizably iterative state which has the potential for various rates of iteration, including a quasi-iterated/granulated state; the second category, stasis, can be subdivided into chaotic stasis with unpredictability, and effluvial stasis that is smooth and without interruption. Within the chaos also exists opportunities to incorporate various densities. Each of these categories can be manipulated within its own continuum of density or rate as applicable, within four possible combined states: sparse and soft, dense and soft, sparse and loud, dense and loud. Formal decisions will create a perceived shape of the resulting piece consistent with desired phenomenological effects.

I have not addressed semantics and semiotics. Due to the lack of relevance regarding acoustic instrumental music, "meaning" has been avoided. In the case of acousmatic music such as that of

[18] In *Partiels*, Grisey continues to explore periodicity through the repetitive cell mechanism as well as texturally within a sonic composite.
[19] Leonard Meyer, *Emotion and Meaning in Music* (Chicago: University of Chicago Press, 1956), 130-35.

Schaeffer, Smalley, Chion, Bayle, and countless other computer musicians and composers, however, the tools described herein can and should be extended to their full range of prowess within these realms as well.

I would like to describe a tool for future consideration: contextual modulation, that which creates the possibility of moving from one sonic/semantic world to another, seamlessly. It stems partly from extending the world of *klangfarbenmelodie* introduced by Schoenberg, wherein colors could be shifted, to techniques described in this paper: deliberate moves from similar instrumental techniques such as tremolo to flutter-tongue, pizzicato to tongue ram. The extension to contextual modulation effects the shift between similar *recognizable* sonic textures, such as walking on gravel, bubbling water, and crinkling paper for example. Each carrying with it an image complete with set of meanings unique to an individual listener, allows for the aural similarities to transcend the semantic meanings, providing an opportunity for surreal compositions bridging worlds of unimagined hybrid realities.

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The Affect Effect:
Key Characteristics in *Così fan tutte*

ROBERT BOTT

Introduction

The concept of key characteristics – the idea that musical keys intrinsically reflect a particular emotion – harkens back to some of the earliest known Greek treatises on musical theory. In Plato's *Republic* the word *harmonia* was "used in conjunction with the various . . . characterizations of musical types . . . and it also [referred] to the harmonious state of the individual soul effected by music."[20] During the Renaissance a renewed interest in the study of ancient sources led music theorists such as Glarean and Zarlino to adapt or directly apply Greek characteristics to the medieval church modes.[21] These associations persisted until the emergence of common-practice tonality in the seventeenth century, which favored the Ionian (major) and Aeolian (minor) modes to the near exclusion of all others. As a result, theorists of the late seventeenth and early eighteenth centuries began to put forth treatises explaining the affects of various keys in this new system.[22]

The discussion on key characteristics—whether or not they actually existed, and, if they did, how each affect should be interpreted—was still part of the musical climate when Mozart began writing his mature operas, as illustrated in this summary by John Platoff:

> There is substantial agreement that, at least some of the time, Mozart and other composers chose keys (perhaps especially for arias) by relying on the conventional association of particular keys with certain character-types, affects, or dramatic situations: D major for a noble character or martial sentiments, for example, or G major for peasant simplicity. In fact, Antonio Salieri refers explicitly to this issue in describing how he began setting an operatic libretto to music. After reading it through carefully, and rereading the texts of the lyric numbers, 'I decided first on the key

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[20] Oliver Strunk, *Source Readings in Music History*, vol. 1 (New York: Norton, 1998), 5.

[21] Rita Steblin, *A History of Key Characteristics in the Eighteenth and Early Nineteenth Centuries*, 2nd ed. (Rochester: Univ. of Rochester Press, 2002), 20–28.

[22] Steblin, 29.

appropriate to the character of each lyric number.' The associations have to do with the general view of the 'character' of each key and with operatic practice and tradition in particular.[23]

Despite Platoff's assertion that there is "substantial agreement" on the use of key characteristics, many details remain murky. His subsequent discussion on characteristics for specific keys is limited, and does not include reference to an in-depth study of an entire opera; moreover, his statement that Mozart and other composers relied on key associations "some of the time" suggests a lack of detailed understanding in regard to the frequency of their use.[24] In addition to this, chapter seven of Rita Steblin's seminal work *A History of Key Characteristics in the Eighteenth and Early Nineteenth Centuries* shows that theorists did not always agree on the affective meaning of a particular key.[25] This further complicates matters and raises questions regarding Mozart's intention in choosing a key for its supposedly innate characteristics.

These murky details provided an excellent impetus for the present study, which seeks to shed light on these topics through comprehensive analysis of *Così fan tutte*. The following questions guided my research:

1) Is there evidence within the composition itself that demonstrates specific use of keys for their affective properties (i.e., is it true that Mozart was actually composing with key characteristics in mind)?

2) If so, did this practice occur throughout the opera, or only "some of the time" as Platoff suggests?

3) Since theorists disagree on the exact meaning of each key, do Mozart's choices in *Così* indicate that he was following the ideas of a particular theorist?

Research Methodology

During much of the twentieth century, scholarship on Mozart's operas was based on the assumption that "'high-level tonal planning' – that is, a network of [pre-planned] relationships among the tonic keys of separate numbers of an opera – contributes significantly to structure and meaning."[26] However, in the 1990's

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[23] John Platoff, "Tonal Organization in the *Opera Buffa* of Mozart's Time," in *Mozart Studies 2*, ed. Cliff Eisen (Oxford: Clarendon Press, 1997), 148–49.
[24] Platoff, "Tonal Organization," 153–56.
[25] Steblin, 109–22.
[26] John Platoff, "Myths and Realities About Tonal Planning in Mozart's Operas," *Cambridge Opera Journal* 8, no. 1 (1996): 1.

articles such as "Dismembering Mozart,"[27] "Myths and Realities about Tonal Planning in Mozart's Operas,"[28] and "Mozart's Operas and the Myth of Musical Unity"[29] challenged this hegemony and called for research based on different paradigms. Webster astutely pointed out that, regardless of analytical method, "a given number cannot be understood except in awareness of its dramatic and musical context."[30] Platoff also advocates for investigation on a more local level, particularly on the subject of tonal planning and key characteristics:

> Thus there is ample evidence of Mozart's general reliance on a group of standard key-associations. However, these associates require keys to be chosen for reasons intrinsic to each number, while high-level schemes in which one tonic is related to others in a systematic way call for key-choices that are mutually interdependent within some larger framework. In Julian Rushton's words, these two are 'virtually irreconcilable.' And Mozart, like his contemporaries, seems to have concerned himself consistently with choosing keys for their own significance, while the evidence in support of large-scale schemes is far more tenuous.[31]

Platoff followed this quotation the next year with a statistical analysis of tonal relationships in twenty-eight Viennese *opera buffe* and in Mozart's operatic *oeuvre*.[32] After reviewing his work it became apparent that a similar methodology would be helpful for investigating key characteristics in *Così* because "statistical evidence, however crude the process of merely counting may seem to be, tells us what composers did and did not do, and how frequently."[33]

I began my analysis with a survey of the keys used in closed-form numbers throughout the opera – arias and ensemble pieces, excluding all instances of recitative – assigning each a principal key by taking into account the initial signature, final cadence, and any internal modulations not delineated by a written change of key.[34] In #27, *Tradito, schernito*, an aria that modulates from C minor to C major, I elected to count each key as a separate entity because the

[27] Carolyn Abbate and Roger Parker, "Dismembering Mozart," *Cambridge Opera Journal* 2, no. 2 (1990): 187–95.
[28] Platoff, "Myths and Realities," 3–15.
[29] James Webster, "Review: Mozart's Operas and the Myth of Musical Unity," *Cambridge Opera Journal* 2, no. 2 (1990): 197–218.
[30] Webster, 218.
[31] Platoff, "Myths and Realities," 10.
[32] Platoff, "Tonal Organization," 149–63.
[33] Platoff, "Tonal Organization," 150.
[34] Wolfang Amadeus Mozart, *Così fan tutte, Wolfgang Amadeus Mozart neue Ausgabe sämtlicher Werke,* series 2, workgroup 5, vol. 18, parts 1 and 2, ed. Faye Ferguson and Wolfgang Rehm (Kassel: Bärenreiter, 1991).

change was indicated not only by a new key signature, but also a significant emotional transformation. However, when considering the finale to each act, I opted *not* to analyze modulated sections individually because there is an eventual return to the initial key of the section.

As shown in Figure 1, Mozart uses 10 keys throughout *Così*: all of the major keys from E-flat to E major, along with F minor and C minor. The keys furthest from C major are used the least, and for the most part the number of uses increases as the key signatures draw closer to the middle ground of C. The outlier in this fairly systematic approach is F major, which is used only three times despite its proximity to C major.

Figure 1. Key usage
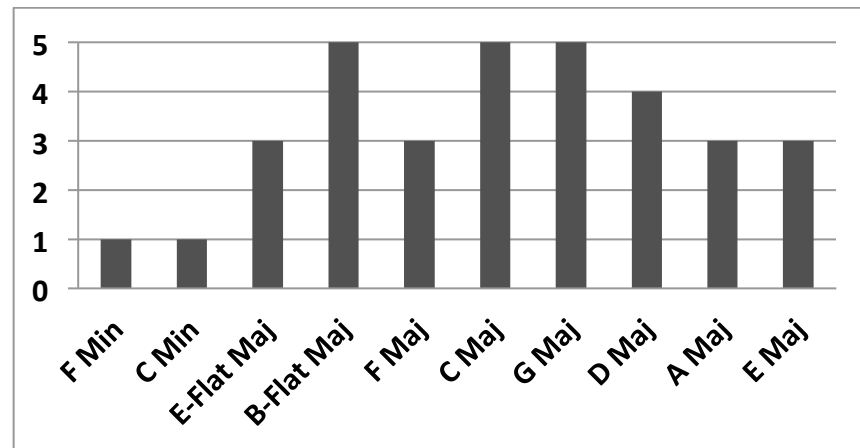
In order to determine if Mozart was intentionally choosing these keys based on their purported affect, I created a rubric that incorporated descriptions of key characteristics as put forth by five German-speaking theorists. Four of these theorists were contemporaries of Mozart, and their dates of publication situate their workwithin the same artistic *milieu*: G. J. Vogler (published in the *Deutsche Encyclopädie*, 1779),[35] J. J. H. Ribock (published in Cramer's *Magazin der Musik*, 1783),[36] C. F. D. Schubart (published in *Ideen zu einer Ästhetik der Tonkunst*, 1784),[37] and G. C. Kellner

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[35] Georg Joseph Vogler, "Ausdruck, (musikalisch)" in *Deutsche Encyclopädie, oder Allgemeines Real-Wörterbuch aller Künste und Wissenschaften,* vol. 2 (Frankfurt-am-Main: Varrentrapp und Wenner, 1779), 386, quoted in Steblin, 121–22.

[36] Justus Johannes Heinrich Ribock, "Über Musik; an Flötenliebhaber insonderheit," *Magazin der Musik*, ed. Carl Friedrich Cramer, vol. 1 (Hamburg: Musicalische Niederlage, 1783), 706–09, quoted in Steblin, 109–11.

[37] Christian Friedrich Daniel Schubart, *Ideen zu eniner Ästhetik der Tonkunst,* ed. Ludwig Schubart (Vienna: Degen, 1806), ed. P.A. Merbach

(published in Cramer's *Magazin der Musik*, 1787).[38] For a perspective on older traditions, I opted to include key characteristics from the 1713 treatise *Das neu-eröffnete Orchestre* by Johann Mattheson,[39] an influential theorist who was "especially interested in…the way modern key affects related to modal affects."[40]

For each closed-form number, I looked at the preceding recitative to establish the dramatic situation and then read the text of the number to determine which emotions were being portrayed. I then compared this to the key characteristics set forth by the theorists. To minimize the element of subjectivity inherent to hermeneutic analysis, I elected to assign each closed-form number one of three categorizations: strong match, partial match, or non-match. The use of a partial match category allowed for some latitude in interpretation given that not every number was unequivocally correlated to or antithetical to the theorists' descriptions.

Numbers were labeled as a <u>strong match</u> only if the text of the libretto and the dramatic situation were unmistakably close to one or more of the theorists' proposed characteristics. This included close word matches between the libretto and the theorists as well as pieces whose key usage obviously parallels the drama, such as in #8, *Bella vita militar*, and #5, *Vorrei dir, e cor non ho* (Figure 2).

Figure 2. Strong Matches.

<u>#8, *Bella vita militar*</u> (Chorus in D Major)
How wonderful is the soldier's life!
Every day one changes places;
Today we go far away, tomorrow, nearer;
Sometimes by land and sometimes by sea.
The sound of trumpets and fifes,
The discharge of the guns, and the noise of the bombs
Give more strength to the arm
And the mind has but one dream:
To win the war.[41]

(Leipzig: Wolkenwanderer-Verlag, 1924), 261–65, quoted in Steblin, 115–19.

[38] Georg Christoph Kellner, "Etwas von Tönen und Tonarten," *Magazin der Musik,* ed. Carl Friedrich Cramer, 2/2 (1786): 1186–90, quoted in Steblin, 12–14.

[39] Johann Mattheson, *Das neu-eröffnete Orchestre*, trans. Hendrik Schulze (Hamburg: Schiller, 1713), 236–51.

[40] Steblin, 40.

[41] Lorenzo Da Ponte, *Così fan tutte*, trans. Marie Thérèse Paquin (Montréal: Presses de l'Université de Montréal, 1980), 57.

Mattheson: D Major is by nature somewhat sharp and obstinate; very apt for noise-making, merry, warlike, and uplifting things...[42]

Schubart: D Major, the key of triumph, of Hallelujahs, of war-cries, of victory-rejoicing...[43]

Vogler: D Major enflames the heart...the spirit welters in heroic deeds.[44]

#5, *Vorrei dir, e cor non ho* (Aria in F Minor)
I do not have the heart to tell you what I came here for;
My lips are stammering,
My voice cannot come out,
But chokes half way.
What are you going to do?
Oh! What a destiny!
Nothing worse could have happened!
I pity you and I pity them.[45]

Mattheson: F Minor seems to depict...a deep and heavy mortal fear in the heart that is combined with some desperation...[46]

Schubart: F Minor [represents] deep depression, funeral lament, groans of misery...[47]

A partial match was assessed when there seemed to be a correlation between the scene and the key characteristic, but there was reasonable room for interpretation as to the exact nature of the match. An example of this is #28, **È amore un ladroncello,** an aria in B-flat Major sung by Dorabella in which she tries to convince Fiordiligi to abandon her love for Guglielmo and give in to the overtures of the "stranger" (Ferrando in disguise). Although there is a reasonable match to the idea of "cheerful love" as espoused by Schubart, given the fact that Dorabella is trying to convince Fiordiligi to be unfaithful to her recently-beloved, it seems to go against some of the other facets of the characteristic, such as "clear conscience" (Figure 3).

Figure 3. A Partial Match

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[42] Mattheson, 242–43. Emphasis added.
[43] Steblin, 18. Emphasis added.
[44] Steblin, 21. Emphasis added.
[45] Da Ponte, 45.
[46] Mattheson, 248–49. Emphasis added.
[47] Steblin, 116. Emphasis added.

#28, *È amore un ladroncello* (Aria in B-flat Major)
Love is a little thief, a little snake;
He can give a heart peace or worry,
as it pleases him. As soon as a passage is
opened through the eyes to the bosom,
the soul is captured and is no longer free...[48]

Schubart: B-flat Major [represents] <u>cheerful love</u>, clear conscience, hope, [and] aspiration for a better world...[49]

A number was designated as a <u>non-match</u> when there seemed to be no correlation between the key characteristic and the drama; only four of the thirty-three total closed-form numbers were labeled in this manner.

Results: Strong Matches

Of the thirty-three possible uses among all keys, nineteen (57.6%) showed a strong match to one or more of the theorists' characteristic descriptions. The results also demonstrated that the frequency of strong matches increases as keys move away from C major, which suggests that Mozart chose those particular keys for specific reasons. This conjecture is supported through further analysis of the two arias cast in the minor mode. As expected, both occur in situations in which a character is expressing an unpleasant or sad emotion. Although it is tempting to simply write this off as a normal use of the minor mode as a melancholy opposite to the happy major mode, I found that the purported affect of each key closely matched each dramatic situation in a very specific way, which points toward intentional use for a particular characteristic.

In #5, *Vorrei dir, e cor non ho*, Don Alfonso is charged with bringing the "bad news" to the women that their men are leaving for war, and feigns deep distress. This aria was a strong match to affects described by both Mattheson and Schubart as previously shown in Figure 2; however, since further analysis was needed in order to determine if F minor was indeed chosen for its specific characteristics, I then compared the aria to Schubart and Mattheson's descriptions of the other minor keys. While there is certainly a trend toward melancholy for many of them, not *all* are said to depict sadness at a level commensurate with this particular dramatic situation (or even to depict sadness at all). For example, Schubart considers G minor a key of "discontent, uneasiness, [and] worry about a failed scheme... in a word: resentment and dislike,"[50] while Mattheson states that "G minor is almost the most beautiful

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[48] Da Ponte, 198–99.
[49] Steblin, 116. Emphasis added.
[50] Steblin, 115–19.

tone as it not only combines the seriousness of [D minor] with a certain loveliness, but also carries with it an exceptional grace and pleasantness through which it is comfortable for both tender and uplifting [things]… "[51] Schubart writes that A minor is said to depict "pious womanliness and tenderness of character,"[52] and to Mattheson A minor "is somewhat plaintive, honorable, and at ease, meaning it invites to sleep; but it is not unpleasant in this."[53]

The fact that F minor so neatly falls within the narrow range of emotion as depicted in Don Alfonso's aria supports the idea that it was chosen over other minor keys for its particular affect. This is likewise true of C minor as used in #27, *Tradito, schernito*, to underscore Ferrando's resentment that his love, Dorabella, gave in to the seductive overtures of a disguised Guglielmo. His feelings of betrayal and his anger at her for scorning him match very closely with Schubart's description of the key: "declaration[s] of love and at the same time the lament of unhappy love – all languishing, longing, sighing of the lovesick soul lies in this key."[54] Although both arias use the minor mode to conjure feelings of sadness or lament, the subtle differences in character and magnitude point toward the conclusion that each key was chosen to reflect *specific* characteristics that closely matched each dramatic situation. A survey of the remaining numbers that are a strong match to the theorists' descriptions yielded similar results and bolstered the argument that Mozart was intentionally utilizing keys for their individual affects. The next logical step was to then analyze the numbers that were only partial matches to determine if they provided a foundation for a contrary opinion.

Results: Partial Matches and Non-Matches

Partial matches occurred in two cases: when there was a seemingly strong match that was in some way undermined or weakened (such as the aforementioned #28 from Figure 3), or when there was not an obvious correlation between the key characteristics and the actual words of the libretto or the dramatic situation. An example of the latter occurs in #30, *Tutti accusan le donne*, a trio in C Major. In this scene Don Alfonso is consoling Guglielmo and Ferrando, telling them not to worry that their lovers were unfaithful because "all women are like that" (*così fan tutte*). As shown in Figure 4, one could argue that there are some similarities to Mattheson's assertion that C major has a "rude and insolent character" or Kellner's portrayal of C major as "a mixture of happy cheerfulness and gentle seriousness," but neither of these descriptions correlates

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[51] Steblin, 236–51.
[52] Steblin, 115–19.
[53] Steblin, 236–51.
[54] Steblin, 115–19.

in an overly direct manner. The ideas of the other theorists also show a low level of association.

Figure 4. A Partial Match to C Major.

> #30, *Tutti accusan le donne* (Trio in C Major)
> Don Alfonso:
> They accuse all women, but I excuse them,
> If a thousand times a day, they change love;
> Some call it vice, and others, a habit,
> But to me, change seems to be a necessity for the heart…
>
> Ferrando, Guglielmo and Don Alfonso:
> Women are like that![55]
>
> Schubart: C major is completely pure. Its character is: innocence, simplicity, naivety, [and] children's talk.[56]
>
> Kellner: a mixture of happy cheerfulness and gentle seriousness is the chief trait of this key. Menuets and charming sonatas, among other things, are suited to its properties.[57]
>
> Ribock: C major is perhaps serviceable for every affect, but will not express one that is very strong and marked.[58]
>
> Vogler: C [major] is perhaps the key most fit for a painting, for pure water arias, for pure subjects.[59]
>
> Mattheson: C major has a rude and insolent character, but will not be inappropriate for boisterous dancing and where else one lets one's joy come forth without inhibition…[60]

As expected, numbers designated as a non-match had no apparent correlation to the key characteristics set forth by any theorist. *In uomini, in soldati*, #12, an aria in F major, falls into this category. As seen in Figure 5, the associations of the key – particularly the positive characteristics such as "magnanimity" and "gentle dignity" – are at odds with Despina's waspish tone and jaded outlook.

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[55] Da Ponte, 214–15.
[56] Steblin, 115.
[57] Steblin, 112. Emphasis added.
[58] Steblin, 109–10.
[59] Steblin, 121.
[60] Mattheson, 240–41. Emphasis added.

Figure 5. A Non-Match.

> #12, *In uomini, in soldati* (Aria in F Major)
> In men, in soldiers, to hope for constancy!
> Do not make us hear such stupid things!
> Everyone has the same nature.
> The moving leaves and the changeable winds are more
> constant than men.
> False tears, false looks, deceiving voices, charming lies, these
> are the principal qualities of men.[61]
>
> Mattheson: F major is capable to express the most beautiful
> sentiments of the world, be it magnanimity, steadfastness,
> love...[62]
>
> Kellner: [in] F major all greatness [of B-flat major] is gone;
> gentle dignity and lovely smiles are unmistakably
> prominent.[63]
>
> Ribock: F major is for me a lesser B-flat major.[64]
>
> Vogler: F [major] is good for dead calm.[65]
>
> Schubart: [F major]: complaisance and calm.[66]

Results: Additional Thoughts

Since over half of the closed-form numbers in *Così* present a strong match to the tenets of at least one theorist there is compelling evidence to conclude that Mozart was not only intentional in his use of key characteristics, but that he employed them throughout the opera. If the ten partial matches are also considered the total increases to twenty-nine of thirty-four, meaning that about 88% of the time the chosen key was at least partially matched to an affective association (Figure 6).

Although the presence of *any* partial or non-matches could be considered a strike against the theory that Mozart wrote with key characteristics in mind (after all, if he did indeed use them, why would he not do so all the time – do not all dramatic situations merit affective reinforcement from the music?), there are three primary factors that undermine this argument. First, in my analysis, I erred

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[61] Da Ponte, 75–76.
[62] Mattheson, 241–42.
[63] Steblin, 114.
[64] Steblin, 110.
[65] Steblin, 122.
[66] Steblin, 115.

on the side of caution in an attempt to be as objective as possible, designating matches based primarily based on word association with the libretto and emotional parallels within a given scene; partial and non-matches could still point toward intentional use if evaluated through the lens of irony, subtext, or authorial commentary. *Bella vita militar*, #8a, is a prime example as it could be considered an intentional use of the "wrong key" to convey the deception being perpetrated by the men. Because assigning such a match based on these characteristics is highly subjective, I shied away from this type of designation in this study, but additional hermeneutic analysis would likely resolve discrepancies or determine a specific reason for them, pointing to intentional use.

Second, it is very likely that other considerations such as voice type or operatic convention would occasionally prove more important in selecting the key of certain numbers. This appears to be the case with #12; although the text and dramatic situation did not match the affect of its home key, Platoff states that "…F [major] is the prime key for what might be called '6/8 maidservant' arias, expressions of either naïve sentiments (often amorous longings) or their reverse, cynical reflections on men and the game of love, by the inevitable subsidiary female character who is usually the maid. (Despina's *In uomini, in soldati* illustrates the latter)."[67] Despite the fact that such issues trump key associations from time to time, it does not undermine statistical results that strongly indicate Mozart matched the affect to the dramatic situation whenever possible.

Third, I believe that many partial matches are just as often a product of the theorists' writings as they are Mozart's musical choices. A study of their descriptions shows a wide variety of interpretations regarding the characteristic of any given key, and although their ideas on remote keys are not identical, they *are* often very specific. E major, for example, is described in this manner:

> Ribock: E major, as when an otherwise quarrelsome person is very cheerful or rather merry…[68]
>
> Vogler: E [major] can depict fire best of all, especially as it stands out through the intensity of its piercing flames.[69]
>
> Mattheson: E major expresses very well a desperate or entirely deadly sadness; best used for extremely in-love help- and hopelessness…[70]
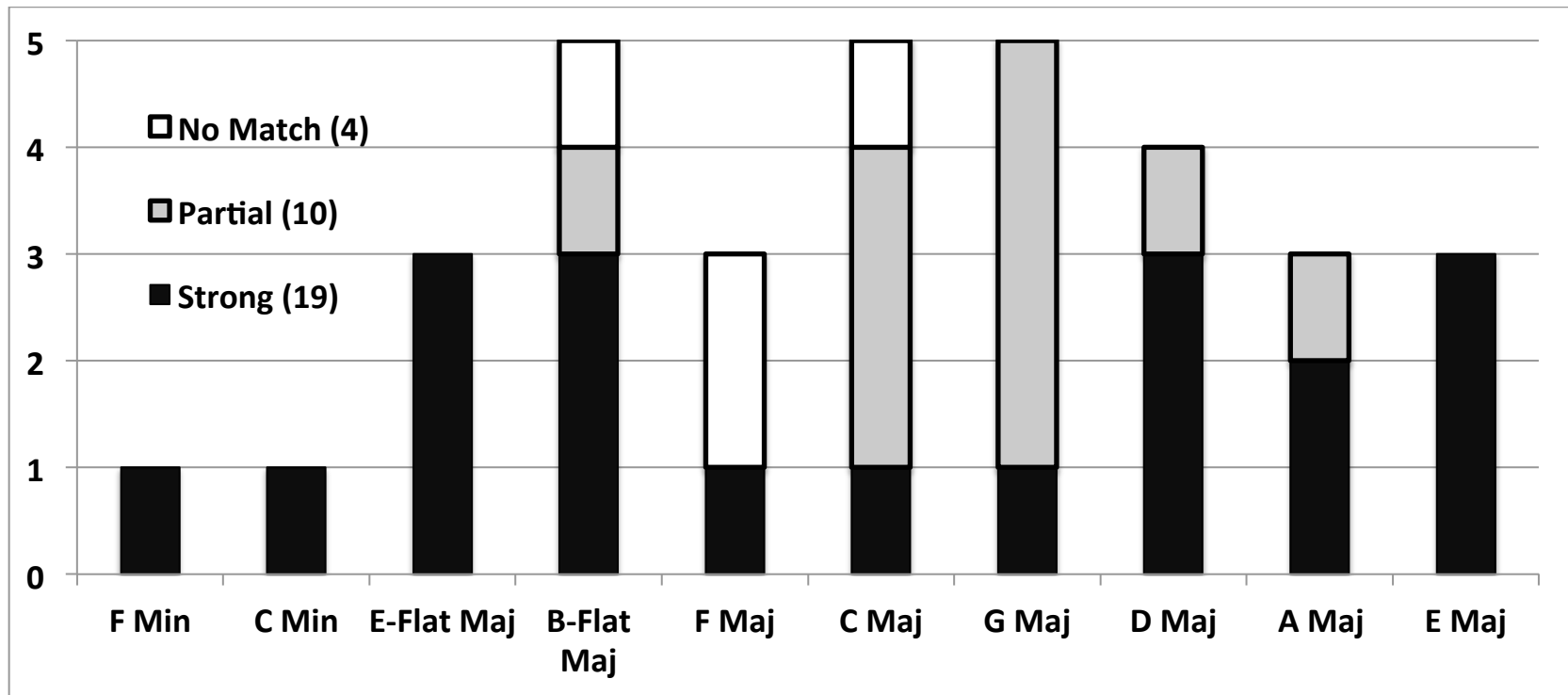
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[67] Platoff, "Tonal Organization," 154.
[68] Steblin, 110.
[69] Steblin, 121.
[70] Mattheson, 250.

Figure 6. Key Characteristic Matches.

On the other hand, when writing about C major each includes a qualifier that introduces room for some doubt as to the exact nature of the key's characteristic:

> Ribock: C major is <u>perhaps</u> serviceable for every affect, but will not express one that is very strong and marked; it is not very noble, but also not at all vulgar.[71]

> Vogler: ... C major is <u>perhaps</u> the key most fit for a painting, for pure water arias, for pure subjects.[72]

> Mattheson: C major has a rude and insolent character, <u>but</u> will not be inappropriate for boisterous dancing...an able composer may <u>re-baptize</u> [the key] into something charming and sometimes even applied to tender moments.[73]

Similar inconsistency is found in their descriptions of G major and F major, and as shown in Figure 6, most instances of partial and non-matches occurred in these keys.

Theorist Correlation

Having determined that there is a strong likelihood Mozart was intentionally utilizing key characteristics throughout *Così fan tutte*, further research was required to determine if his compositional practice was informed by the writings of a particular theorist. The methodology for this analysis was similar to that used for matching each key to its purported affect: when assigning each closed-form number a mark of strong, partial, or non-match, I also noted which theorist's description correlated with the sentiment being expressed in both the libretto and the drama. I opted to count any theorist whose description seemed to correspond, rather than limiting each instance to only one "best" match, so several numbers were deemed as matches to multiple theorists. The results are shown below in Figures 7 and 8.

While a strong correlation to both an older and a contemporary theorist was puzzling at first, I realized after contemplating the data that this result makes sense when seventeenth-century theoretical practice is taken into account. Because theorists during that time were more intent on explaining and describing contemporary processes than prescribing new rules, the treatises of Schubart, Vogler, Kellner, and Ribock are likely an amalgamation of their own ideas on key characteristics (drawn in part from their teachers, who would have been educated in

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[71] Steblin, 109–10. Emphasis added.
[72] Steblin, 121. Emphasis added.
[73] Mattheson, 240–41. Emphasis added.

Matteson's day) as well as their observation of composers such as Mozart and Salieri. The observational side of this equation seems to hold particularly true for Schubart, whose admiration for Mozart has been well-documented and whose proto-Romantic ideas parallel Mozart's compositional trajectory.[74]

Thus Mozart likely influenced *and was influenced by* contemporary thought on the affective properties of keys. On the other hand, the matches to Matteson elucidate the starting point of the Germanic tradition of key characteristics to which Wolfgang was an heir through his teacher, Leopold Mozart.[75]

Conclusion and Outlook

The results of my analysis indicate that Mozart was consciously utilizing key characteristics throughout *Così fan tutte,* and that his views on the affective properties of each key were likely drawn from the Germanic tradition started by Matteson and later influenced by contemporary thought. Further research on the topic could continue to shed light on other murky details and might include investigation of the following questions:

1) Why is F major used so infrequently and why was it seldom a strong match to the affect of the scene?

2) Each finale includes extended sections in different keys; are each of these excursions meant to represent a particular affect, or are they merely temporary departures from the main key?

3) Could any numbers that were classified as partial or non-matches be understood as strong matches when looked at from a different perspective (authorial commentary, irony, etc.)?

4) In what instances are key characteristics superseded by other considerations?

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[74] Christian Friedrich Daniel Schubart, Preface to *Musicalische Rhapsodien: Drittes Heft* (Stuttgart: Buchdrukerei der Herzoglichen Hohen Carlsschule, 1786). Schubart references Mozart as a composer worthy of study and refers to him as "the shimmering one" (translation by author).

[75] Leopold Mozart, *Versuch einer gründlichen Violinschule* (Augsburg: Johann Jacob Lotter, 1756), 59.

5) Is there evidence that other operas by Mozart or his contemporaries were composed with conscientious detail to key characteristics?

Although this study could be considered beneficial on the merit of historical value alone, it also provides information that can be useful for a modern performer of Mozart's operas. Understanding his use of key characteristics can inform decisions related to the tuning and temperament used for a production and provide context for questions related to specific instrumentation (for example, is it advisable to follow the modern practice of substituting clarinet in A for the requested clarinet in B-natural in #25?). For vocalists, familiarity with a key's purported affect provides insight into the dramatic meaning of scenes and individual numbers, and could be used to inform decisions related to a character's emotional portrayal.

Figure 7. Matches by Theorist (Mattheson, Schubart, Kellner, Ribock, and Vogler).

	Strong	Partial	No Match
F minor	#5 (M, S)	—	—
C minor	#27 (S)	—	—
E-flat major	#6 (M, S) #11 (M) #21 (S)	—	—
B-flat major	#7 (S) #14 (S) #24 (S)	#28 (M, S)	#20
F major	#23 (M, K)	—	#8a #12
C major	#27 (S)	#3 (M) #30 (K) #31 (K)	#13
G major	#15 (M)	#1 (M, S, V) #16 (M, S, V) #19 (M) #26 (M)	—
D major	#8 (M, S, V) #9 (M, S, V) #22 (K)	#18 (M, S, V)	—
A major	#4 (S, R, V) #29 (S, R, V)	#17 (S, V)	—
E major	#2 (V) #10 (M) #25 (V)	—	—

Figure 8. Total Number of Matches.

Number of Matches (Strong and Partial)

Mattheson, Schubart, Vogler, Kellner, Ribock
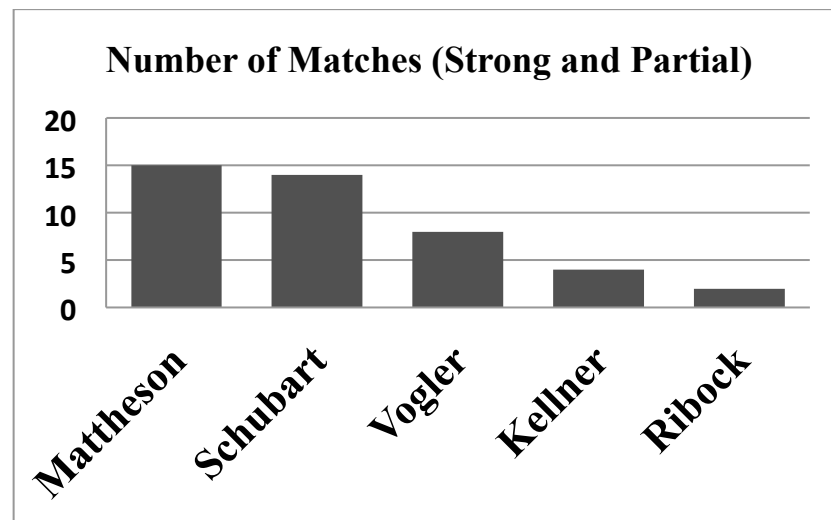
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Luigi Ceccarelli's *Cadenza*: An Analytical Étude

MARK VAUGHN

Originally called *musique concrète*, acousmatic music is music that is intended to be played solely through speakers with no human performer. Since its inception, the issue of how to interpret this music has been frequently debated.[76] The analyst must consider how one analyzes music that usually lacks a score, often treats timbre as the primary structural element, and has no performer.[77] Similarly, the audience member who is accustomed to the classical concert hall must develop an interpretive framework for music that often de-emphasizes rhythmic and pitch relationships in favor of timbral and spatial elements, has no performer, and is played through speakers in a dark concert hall.

Throughout its development, tools for analyzing and describing acousmatic music have been developed by theorist/composers such as Pierre Schaeffer and Denis Smalley. These tools deeply influence how acousmatic music is understood by its practitioners and devotees.[78] Denis Smalley's concepts are particularly useful for listeners initially approaching acousmatic music. In his article "Spectromorphology: Explaining Sound Shapes," Smalley puts forth a method for describing, analyzing, and thinking critically about the materials of electronic music. In this article, he examines certain mechanisms of how listeners perceive sound. One of these mechanisms he terms "source bonding," which he defines as "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."[79] Smalley explains that sound is indicative of motion and therefore energy, describing gesture as "an *energy-motion trajectory* which excites the sounding body, creating spectromorphological life."[80]

In essence, Smalley's concept of source bonding is that listeners perceive certain sounds as caused by *something* in the absence of visual stimuli, which in turn leads us to theorize about the

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[76] Simon Atkinson, "Interpretation and Musical Signification in Acousmatic Listening," *Organised Sound* 12*,* no. 2 (2007): 113.

[2] Marco Stroppa, "The Analysis of Electronic Music," *Contemporary Music Review* 1, no. 1 (1984): 177.

[78] Natasha Barrett, "Spatio-Musical Composition Strategies," *Organised Sound* 7, no. 3 (2002): 314.

[79] Denis Smalley. "Spectromorphology: Explaining Sound-Shapes," *Organised Sound* 2, no. 2 (1997): 110.

[80] Smalley, "Spectromorphology," 111.

source of the sound. When we hear a sound, we infer that something has moved in a way that has produced the sound even if we cannot see what it is.[81] Elements such as similarity of timbre, density of sound, and spatial placement are all cues that allow us to hypothesize about the cause of a sound in the absence of visual stimuli and to group sounds together. Smalley explains that the mechanism of source bonding is a key component of how sound is perceived and is also an important component of how we experience electronic music.[82]

Source bonding can allow any listener to begin analyzing the materials of electronic music and creating imaginative explanations for what they might mean. Though Smalley's writings were in many ways intended to provide grounds for increased engagement and understanding, the

numerous articles and papers that discuss how engagement with this music can be better facilitated are evidence of the continued gulf between the world of concert electronic music and those outside this world.[83]

Complicating Factors

Though the analysis of acousmatic music presents unique challenges, analysis in general is daunting. In the article "How We Got Out of Analysis and How to Get Back in Again," Kofi Agawu, speaking specifically about acoustic classical music, engages a musicological debate centered around Joseph Kerman's article, "How We Got Into Analysis, And How to Get Out."[84] In this article, Agawu critiques Kerman's proposition that analysis should be "[mediated by] history, aesthetics, and . . . criticism."[85] Agawu instead argues that analysis should be concerned primarily with the materials provided by the music itself.[86] He cites Theodor Adorno's thoughts on analysis, claiming that the purpose of analysis is to come into contact with the "truth content" of the work.[87]

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[81] Smalley, 110.

[82] Smalley, 110.

[83] See Curtis Bahn, Tomie Hahn, and Dan Trueman, "Physicality and Feedback: A Focus on the Body in the Performance of Electronic Music," *Proceedings of the International Computer Music Conference*, (2001): 44, and Kim Cascone, "Grain, Sequence, System: Three Levels of Reception in the Performance of Laptop Music," *Contemporary Music Review* 22, no. 4 (2003): 101.

[84] Kofi Agawu, "How We Got Out of Analysis, and How to Get Back In Again," *Music Analysis* 23, no. 2-3 (2004): 267-70.

[85] Agawu, 269.

[86] Agawu, 269-70.

[87] Agawu, 267.

Agawu's conception of analysis is that it is an activity that should draw us nearer to the true meaning of the work despite the fact that this meaning is "not . . . a concrete presence that can be beheld but . . . a constantly receding target that becomes more elusive the closer one gets to it."[88] He also calls the truth content the "surplus," what I take to mean as the singularity and uniqueness of the work and the inspiration that the work facilitates in its interpreters and listeners, essentially that which is left over when all else has been accounted for.[89] Agawu states that:

> The truth content is not necessarily a literal, empirical truth but rather a dynamic, motivating truth designed partly to anchor listening in specific sociocultural and historical moments even while – and this is the paradox of it – releasing the analyst from the dubious responsibility of having to establish the authenticity of the analysis.[90]

Agawu goes on to speak of analysis as both performance and composition, explaining that analysis is an imaginative endeavor that engages creatively with the materials of the piece itself and presents potential interpretations and ways of hearing that are unique to the piece.[91] Agawu's discussion illustrates the complexity of musical interpretation in any context, but he makes clear that the purpose of analysis is in some way, to understand.

My approach in this paper is to equate listening with interpretation, interpretation with analysis, and analysis with an attempt to understand the truth content or meaning of the work. Every listener is an interpreter and therefore analyzes music. I use Agawu's conception of analysis as composition or performance as a prompt for what I call an "analytical étude" of Luigi Ceccarelli's electronic composition, *Cadenza*. I use the term "étude" because I view this paper as a study of both how to analyze acousmatic music and an observation of how the process of analysis takes place. I find the term étude particularly appropriate because of the creative, non-authoritative approach that I wish to take. In the same way that a musical étude can teach an objective musical skill while incorporating imaginative presentations and interpretations, so do I want this analysis to deal with the objective facts of the composition while incorporating the imaginative and the subjective.

In order to accomplish this goal, this "étude" incorporates multiple interpretive approaches, including empirical, comparative,

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[88] Agawu, 272-73.
[89] Agawu, 272.
[90] Agawu, 273.
[91] Agawu, 274-79.

and imaginative lenses of interpretation. I use the writings of Agawu and Smalley throughout as a foundation for inquiry and description. It is important to note that my analytical reading is meant to be consulted and critiqued in conjunction with the piece itself (*Cadenza* is freely available for listening online.)[92] I invite listeners to explore their own interpretations. The ultimate purpose of this study is to help the new listener of acousmatic music imaginatively engage with both *Cadenza* and other acousmatic works by demonstrating how a variety of perspectives can allow for a deeper understanding of acousmatic music.

Cadenza: An Overview

Written in 2010 by the Italian composer Luigi Ceccarelli, *Cadenza* was dedicated to the Belgian electroacoustic composer Annette Van de Gorne in honor of her birthday.[93] The composition, which was written for 5.1-channel surround sound (analyzed here in stereo), utilizes as its primary sound material audio from two separate performances, one by the contrabassist Daniel Roccato and the other from the violinist Diego Conti.[94] Ceccarelli has frequently performed with Roccato in an improvisational duo consisting of electronics and contrabass.[95] Ceccarelli stated that his intentions for *Cadenza* were

> to create the impression of a complex hybrid man-machine that would enhance the virtuosic performance beyond merely human capacities by means of an extreme emphasis on gestures, amplified by a mechanical/digital machine and expanded into space in all of its teeming details.[96]

When initially confronting the unfamiliar materials of electronic music, interpretation usually begins with comparison to the familiar. The composer Natasha Barrett described this process: "When neither source nor causality are clearly recognizable, we find ways to place the sound into the context of our knowledge of the world."[97] The inspiration for *Cadenza* clearly has its roots in the world of classical music practice. Ceccarelli's citation of "the virtuosic performance," the improvisatory relationship between Ceccarelli and Roccato, and the title of the work all imply that the

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[92] Luigi Ceccarelli, "Cadenza," *SoundCloud.com*, n.d., Sound Recording, https://soundcloud.com/luigi-ceccarelli/cadenza (1).

[93] Luigi Ceccarelli, "Cadenza," *EdisonStudio*, Edison Studio, (n.d.): 1, http://www.edisonstudio.it/en/portfolio-items/cadenza/ (2).

[94] Ceccarelli, "Cadenza" (2), 1.

[95] Luigi Ceccarelli. "X-Traces," *EdisonStudio*, Edison Studio, (n.d.): 1, http://www.edisonstudio.it/en/portfolio-items/x-traces/

[96] Ceccarelli, "Cadenza" (2), 1.

[97] Barrett, 314.

genre of the concerto influenced Ceccarelli in the creation of this work. Comparing the electronic medium of the piece and classical music practice provides an initial area of exploration for the listener.

From a general perspective, one of the primary structural processes of *Cadenza* is a movement from non-pitched percussive materials to pitch-based percussive materials. Specifically, the trajectory of *Cadenza* can be observed as a gradual combination of two sonic phenomena, noise and resonance. Noise is sound that is broadly distributed across the frequency spectrum with no particular emphasis, such as static on a TV. Conversely, resonance is the cancellation and emphasis of certain frequencies within the frequency spectrum based on the shape, size, and acoustic reflective properties of a sounding body.[98] When resonance is narrow and regular enough it will result in pitch (e.g. a blown bottle). The particular way that noise is shaped and organized by a sounding body through processes of sonic reflection and interference is what creates the instrumental timbre of a trumpet, a violin, or a guitar (See Example 1).[99]

Example 1. Spectrograms of the first and last sounds of *Cadenza.*
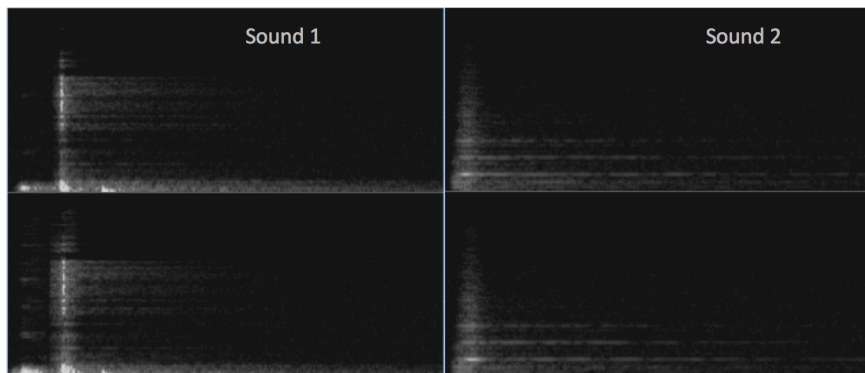
The first sound's amplitude is distributed broadly across the frequency spectrum, whereas the last sound shows a more constricted and regular pattern of distribution. The lines display the harmonic series, illustrating the pitched nature of the sound. The noise that remains, in conjunction with the pitch, produces the timbre of the sound.

Accompanying the integration of noise and resonance throughout the piece is what I choose to call a movement from "electronic" timbres to "instrumental" timbres. Electronic timbres are here used to describe sounds that are not easily related to or described by common instrumental sounds. Instrumental timbres are those that can be classified according to outside instrumental

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[98] Jeffrey Hass, *An Acoustics Primer* (Indiana University: Center for Electronic and Computer Music, 2003) chap. 9, accessed October 25, 2016, http://www.indiana.edu/~emusic/acoustics/resonance.htm.
[99] Hass, 9.

reference, such as "string sounds," "snare drum sound," etc. The quotations denote the inadequacy of these designations, given that acoustic instruments initially produced the sonic material, which was then recorded by electronics, processed electronically, and in performance is produced by electronics. Nevertheless, these designations provide a practical way of categorizing events within the piece. The dual processes of integrating noise and gradually replacing electronic timbres with instrumental timbres are useful methods for observing the formal structure of *Cadenza.*

Cadenza: **Part One**

The overall form of *Cadenza* can be divided into three major sections (Example 2). Within the first section, I have identified two subsections and two interludes (Example 3). The first subsection is comprised of primarily percussive, noise-based material and is followed by an interlude of sustained reverberant material. This interlude presents a clear example of resonance that contrasts with the preceding noise-based material. In the second sub-section a crescendo of dynamic interplay between the percussive and resonant materials occurs before a final interlude of resonant material concludes the first section.

The arrangement of materials in this section can be seen as expository. Examples of noise-based and resonant material are presented as separate and isolated, plainly setting forth the materials that will be developed as the piece progresses. There are sounds within this section that are pitched, but I hear them as structurally unimportant at this point in the piece, considering they do not occupy the foreground and they have no apparent pitch organization. The pitched elements appear to be secondary to the elements of rhythm, timbre, and especially texture.

In regards to texture, Smalley's previously mentioned concept of "source bonding" provides a valuable method for investigating *Cadenza*. When we theorize about the source of a sound, one potential, *imagined* explanation is that the sound has been intentionally caused by an unseen actor, agent, or instrumentalist. Thinking of sounds as actions by an instrumentalist allows for descriptions of texture common to acoustic practice. These concepts of texture (polyphony, homophony, etc.) are excellent constructs for exploring common elements in electronic music, such as the use of space and the structural use of timbre.

Example 2. Annotated waveform of the overall form of *Cadenza*.
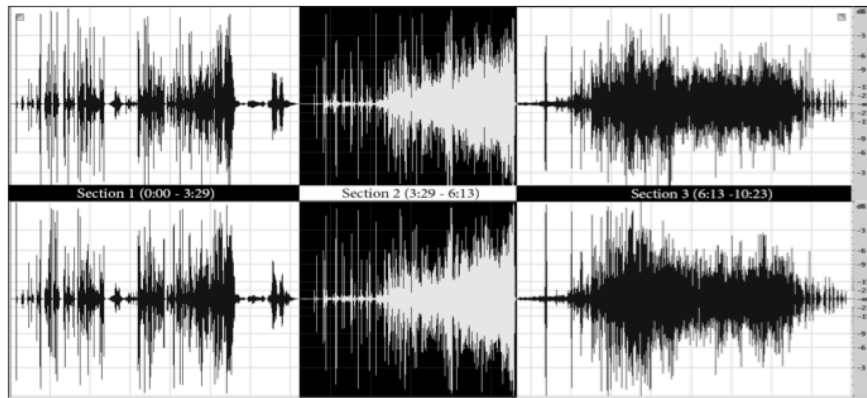
A representation of Cadenza's *waveform (amplitude/time) divided into the three major sections with the time of each section given in minutes and seconds. The gaps in time indications are silences.*

Example 3. Annotated waveform of *Cadenza's* first section.
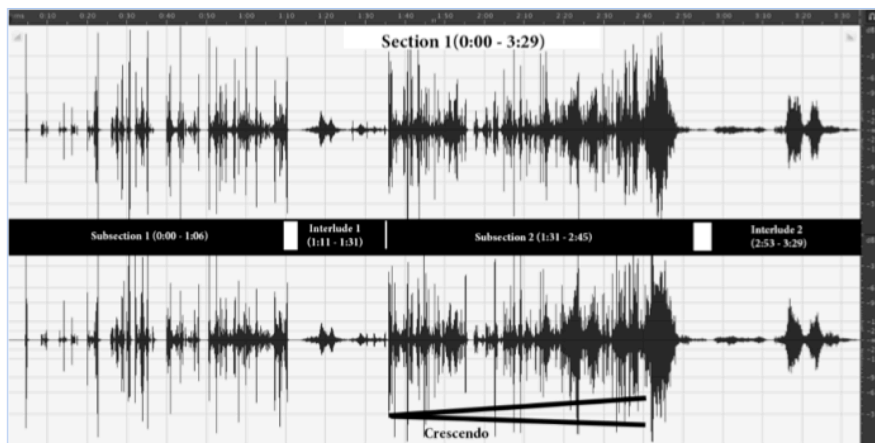
The contrast between the reverberant materials of interludes 1 and 2 and the more percussive material of subsections 1 and 2 are illustrated.

In the first subsection of the first section of *Cadenza*, the material could be described as monophonic, i.e. implying a single actor or agent. The sound in this section is distributed fairly widely in space and is timbrally varied which could imply multiple actors, but the low density of attack points leads me to interpret the sounds as the actions of one invisible agent. However, the sustained resonant material that follows implies something other than merely movement; the reverberant qualities denote a new space into which the sonic material has entered. In this interlude, the skittering sounds could be described as intentional sounds caused by an invisible agent or could be compared to the melody in homophonic texture, in this case sounding against the accompaniment of a resonant space.

In the second subsection, the skittering sounds of the first interlude interact with the noise-based elements of the first subsection to create a two-voice polyphonic texture. This texture includes brief interactions with the resonant material of the first interlude. These postulations demonstrate how concepts of texture can be used to interpret spatial elements, sound types, and the implied movement evoked by a sound from an invisible source.

Cadenza: Part Two

The second major section of the work (Example 4) consists of a large crescendo, observable as an expanded version of the crescendo found in the first section. It begins with a noise-based rubbing sustained sound that could represent a transformation of the sustained resonance of the earlier section into sustained noise-based material. The percussive interjections that continue from the first section are accompanied by increased reverberation. Resonance and noise are now more integrated. In contrast to the disconnected presentation of the first subsection and interlude, the noise-based material is now the excitation source for the reverberation or resonance. At 4:51, a low electric guitar-type sound heralds the addition of more pitched percussive sounds and resonance increases further. At 5:26, a squealing sound, itself clearly pitched, announces the arrival of the most explicitly pitched and instrumental sounds heard thus far.

Example 4. Annotated waveform of *Cadenza's* second section.
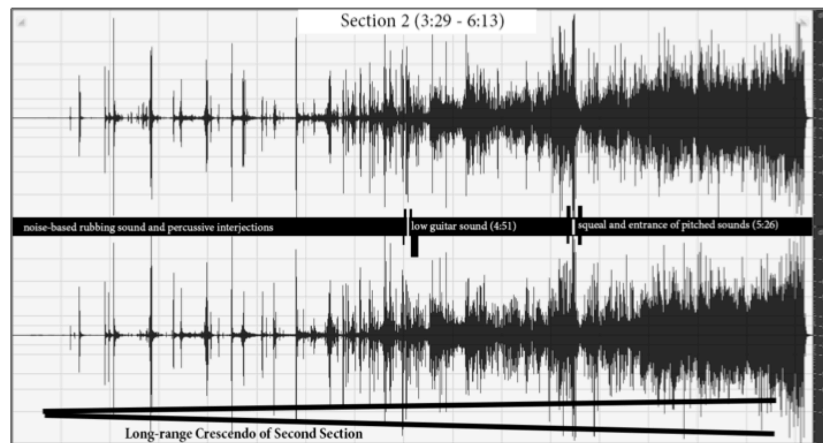
The percussive sounds of the first section are gradually combined with the reverberant material that was presented as separate in the first section. Clearly pitched sounds occupy the foreground at the climax of this section.

Until this point, most of the sounds heard have not clearly emulated any conventional instrumental sounds, but as pitch becomes more pronounced in the second section, so do instrumental timbres. Additionally, the pitched sounds introduced by the squeal
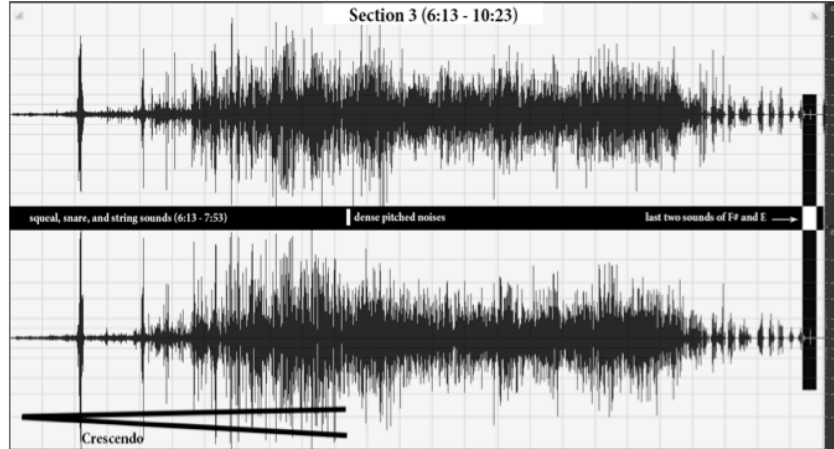
are the most reminiscent of the source material of violin and double bass, having a pronounced string-like timbre. The squeal is also accompanied by a percussive sound that evokes the sound of a snare drum. The starkness of pitch in the squealing glissando, the interjection of drum sounds, and the addition of pitched string sounds, all of which occur at the climax of a nearly three-minute crescendo combine to signify an important structural moment in the progress of the piece. The initial sonic material has yielded to or been transformed into instrumental timbres and the elements of noise and resonance have been brought into closer proximity, ultimately presented as unified in the first structurally important pitched sounds.

In regards to texture, the continuous friction that begins the second section could be perceived as the accompaniment in a homophonic texture that then builds to a dense polyphony. The percussive interjections against the friction sound can be heard as either the melody or the actions of a separate instrumentalist/agent. As it proceeds, the texture gradually incorporates multiple pitches and timbres spread throughout stereo space, giving the impression of multiple agents or instrumentalists being added. At the climax of this section, the combination of the separate sounds of the squeal, the snare drum interjections, and the frenetic string sounds all imply multiple agents due to the disparity of timbre, the spatial placement, and the sheer density of sonic material. The texture can be heard as intensely polyphonic, but the squeal clearly occupies the foreground, which could be perceived as the soloist in a concerto.

Cadenza: Part Three

The third and last section (Example 5) presents the culmination of the integration of noise and resonance. Where previously resonance and noise provided the polar extremes in the timbral palette, now pitch has replaced resonance in opposition to noise. Up to this point, pitch has been presented as free-floating in the unstable form of the squeal and noise has been consolidated into the form of the snare drum sound. The form of the third section can be seen as the gradual combination of these sounds. It is the pitched, percussive string-sounds first announced by the squeal of the second section that ultimately bring the disparate elements of noise, resonance, rhythm, timbre, and pitch into cohesion.

Example 5. Annotated waveform of *Cadenza*'s final section.

Section 3 (6:13 - 10:23)

squeal, snare, and string sounds (6:13 - 7:53)   dense pitched noises   last two sounds of F# and E →

Crescendo

The familiar crescendo of percussive sounds building to more organized material is illustrated here. The final establishment of pitched noises as the dominant timbre progresses from the end of this crescendo to the final two pitches.

Formally, the section begins with a crescendo that can be seen as related to those found in the first two sections, but one that avoids the abrupt drop to silence found in the previous two sections. The crescendo of the third section instead builds to a preponderance of pitched percussive sounds and ultimately the establishment of a tonal center, E, in the string-sounds. This tonal center is established through the frequent repetition of E and the use of notes including F-sharp, G, and A.

As the section progresses, all remaining noise-based sounds are gradually removed, the range of activity across the frequency spectrum is gradually constricted to normal instrumental ranges, and the sonic material displays an integration of resonance and noise, a unification realized in the form of instrumental timbre. The piece as a whole gradually loses energy as all noises other than the string sounds disappear and the density of sounds subsides before ending on a final two-note cadential gesture (F-sharp to E). There are several interesting elements to note concerning the textural development of the final section. Following the abrupt drop to silence of the second section the squeal's role is inverted. Where the squeal previously performed a melodic role, the drum and string-sounds now do so. The squeal, sounding in the distance, serves as the accompaniment to phrases iterated by the string and snare-sounds. This arrangement of sounds illustrates how spatial placement can contribute to the interpretation of a sound's role in an acousmatic work. The string-sounds, in conjunction with the snare-sounds, are ambiguous between the impression of a single agent or two agents interacting against the accompaniment of the squeal. This section could be described as either a homophonic texture or a tow-voice polyphonic texture.

In a similar fashion to the second section, the textural process in this section develops roughly from homophony to polyphony. The final establishment of pitch coincides with full-scale polyphony and the impression of an "orchestra" of agents. By the end of the piece the gestures gradually thin, incorporating more silence but continuing the impression of polyphony. The final F-sharp is a minor seventh below the E and is slightly displaced in the stereo field, which to my ear gives even the final cadence the impression of being performed by not one, but two instrumentalists.

This analysis/interpretation demonstrates how analyzing timbre by tracking the relationship between noise and resonance and observing the connections between traditional concepts of texture, spatial elements, implications of agency, and sonic density are both useful methods for interpreting/analyzing *Cadenza*. These processes are not only applicable to this piece, but also to a variety of other acousmatic works. With these approaches any listener can begin to think critically about and interpret acousmatic music.

The Interpretive Approach

Because of the lack of a score and performer, acousmatic music invites the subjective into the listening experience more so than acoustic classical music. Smalley's discussions of source bonding and attribution of agency are in some ways objective descriptions of how one hears, but there is an imaginative element to this mechanism as well. Smalley says "the wide-open sonic world of electroacoustic music encourages imaginative and imagined extrinsic connections because of the variety and ambiguity of its materials. . .," and furthermore that "source bondings may be actual or imagined . . . they can be constructs created by the listener."[100]

This analysis of *Cadenza* is meant to offer *some* interpretive mechanisms for understanding elements found throughout acousmatic music, but another aim is to invite the imaginative and subjective into the analytical process and to encourage listeners of acousmatic music to form their own interpretations. Each listener, as a perceiver of music creates his or her own interpretation and is therefore engaged in the process of analysis. Incorporating diverse perspectives, analogies, and constructs into the dialogue around any music can only broaden and deepen one's comprehension of it.

Does this mean that anything goes and all interpretations are equally valid and informative? No. If an audience member says that an acousmatic piece sounds like nothing but random bleeps and bloops and another describes a complex process of timbral, spatial, and pitch transformations that enriches the hearing of the piece for

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[100] Smalley, 110.

many listeners, it is obvious that one interpretation is both more informative and useful than the other.

Returning to Adorno and Agawu's "truth content," it seems clear that an interpretation is valid if it allows for a deeper understanding of the piece. By postulating multiple agents at work throughout *Cadenza*, my analysis contradicts Ceccarelli's stated intentions for the work, when he describes his desire to create a "(singular) complex hybrid man-machine…" Does this mean that my interpretation is wrong because I do not hear the piece as the product of one invisible agent, but many? If mine is right, does it mean Ceccarelli's is wrong?

Agawu states in his article that "the analyst must not be distracted by questions of intentionality, as when sceptics wonder whether the composer was conscious of relationships unearthed by the analyst."[101] Roland Barthes famously proclaimed the "death of the author," stating that the meaning of a piece of literature is not an objective truth held by the author that readers seek to uncover, but exists in the interpretation of the reader.[102] Both of these views support the argument that the meaning of a piece is situated within the mind of the listener and the relationships they can discover.

Though Ceccarelli states in his notes on the piece that he wished *Cadenza* to be perceived as the actions of one agent and my interpretation suggests multiple agents, each proposed interpretation is simply a potential way of exploring the piece. The subjective elements of my analysis are meant to adhere to Agawu's thoughts when he says, "Imaginatively composed explanatory props provide access to a work's truth content"[103] When a listener states a perspective on how the piece should be interpreted, its validity should be judged by how it enriches the listening of the piece.

Does this mean then that all interpretations are equally valid provided they mean something to somebody? In some ways, yes. This may present problems for an approach to analysis that prescribes a certain rigor, but just as there are pieces of music that are more complex, subtle, and difficult, so should there be analyses that are geared towards listeners of various levels of expertise. If analysis is akin to composition and performance, then as there are works of various difficulties, there should also be analyses of similar complexities.

This does not mean that each listener should simply choose

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[101] Agawu, 272.
[102] Roland Barthes, "The Death of the Author," in *Image/Music/Text*, trans. Stephen Heath (New York: Hill and Wang, 1977), 147.
[103] Agawu, 279.

the interpretation that is the most appealing to him or her. Regardless of the complexity, it is important for an interpretation to engage substantively with the work. To have a variety of analyses and interpretations provides the ground for dialectic between various listeners and interpreters. If my analysis is entirely contrary to the impressions of another listener, it is up to that listener to provide an interpretation that is equally or more explanatory. This is how various analyses can gradually grow towards the "truth content."

The intention of this study and its approach is to provide a study that lives up to Agawu's description when he writes: "a good analysis leads you back to the composition; you re-enter that world, reconsider its making, and resume the process of exploration."[104] Disregarding a given perspective or method of interpretation can limit our understanding of music. Incorporating imaginative explanations such as the practices of other mediums, comparison to instrumentalists, invisible characters, and imagined spaces are all valuable descriptors and classifiers for getting closer to what a piece is about. Though we cannot ever fully reach the "truth content," we can draw closer through these "explanatory props."[105] Allowing imaginative and interpretive freedom, not just in regards to acousmatic music but to all music as a whole, is vital to deepening our comprehension of music.

It is in this spirit that this analysis serves as an "étude," or an artistic/intellectual exercise for developing a new skill, in this case the analysis of acousmatic music. The analysis here incorporates imaginative and creative elements that are not objective facts about how the piece unfolds. They are combined with objective observations to demonstrate how both the objective and subjective are valuable and viable modes for producing an analysis of not only acousmatic music, but all music.

Conclusion

This analysis has incorporated empirical, imaginative, and interpretive approaches in order to understand both *Cadenza* and elements of acousmatic practice as a whole. The purpose of this approach has been to seek insight into the work and what it can teach us about how to listen to and interpret both itself and other works. I have proposed certain models, including attention to the use of noise and resonance, the postulation of imaginary agents, and comparison to other musical practices as methods for interpreting, analyzing, and listening to electronic music. These models will not hold for all works contained within the expansive medium of

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[104] Agawu, 275.
[105] Agawu, 279.

electronic music, but they do provide starting points for a new listener to engage with acousmatic music. The sonic phenomena discussed can be easily identified by most listeners and evaluated critically, allowing a listener to take an active and imaginative role in the listening process.

The ultimate point is that all music requires active participation on the part of the listener. Acousmatic music, lacking the traditional mediation of a performer's interpretation, a musical score, and identifiable pitch structures and rhythms may require the listener to fill in further blanks, but the effort required is highly rewarding. The uniqueness of any work is the particular avenue that it opens for our imagination to roam. Music does not prescribe how we are supposed to think or allow only one interpretation or experience. Electronic music or any unfamiliar music may ask more questions of a listener, but considering the answers is part of the pleasure. With this in mind, I have offered an analysis that proposes one potential set of answers to the questions posed by *Cadenza*. In Agawu's view, analysis "would go on always and forever."[106] This analysis is but one in a number of potential interpretations, interpretations situated in individual listeners that are thus as infinite as the imaginative faculties themselves.

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[106] Agawu, 270.

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