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**Barbara Barry**  
Lynn University, Florida  
babar42@hotmail.com

***BLACK SWANS AND MANY WORLDS:***  
**CONTEMPORARY MODELS IN MUSIC, THE ARTS AND IDEAS**

**Abstract:** *Black Swans* and *Many Worlds* are new models to help explain musical structures, and by extension, events in the social environment and in internal human experience. *Many Worlds* takes its departure point from quantum physics, and especially the work of Hugh Everett III, who used the defining point of a measurement in the sub-atomic world as initiating alternative courses of action. Everett extrapolated this idea to the macro-world: a defining point may initiate multiple outcomes, each with its own character and events, as parallel worlds. One application of this model is to consider musical works within a genre as *Many Worlds*. *Black Swans* derive from Nassim Taleb, who proposes that social, political, and in fact all aspects of today's world are not understandable by logical processes or incremental change but are often rocked by extreme, unpredictable shocks. If *Many Worlds* provide new ways of thinking about potentiality, probability and innovation, *Black Swans* arrest us in our tracks by eruptions that threaten to derail contemporary life, and with it, music, the arts and ideas.

**Key words:** models, musical structure, Quantum mechanics, Psychology

“We have seen that the brain is a creativity machine. It searches for patterns amid chaos and ambiguity and it constructs models of the complex reality around us. This search for order and pattern is at the heart of the artistic and scientific enterprise alike.” (Kandel 2012).

In *The Road to Reality*, Roger Penrose raised the need for scientific theory to forge powerful directions for the twenty-first century if it was going to reveal significant new discoveries of comparable import to those of the twentieth century (Penrose 2005). Since contemporary ideas differ substantially

from those of the past, they need innovative approaches to develop new theories. Such new approaches in turn provoke different questions; and in the attempt to answer them, reveal striking perspectives on events and existential contexts.

The value of new theories is not that they make truth claims, although after a time they tend to become ingrained in the intellectual landscape. Rather, they offer challenging ways to rethink existing premises of how the world works. David Passig notes that while convincing scientific theory, in Karl Popper's view, most closely corresponds to facts, theory is not in itself truth but an explanatory scenario: "We need to remember, however, that scientific paradigms are useful in offering us mental patterns, not eternal truths" (Passig 2013: 145). Those mental patterns are subject to both external influences involving changing social and cultural paradigms, and an internal evaluation of problem-solving. Developing new theoretical and philosophical approaches can be achieved by adapting a model from a different intellectual sphere, which often yields surprising directions and insights. Isaiah Berlin, reflecting on the agenda of philosophy, sees modeling as a central method of establishing intellectual identity, as it provides a framework within terms explanation can take place and advances in conceptual constructs achieved (Berlin 1966/7).

One aspect of the contemporary intellectual landscape is the coexistence of theories that propose descriptions of reality from radically contrasted points of view. In physics, as an example, concurrent with classical descriptions of time and space that provide identifiable co-ordinates for structures in the physical world, are competing narratives in quantum theory that describe highly unpredictable behavior at the micro level of existence, in the indeterminate behavior of sub-atomic particles. As the prevailing conceptual model, a seemingly random substructure underpins patterns of existence.

There are some surprising, albeit logical consequences of quantum theory for contemporary existence, and by extension, for musical works. One is the parallel between the unpredictable "underworld" of quantum existence and the unstable "overland" climate of the postmodernist world, dislocated by terror attacks, economic collapse and natural disasters. With unpredictability

and chaos prevalent in so many areas of life, and “real” and fictive dimensions blurred by advertising images and computer graphics in a hologram of unstable identities, it is not surprising that perception of contemporary reality is often closer to the random quantum world than to any set of known co-ordinates. In times of personal anxiety or social disruption, even when forefronted by what Philip Roth has called “the unstable illusion of stability” (2002: 128), the randomness of underlying existence becomes effectively the model for lived existence. As part of the multiplicity of contemporary identities, art works, past and present, nevertheless propose modes of experience different from everyday reality, even when they are in part referential to existential human dilemmas; and through innate structures and the working-through of dramatic designs, can be construed as alternative worlds. Art works, and especially musical works, as self-standing entities in parallel worlds with their own rules of engagement will be referred to as “Escher worlds”.

Penrose proposes that reality can be described as conceptual worlds from three perspectives: mathematical, physical and mental. While each approach is autonomous in material and perceptual modality, it may nevertheless have connections to the others in terms of imagery and/or conceptual values. At a further level of connection, though, a construct in one of these conceptual perspectives can provide a model for another, so that imagery in one world becomes the basis for a reconfigured metaphor in another area of discourse. As instance, Gluck and Calzabigi crafted their classicizing agenda for opera in the 1760s and 1770s by adopting the terminology of “moving architecture” to musico-dramatic realizations of the noble and statuesque. The plasticity of ideally represented human forms in classical sculpture and the harmonious proportions of architecture are reinterpreted in the opening instrumental music in Act 2 scene 1 of *Orfeo ed Euridice*, conveying the serenity of the Elysian Fields through rounded melodic contour and symmetrical phrasing.

Classicizing agenda aside, Greek sculpture was not just the idealization of human beauty as a Platonic Form: those same heroic human forms could equally be contorted by rage and vengeance. The intense twisting movement of *Laocoön and his Sons* in the Vatican Museum has a ferocious immediacy as the father and his two sons are strangled by writhing snakes in retribution

by Poseidon for revealing the trick of the Trojan horse.<sup>1</sup> This dark underbelly of violence in the ancient world, with its blood feuds and vengeance, has its counterpart in the following scene of the opera that takes Orfeo to the gates of hell and confrontation with the aggressive Eumenides, who are the vengeful Furies from the *Oresteia*. In *The Birth of Tragedy from the Spirit of Music* Friedrich Nietzsche (1999) identifies this incipient violence that threatens to derail human action in his modeling *à l'antique*. Reinterpreting the opposed imagery of Apollo, the god of reason, and Dionysos, the god of inebriation and unbounded sexuality, Nietzsche depicts drama as polarized emotional conflict, locked between the intense striving for love and the downward pull towards death – in Freud's terms, between Eros and Thanatos. Nietzsche envisaged this experiential conflict as the powerful tension between the background's Will-driven surging energy field that threatens to engulf "left-brain" activity like logical action and decision-making, and the Apollonian constraint of foreground structure through words and motifs that make drama – and music-drama – possible.

At the interface of Penrose's mathematical and mental worlds, the present musical model, in reinterpreting musical structures and journeys, draws on two aspects from theoretical physics. The first of these construes musical background as predicated on the quantum world, with its apparently random behavior of subatomic particles – a background of indeterminate behavior and random actions that nevertheless underlies the foreground of physical existence. Such a highly digressive background underpinning ordered foreground structures may, on the face of it, be counter-intuitive, but on further reflection helps explain many areas of human, and musical, behavior. In many respects, the contemporary musical world – discontinuous, multifaceted and simultaneous – is a quantum world, characterized by unpredictable courses of action, leaps across time-zones, and micro elements scattered through the stratosphere of time and space. The model of primal background energy that continually strives to push through and dislocate foreground order reverses Schenker's normative description for tonal repertory of a law-like underlying harmonic /

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<sup>1</sup> See at: <http://www.rationality.net/images/LaocoonGroupfinal.jpg>.

linear *Ur*-structure that supports digressive foreground events ‘composed out’ at the musical surface. In Nietzsche’s terms, Schenker’s background structure is Apollonian, whereas the random background energy field in the present model is Dionysian. Its disruptive potential is held in check by foreground structure, but at stress points those constraints can, and do, rupture.

If Penrose is right that a referential framework can be identified in different disciplines as a shared climate of discourse, then the idea of a potentially unstable equilibrium between disruptive background forces and foreground constraint is present in, but not limited to, mathematical and musical worlds. It is the political *modus vivendi* in conflicted societies struggling against oppressive Islamic extremism and can also be discerned in unpredictable economic forces where seemingly irrational movements cause both the rise and fall of market sectors in the globally linked world. But, as well as these external manifestations of background Dionysian force-fields which have the potential to disrupt normative procedures, the model has striking parallels with the structure of the mind. Beneath the neo-cortex’s rational faculties of order, reflection and decision-making are the disruptive drives of the old crocodile brain. In everyday social relationships, the conscious mind imposes essential constraints on the primitive brain’s libidinous desires; but, unfulfilled and often unvoiced, those repressed desires seek outlets in fantasy, dreams and art. Despite the mind’s distinctive arenas of action, these mental *dramatis personae* are not completely immured from one another. At the interface of consciousness, which Freud, in *The Interpretation of Dreams*, compares the portal of the mind to the archeology of a buried city (Freud 1950), suppressed emotions from the subconscious cross those fuzzy boundaries, allowing the psychic substratum to emerge into conscious existence.

The second aspect of modeling from quantum physics is another kind of intersection, the tunnel-like connectors between space-time zones known as “wormholes”. In particle physics they are infinitely brief links between domains, and on account of the extremely difficult conditions needed to create and, even more, sustain them, they primarily inhabit the realm of theoretical calculations. Rather than limited to largely hypothetical possibilities in the actual world, though, “wormholes” have become actual connectors in

hypothetical worlds – in pop culture’s fantasy fiction and sci-fi movies, where “wormholes” are effective short-cuts between remote cosmic zones, like the jump into hyper-space to avoid enemy pursuit in the *Star Wars* movies or that ultimate inter-terrestrial hip-hop *The Hitchhiker’s Guide to the Galaxy*. In this lighter vein, physicist Alex Vilenkin calls “wormholes” “shortcut tunnels though space-time for intergalactic travel” (Vilenkin 2006: 192). “Wormholes” are passageways between otherwise discrete realms of time, space and the imagination that have become permeable, like the back of the wardrobe that leads into Narnia in *The Lion, the Witch and the Wardrobe*. But they are not just connectors in the external world, real or fantasy, to the remote past or distant space: they are equally the means of recourse to other worlds of inner experience, in the seamless crossover to the past in dreams and memories, interspersed with fragmentary consciousness of the present. Proust’s recreation of internal imagery as part of the multiple existences of individual human existence and the porous boundaries between them stems from the evocation of such shifting layers of consciousness.

“I would fall asleep again, and thereafter would reawaken for short snatches only, just long enough to hear the regular creaking of the wainscot, or to open my eyes to stare at the shifting kaleidoscope of the darkness, the sleep which lay heavy upon the furniture, the room, that whole of which I formed no more than a small part and whose insensibility I should very soon return to share.” (Proust 2003: 2–3).

The famous description of the madeleine, the cake moistened by lime-tea, is precisely such a connector between the present and the past, opening up a whole inner world buried under years of oblivion which now springs to the surface of consciousness with vivid immediacy.

“And suddenly the memory revealed itself. The taste was that of the little piece of madeleine which on Sunday mornings at Combray (because on those mornings I did not go out before mass), when I went to say good morning to her in her bedroom, my aunt Léonie used to give me, dipping it first in her own cup of tea or tisane....And as soon as I had recognized the taste of the piece of madeleine soaked in her decoction of lime-blossom which my aunt used to

give me, immediately the old grey house upon the street, where her room was, rose up like a stage set to attach itself to the little pavilion opening onto the garden..." (Proust 2003: 63–64).

The madeleine is the technique that essentially opens the whole novel by connecting the weight and disillusion of present time to the richly textured past. In the juxtaposition of a dark present and access to sharply defined images of love and longing that lie beneath the surface, *A la Recherche du Temps Perdu* is very much a *Winterreise* world. Instead of a physical image that springs open memory, in many of the *Winterreise* songs, slippage between the frozen landscape of the unending present and the inner world of memory is the switch between tonic major and minor. In *Frühlingstraum*, no. 11, the opening dream of colorful flowers in May is brusquely torn aside by the incursion of the dark, cold present with its dissonant screeching of ravens from the rooftops. The end of this abrasive intrusion ends on a fiercely ascending A minor broken triad, *ff*. Across the succeeding silence, the pitch A is the connector to A major, *pp*, as the dream world resumes in the longing for a spring that never comes (**Example 1**). A similar pitch connector between tonic minor and major occurs in *Der Wegweiser*, no. 20, in the second part of the cycle, where the narrator has reached a decisive point in the journey through the revelation, at the end of the song, of where the journey is taking him. In the first verse in G minor the narrator looks out at the rocky landscape ahead of him with dread, where there is literally and metaphorically, no path, tonal direction slips from G minor to F minor and back (**Example 2**). At the end of the first verse the repeated pitch G in the right hand of the piano turns the tonal direction into G major, and the experiential questioning turns inward, as he asks himself why he feels compulsively driven out into the wilderness – and it is on this same repeated G that he finally sees the sign post of his final destination.

Such connectors between zones, remote not just in time but even more in expressive character, are not limited to vocal music but are just as powerful in instrumental music, often at salient points of structural articulation by means of one or more pitch connectors. In the first movement of Schubert's C major string quintet, D. 956, the expected appearance of the second subject

in G major and prepared by the proceeding forward momentum ending on an emphatic G (bar 58) in cellos 1 and 2, is deflected by one of Schubert's most magical moves. While cello 1 sustains G, cello 2 moves down chromatically to E flat so that the second subject occurs in a connected but remote imaginary landscape (**Example 3**). The E flat section ends in G, using the E flat triad with F sharp as a German 6<sup>th</sup> in G major. After the E flat section repeats, with the cello parts now rescored in violins 1 and 2, the second resolution in G then stays in that key, leading to the modified version of the second subject in G major. The whole E flat major episode can accordingly be seen as both "time out" in the expressive delineation of the movement and part of the contour in its tonal planning.

The use of pitch connectors, as "wormholes" between temporal zones to create expressive digressions in a movement's structural contour, can also be found in Beethoven's instrumental writing. In the first movement of his Fourth Piano Concerto, op. 58, the piano's second entry, elaborating the first theme, opens out into confident triplet passagework that counterpoints the first theme presented by the winds, with forward rhythmic momentum impelled by *sforzandi* on the second half of the beat. Unforeseen from the point of view of logical process, this rhythmic momentum and sweep across tessituras is arrested by an unexpected interpolation in B flat major (bar 105, 6 before figure C). Poised *pianissimo*, the B flat section, belonging neither to what has preceded nor what will follow it, holds in suspension the movement's time and action; and its very stillness is like music reflecting on itself from a remote distance (**Example 4**). These planes of momentum and reflection are linked by a slender funnel of two pitches, D and F in flute and oboe (7 before figure C) as the switch point into the stillness of the B flat section. The interpolation lasts only six bars – four for the B flat reflection itself and two as transition back to the main action of the movement. Reinterpreting the pitch B flat as a chromatic 6<sup>th</sup> like the Schubert quintet example, this is followed by a bass G sharp which enhances A as the dominant of D major, in preparation for the second subject (9 after figure C). A similar procedure of pitch and temporal connection between contrasted material and expressive domains occurs in the slow movement of Beethoven's 9<sup>th</sup> symphony, where the double variation



form of alternating B flat major, Adagio molto e cantabile in 4/4 and the  $\frac{3}{4}$  Andante moderato in D major are connected by means of a re-contextualized link. Towards the end of the first B flat major section, the outer pitches of the strings (bar 23), F and A, frame the dominant 7<sup>th</sup> of B flat with its implicit expectation of resolution. On the last beat of the bar, though, the bass line F rises to F sharp, bypassing expected closure, and switches onto the sharp side of the tonal spectrum. The bass F sharp realigns into the 2<sup>nd</sup> violins and violas, which unfold the beautiful D major theme (**Example 5**).

These examples of pitch hinges, connecting disparate expressive domains through key, dynamic plane, contour and instrumental sonority, can be seen as examples of ‘wormholes’ in musical structures, by providing access to a remote domain by pitch linkage and/or enharmonic reinterpretation. But a striking example of pitch juncture rather than pitch connection between adjacent but unrelated expressive arenas can be found in Schubert’s *Wanderer* Fantasy, op. 15. This occurs in the extended “composed-out” link between the pitches G, as V of the Fantasy’s prime C major (bars 165–166) and the dissonant shock of G sharp, *ffz*, which is not connection via pitch reinterpretation so much as obliteration of the preceding G, using the obsessive dactylic rhythm which dominates the entire fantasy. The obsessive repetition of the G sharp dactylic figure with shifting, dissonant harmonic underpinning, unfolds a circuitous path over the next twenty-one bars in preparation for the solemnly-paced Adagio *Wanderer* theme in C sharp minor. In virtual slow motion, the *Wanderer* theme, centered on the repeated G sharp minor pitch, uses the same dactylic figure, so the heraldic opening of the fantasy is mirrored in the *Wanderer* theme like a remote memory.

By contrast with examples of “wormholes” as pitch connectors between discrete expressive planes in the Beethoven examples, the *Wanderer* link, in part freer and more radical in its treatment by the context of the fantasy, shows how disruptive energy can impact direction within the “wormhole”. But a different, innovative reading of “wormholes” in musical structures shows that, rather than just linkage between zones – however such connectors are construed – “wormholes” located at the juncture between domains can equally be points of collision which rupture the musical surface. At such

confrontational intersections, the juncture splits instead into fracture lines; and at these explosive fissures the background energy field strives to erupt into the foreground. The development section of the first movement of Mahler's 2nd symphony shows two of these break points. In the first of these, after a sustained bass pitch D of seven bars (7 before figure 12), the whole orchestra, vertically aligned, *ff*, erupts in a volcanic explosion, and opens a new perspective of development that is not only about the reinterpretation of material but of energy. The second is an even more dissonant, sustained and aggressive rupture (at figure 18). Charged with chaotic force, the eruption threatens to derail the entire movement until the whole orchestra aligns rhythmically, *fff*, for a massive dotted descent (10 before figure 20). The propulsive drive down four octaves anchors the powerful bass G (5 before figure 20) as the movement's structural dominant, from which the recapitulation explodes, *fff*, in jagged stabs of sound and silence (**Example 6**).

The unpredictable and potentially explosive underlying energy field in the quantum world provides a radical new model as conceptual background, a model that may throw light on abrupt switches between expressive domains and ruptures in the musical fabric in important nineteenth century works, like Schubert's *Wanderer* Fantasy, Chopin's F minor Fantasy, op. 49, and Liszt's *Les Funerailles*. Rather than subsuming such powerful structural deformation into an ordered Schenkerian harmonic / contrapuntal background, textural dissonance is seen as the forefront of background disorder, thrust forward into the music's surface. Digressive or disruptive features are not smoothed away as reductive elements in an implicitly ordered *Weltanschauung* but viewed instead as manifestations of an incipiently threatening entropy. At strategic places where borders between zones are weak or under stress, these dissonant features – harmonically dissonant, rhythmically derailing and dynamically intrusive – break through with eruptive force. This choreography of potential eruptive force beneath a contained surface is not exclusive to the quantum world, dimensions of the musical world, the geographical world or potentially – or actually – unstable political regimes. In addition to such external manifestations, modeling the dynamics of mind reveals similar characteristics: the subconscious, with its potentially eruptive drives and

desires, is the substrate beneath conscious order. When the mental censor is diverted or overridden, those desires break through the surface under intense emotion or in dreams. So if Penrose is right that our conceptions of reality are expressed through mathematical, physical and mental worlds that have underlying connections to each other, then theoretical constructs that provide an explanatory *modus vivendi* for such worlds may reveal striking parallels: between musical structures as cosmic landscapes – characterized by unexpected digressions, or, in more extreme cases, dislocated by violent and chaotic rupture (in composers as different as Gesualdo and Berio) – and the internal choreography of the mind on the one hand; and between musical structures, as a postmodernist broken echo of the music of the spheres, and the mathematical modeling of underlying physical existence on the other. In each case, ordered foreground structure is underpinned, and at times, interpenetrated by a charged, unpredictable energy field. Nietzsche's dialectical tension between Apollo and Dionysos takes on new meaning in the multiple narratives of contemporary discourse.

Within such fields of discourse, another aspect of theoretical physics provides art works, and in particular musical compositions, with a persuasive model; that is art works as alternative realities or alternative worlds. This concept is based on the work of Hugh Everett and is known as the Many Worlds Interpretation (MWI) (Everett 1973). Everett showed how, in a quantum environment, sub-atomic particles exhibit alternative paths of behavior at a strategic point of measurement. The measuring point is effectively a kind of bifurcation of behavioral pathways. Extrapolating from such possible alternative lines of action in quantum existence, Everett proposed that, in the macro physical world also, a strategic point of articulation could similarly instigate an existential split of direction into alternative realizations, so that each world develops its own scenario of events independent of any other world. This means that a range of alternative possible realizations branch out from the point of instigation and co-exist, each with its own independent behaviors and outcomes. While branching worlds may share inhabitants – you and I may appear in multiple worlds – and reference points like buildings and street signs, main characters and subsidiary players may act in radically different

ways. Vilenkin takes as an example of such a decisive point initiating splitting into different, parallel futures, of Julius Caesar's monumental decision to cross the river Rubicon at the head of armed legions, and how this decisive action could play out in Many Worlds:

“With the words ‘*Iacta alea est!*’ – ‘The die is cast!’ – he ordered the troops to advance. And the die was cast indeed: on some earths Caesar went on to become the dictator of Rome, while on others he was defeated, tried, and executed as an enemy of the state.” (Vilenkin 2006: 112).

In the parallel futures that stem from such actions, outcomes may be diametrically opposite: in one world, or on one path of the labyrinth of time, as Borges says in *The Garden of Forking Paths*, you may arrive at this house and you are my friend; in another, you are my enemy (Borges 1971).

The Many Worlds Interpretation is a construct of simultaneous, non-commensurate realities, tracing different courses of action in the multiple worlds of contemporary existence. In fact, it could be argued that contemporary reality itself can be considered as superimposed, integral, multiple worlds. In Everett's reading, where the variant worlds from an initial concept of demarcation are effectively variations on a theme, such integral worlds can be seen in the prints of M. C. Escher with their highly structured, self-contained symmetrical patterns and incommensurate mathematical planes; and in literature, in the alternative endings of John Fowles' *The French Lieutenant's Woman*. Borges notes the reinterpretation of time as a multiplicity of temporal realizations, as “... an infinite series of times, in a growing, dizzying net of divergent, convergent and parallel times” (Borges 1971: 53). In these distinct, parallel scenarios of reality, conceived in fourth, fifth and more dimensions of space-time, each world is an independent entity, different from any other, and they do not intersect, or only minimally with those with similar initial patterns and premises. When worlds share initially similar geological / structural features, they are described as having weak decoherence, that is, having less “drop off” into unpredictable paths as subsequent stages of action unfold, whereas those with strongly opposed characteristics, manifest in radically different dispositions which cannot be bridged from one self-

contained world to another, are described as having strong decoherence. Realizations effectively become an array of parallel worlds that fan out from a point of departure and become more differentiated the further they are from that initiating point. Everett believed that all of these worlds actually do exist, but due to our inbuilt hardwiring, we can only perceive one of them as “the” world. Paul Bruney explains the perception of our particular world that, in the co-existence of conceptual worlds, the act of measurement or perception is a decisive action that effectively highlights a specific realization, what he calls a particular world-line.

“The MWI incorporates all possible world-lines in a universal wave-function. The world-lines are superposed and exist simultaneously. Each world-line describes an evolutionary path of locations and events in a given system through four-dimensional space-time. Events that do not happen in one world-line do happen in other simultaneous world-lines. We normally experience only one ‘real’ world line at a time in accordance with quantum decoherence, which is intrinsic to the Many Worlds Interpretation. The interaction [i.e. measurement] ‘selects’ a particular world-line such that it *appears* to ‘collapse’ into a real sequence of locations and events.” (Bruney 2010: 634).

Physicist Michael Mensky has proposed an interesting modification of Everett’s ideas which he calls Extended Everett Concept (EEC). Everett construed existence as co-existent, parallel realities but because of our mental construction and neurological networks, we can only perceive one of these worlds in normal experience at any one time. In everyday experience, we know that a place we have visited, such as St. Mark’s cathedral in Venice, continues to exist even after we have left, but even if we cannot see it at this precise moment, we could see a video of it in real time, read Ruskin or Proust on Venice, see a painting by Turner or Canaletto, as part of the larger reality that artifacts, people and places exist beyond our immediate perception of them. Mensky contends, though, that alternative worlds, such as being in another time in front of St. Mark’s, are not totally cut off from present existence; but in alternative states of consciousness, either dimmed consciousness between waking and sleeping, or heightened consciousness of meditation or narcotics, we have glimpses into such other worlds, insights which he

compares to how the unconscious mind resolves a problem during sleep when that solution is blocked to conscious mental activity. At the permeable borders of consciousness we intuit alternative solutions in the scenario of parallel worlds, even if in normal perception we cannot access their content except at the borders between realms of consciousness or as theoretical reconstructions (Mensky 2013). As the “stuff that dreams are made on”, images conjured up at the borderland of consciousness are not merely the mind’s repository of anxieties and desires: at the crossroads of consciousness, they are a window onto alternative realities. By contrast with Everett’s view (and Mensky’s modification of it) as alternative co-existent worlds limited to perception by human physiology, physicists Raphael Bousso and Leonard Susskind take a different viewpoint on Many Worlds. They contend that, as well as the real world, other potential realizations of existence are not necessarily alternative choreographies of our actions in variant patterns of replay – as Nietzsche maintained in his theory of eternal return – but rather Possible Worlds, which conceivably have some deformation of design or climate that prevents their sustainability as complete entities, rather like a sketch for a musical work that has been discarded before completion.

It has long been ascribed to art works the capacity to delineate meaningful domains of reality. While these may have significant connections to social and cultural milieu, as religious art, domestic music or individual portraits, such domains nevertheless have their own frames of reference, techniques of presentation / representation, symbolic imagery, structural procedures and rules of engagement. As reframed discourse, they model reality by counterpointing order in some areas of structural articulation, such as highly finished passage work – musical or painterly – with ambiguity of meaning or interpretation in other areas; and this dialectical interplay provides crucial ways of redefining boundaries of style and genre. If art works are alternative representations of reality, then they also redefine time and space through new perspectives of light, matter and energy. By means of texture, image-making and composition, painters redefine light to create new visions of reality, such as the lustrous iridescence on the man’s sleeve in Rembrandt’s *The Jewish Bride*

in the Rijks Museum,<sup>2</sup> and the shimmering refraction of light through water in Turner's *Rain, Steam, and Speed – The Great Western Railway* in the National Gallery, London<sup>3</sup>. As well as Rembrandt's new, expressive characterization in seventeenth century Dutch portraiture and Turner's innovative nineteenth century nature painting capturing the ephemerality of movement, these paintings can also be read from a contemporary perspective as prescient representations of light as an energy field. Through skilled techniques of illusion, they engage the viewer's imagination in a reconfigured reality.

Techniques of illusion, as means of convincing us of actuality in the deceptive surface, are essential in creating alternative realities, as in Rembrandt's dazzling technique for the multi-layered lace collar in the portrait of Margaretha de Geer in the National Gallery, London. But the painting engages the viewer not just on account of the exquisitely rendered collar, but because it draws attention to and engages the viewer's empathy with the powerful expressive center of the painting, Margaretha's time-worn, introspective face, painted in a much looser style, with broad brush strokes.<sup>4</sup> Her hands, as secondary highlighted passages, are painted with the same rough technique; her right hand clasps a handkerchief while the left, over-sized and with the same reddish blemishes as on her face, rests on the arm of her chair. In creating alternative realities, visual and dramatic forms do not rely on photographic verisimilitude so much as communicating by implicative codes that allow the audience to relate through the imagination to the expressive reality contained in the image – like Joey, the moving, life-like wire-framed horse in the stage production of *War Horse*. The action on the stage, whose workaday *modus vivendi* is patched up clothes, glaring lights, straining muscles and a wired puppet, is transformed through an illusionist's sleight-of-hand that suspends belief and evokes wonder. As a powerful, alternative reality, Michael Caine called this illusion, in the film *The Prestige*, the convincing

<sup>2</sup> See at: <https://www.rijksmuseum.nl/en/collection/SK-C-216>.

<sup>3</sup> See at: [http://www.nationalgallery.org.uk/cid-classification/classification/picture/joseph-mallord-william-turner,-rain,-steam,-and-speed-the-great-western-railway/262588/\\*moduleId/ZoomTool/x/-30/y/-92/z/2](http://www.nationalgallery.org.uk/cid-classification/classification/picture/joseph-mallord-william-turner,-rain,-steam,-and-speed-the-great-western-railway/262588/*moduleId/ZoomTool/x/-30/y/-92/z/2).

<sup>4</sup> See at: [http://www.nationalgallery.org.uk/cid-classification/aspects/front/rembrandt,-portrait-of-margaretha-de-geer,-wife-of-jacob-trip/305091/\\*moduleId/ZoomTool/x/201/y/0/z/1](http://www.nationalgallery.org.uk/cid-classification/aspects/front/rembrandt,-portrait-of-margaretha-de-geer,-wife-of-jacob-trip/305091/*moduleId/ZoomTool/x/201/y/0/z/1).

realization of the magical act. Freud wrote of art as magic and the performer who creates its alternative reality as a magician.

“In art alone it still happens that man, consumed by his wishes, produces something similar to the gratification of those wishes and this playing, thanks to artistic illusion, calls forth affects as if it were something real. We rightly speak of the magic of art and compare the artist with a magician.” (Freud 1998).

In addition to this sense of art works as meaningful expressive domains that partake of both experiential reality and wonder, there is another sense in which they are not just different worlds but Many Worlds. The theoretical model describes how, in the Many Worlds Interpretation, a point of measurement initiates parallel co-existent and self-contained entities that contain all possible variants of the initial material. Analogically, a musical departure point that can initiate all possible realizations stemming from it could be described as the blueprint of a genre. Works that “activate” this blueprint are like Many Worlds, in the sense that each one contains the genre’s core identity paradigms, such as the motivic prime material played out through the tonal plan of a ritornello movement. The framework, distinctively realized through thematic material, imaginative pattern-making and scoring, becomes a particular work / world, whose tonal plan is the shorthand for the road-map of expectations. The blueprint is like a flexible Google map, where you can change the route and avoid I95 near Miami for side roads that will take you more surprisingly or circuitously to your destination. These routes are a “set of sets”, in terms of which musical works adhere more closely or loosely to the paradigms of identity, as strong or weak decoherence; but even more, through distinctive imagination, these identity paradigms are recreated as “Escher worlds”.

In drama and music-drama, though, another layer of recognition is superimposed on the Many Worlds of art works in an autonomous world, with its alliances and betrayals. Concurrently with relationships forged on the stage about power, conflict or love, what may be called the explicit dimension – that is what other characters know – there are also motivations hidden from one or more characters that may strategically impact how relationships are



formed, alliances made, friendships betrayed. The audience is privy to this insider information, “overhearing” Iago’s corrosive resentment of Othello as he is “thinking aloud” about his plan to undermine Othello at his most vulnerable place, his love for Desdemona. Even though Othello has risen to the highest level of military command and been recognized for his military skill by the established regime, he is not part of it: he is an outsider who has developed a respected persona that Iago will undermine and rip apart. So the audience becomes more than silent observers: they are participants who cannot intercede and witnesses who cannot avoid the inevitable consequences played out before them. This signaling of insider information to the audience is often achieved in opera through orchestral writing, whose flexibility enables it to either refer back to time past by recalling earlier music, or, through referential motifs and refrains, play out its conflicted predicament to its inexorable conclusion. In *Wozzeck*, the fractured, dissonant orchestral writing that accompanies Wozzeck’s exchanges with the Captain, the Doctor and Andres in the early part of the work, builds up a sonic pictogram of Wozzeck’s obsessive behavior and mental instability. Unhinged by Marie’s betrayal with the Drum-major, Wozzeck loses any residual point of human contact and, in the Act 3 dialogue with Marie, gruesomely murders her. The orchestra’s dislocated motifs that have conveyed Wozzeck’s unstable, obsessive internal world now emerge from their role as unspoken Greek chorus and after Marie’s murder, the orchestra effectively reviews and culminates the sordid tragedy, taking center stage as the work’s dramatic *coup de théâtre*. In both *Othello* and *Wozzeck*, suppressed toxic resentment can be read as the underbelly of chaotic energy that threatens to destabilize human relationships; and under the extreme pressure of betrayal and rage, breaks through, overwhelming and destroying the principal characters.

In *The Birth of Tragedy from the Spirit of Music*, Nietzsche proposed a striking redefinition of music-drama. By contrast with Winckelmann’s poised neo-classical reading of Greek architecture and drama, Nietzsche saw drama in the ancient Greek world as an intense conflict between Dionysos and Apollo. The tension between these powerful opposites Nietzsche identified as the fundamental confrontation between the striving life-force and the pull towards

death – Freud’s Eros and Thanatos – reinterpreted as the conflict between Dionysian background, as incipient surging chaos, and Apollonian foreground that holds back that subversive power by images, gestures and motifs. Nicholas Rennie described this oppositional tension as “...an agonistic polarity between an aesthetics of space and an aesthetics of time” (Rennie 2001: 186). Internal components are not deconstructed in Nietzschean dialectics so much as continually pulled between the opposite demands of energy and constraint. But under intense pressure, structural constraints buckle or fracture, allowing the chaotic undertow to break through to the surface.

Not only Eros and Thanatos: while the conflict is played out between the intense life-force, in Schopenhauer’s term of the Will, and its opposite pull towards death that Nietzsche recognized as the interlocked forces in Wagner’s operas and particularly in *Tristan and Isolde*, Dionysos and Apollo are also personas of psychological identity. Dionysos is the cruel, relentless old brain, entrained into the powerful, cyclical rhythms of nature, as well as sensuality and violence, and the incipient emotional surge of anger or ecstasy beneath the surface of conflict (Bloom 1995). Apollo, on the other hand, can be read as the neo-cortex’s organizational capabilities like language, order and symbolic thinking. In his benevolent and authoritative representations, Apollo is the god of the sun and healing, from Monteverdi’s *L’Orfeo* to Louis XIV as *Le Roi Soleil*. But Apollo is also the god of music, and the left-brain intellectual capacities that enable us to build cities and conceive micro-particle worlds are inflected by right-brain modalities of inclusiveness, music and the expressive imagination.

Dionysos and Apollo can be seen, then, as a model of human hard-wiring that characterizes three domains of physical and human existence: the substratum world of quantum physics, the internal world of the mind and the reconstructed world as a stage. Each of them is a self-contained entity with its distinctive arena of action and principles of governance, and each one coexists with other self-contained entities in the pluralistic, contemporary “now”. Each of these realms has an inner dimension, as the behavior of components, characters and events within the larger arena of action; and an outer dimension, as description of that behavior or interpretation of its events. So the

world of the mind can be described as the imprint of the individual's internal, emotional world; and its crafting in external products of visual, literary and musical media. The world of the mind becomes the superhighway between the internal world of the imagination and emotion and the external shaping of artistic design.

At the strategic juncture between internal affect and external order, instrumental music is emblematic of the interface between expressive gestures and structural networks. Those networks are often predicated, as mentioned earlier, on a genre's cluster paradigms, like its DNA's "blueprint", within and against which each work defines its individual identity of material and course of action through striking unpredictability and creative problem-solving. These solutions, as distinctive, parallel, self-contained entities from their conceptual point of departure, are like variations, not only on the typological themes of structural paths with their expectations of digression and closure, but on the conceptual theme of Many Worlds. From this perspective, the coexistence of variant versions of a generic / genetic pattern as musical worlds can be described as a dimension of the quantum reality of contemporary existence.

Modeling the Many Worlds Interpretation accordingly shifts the previously informal description of art works as alternative kinds of reality to a more precise description of self-sufficient entities governed by internal paradigms of action. Thomas Kuehn has called such a description "a coherent theory of textuality" (Kuehn 1991: 211). Musical works as entities exhibit two intrinsic properties of the Many Worlds model. In the first of these, as has been seen above, the concept of a musical work within a genre, with its distinctive identity and course of action, is modeled on a conceptual ground-plan whose variants are like an array of actions: they may be realized either more closely or loosely, depending on the extent of adherence to or departure from normative courses of action. This web of probable outcomes fans out along diverse paths from its initiating ground-plan through selective actualizations in individual works. The image of a fan, with some open and some concealed designs, has significant connection with an array of branching possible worlds as variant outcomes that stem from a strategic point of initiation. In addition, each musical work may be seen as the point of initiation from which fans

out a cluster of “internal variants” – performances, arrangements, recordings, editions of scores and sketch studies. While each of these variants is, in the global sense, simultaneously available on the internet, through publications, live performance or recorded audio streams, only one of them is perceivable to any one observer or listener at any one time. This would indicate that multiple, self-contained, co-existent worlds in contemporary existence are replicated not only between large-scale domains of quantum existence, psychological makeup and the world as a stage, but can also be modeled within an individual musical work. Its diverse dimensions of existence, as recordings, performances and literary descriptions, can be conceived as strands emanating from “the work as a world”, with variant versions arrayed on parallel tracks.

While the first aspect of modeling between the Many Worlds Interpretation and musical works is multiple variants, the second aspect is multi-dimensionality. MIT physicist Max Tegmark has developed a theoretical plan, in which the Many Worlds Interpretation is extrapolated to a larger, multi-leveled construct of the universe. Based on mathematical calculations of the extent of the universe and partially confirmed empirically by observation of remote stars way far beyond our galaxy, the universe now unfurls as a vast expanse of constellations, a super-store of galaxies termed the multiverse. Even this galactic mega-space, though, is believed to be finite. This means that, at immense distances of time and space, patterns repeat, so that, conceptually “out there”, there will be replicas of our world, of our music, and somewhat disconcertingly, of ourselves. Some of these mirror worlds may be exact replicas of ours; in some of them, we may have different encounters and outcomes, conversations and journeys, as creative variants in the return of the patterns of existence. In certain cases, those patterns become distorted so the replicas may be deformed and possibly abandoned half-finished, like sketches of musical works left incomplete or discarded in favor of other solutions. At every juncture, Nietzsche’s “eternal return” takes on new, unforeseen and extraordinary potential.

Through the second corollary of multi-dimensionality, the multiverse opens up whole new perspectives of theoretical paradigms for musical works as integral structures and self-governing worlds. If the first aspect of

the MWI models musical works as internally regulated entities – that is, as variant identities of generic / genetic ground plans or variant versions of a work through performances, recordings and scores – then at this larger perspective, musical works are entrained within multi-leveled social, cultural and theoretical contexts, conceptually like different “galaxies”. However, a musical work does not reduce to these contexts but each of them refracts different levels of meaning onto the work. Through these two perspectives of modeling, new criteria of problem-solving and evaluation can be proposed: from the first viewpoint of integral reference, parallels can be drawn between specific spheres of intellectual discourse, between Many Worlds as variant versions of creation and musical works as variant forms of realization. From the second, larger perspective, multi-dimensional contexts for musical works may be replicated in the worlds of multiple galaxies, which, in turn, are embedded in the mega-context of the multiverse.

But not everything can be put in place – or even places, as far as contexts go – and explained, let alone explained away. Many times, in the contemporary social climate, political environment and stock market, as well as contemporary musical works / worlds, unpredictable, painful shocks rock our world that we “didn’t see coming” and are hardly less explicable in retrospect, although pundits of all stripes will talk about missed clues and intelligence gaffs about 9/11, the collapse of Enron, the 2008 meltdown, and the fall of communism. At a time when, hypothetically, we are more in control of our environment by better drugs and “going green”, these unforeseen seismic heaves show that we are not – often, just at the point that people thought they were doing OK, catastrophe of one description or another hits, as just before Bernie Madoff destroyed individuals’ and institutions’ savings, leaving in his wake a trail of disaster. Nassim Taleb calls these unpredictable shocks that affect all areas of life Black Swans (Talib 2007). He identifies three main characteristics of Black Swans: one is they are outliers, that is, they are outside the realm of regular happenings and therefore, like 9/11, beyond expectations of what might reasonably happen (Black Swans are, by their nature, unreasonable); secondly, their impact is extreme, so they are on the mega-scale of terrorism,

stock market collapse or being diagnosed with cancer; third, people make up scenarios and explanations subsequently, because such sudden, unpredictable shock events can only be explained, if at all, after the fact, with the intention (hope) of making them more understandable and therefore less threatening in their unpredictability and severity. Trends measured by statistics and bell-curves, Talib says, give a distorted picture of cumulative, incremental change, whereas:

“Almost everything in social life is produced by rare but consequential shocks and jumps; all the while almost everything studied about social life focuses on the ‘normal’.” (Talib 2007: xxix).

The other problem about normative explanations as causal logic and incremental change is that they do not take account of random outbursts – in any sense; and so, lacking the tools to predict such shock events, or those who “should know” how to predict them, we tend to produce *post facto* explanations to reduce the randomness that can reduce our world, literally or metaphorically, to rubble. Since predictability is a prerequisite for most of life’s activities (the sun rose yesterday, the sun rose today so the sun will likely rise tomorrow), we miscalculate or simply do not factor in random events that will overturn those expectations at a stroke. Taleb calls these non-implicative events dimensionality.

“The more random information is, the greater the dimensionality, and thus the more difficult to summarize. The more you summarize, the more order you put in, the less randomness. *Hence the same condition that makes us simplify patterns pushes us to think that the world is less random than it actually is.* (Talib 2007: 69, author’s emphasis)”.

The presence of the unpredictable in present day society – the violent, disruptive Black Swans so prevalent in barbaric parts of the modern world with dangerously sophisticated weapons as well as in sophisticated parts of the world motivated by ruthless competitive drives – is a further indicator of the random, chaotic Dionysian energy field that seethes under the surface of existence, and musical existence, either breaking through to the surface at

fracture points or projecting postmodernism's prevailing climate of dislocation. Incipiently unstable, this underlying random background helps explain the dynamics of uncertainty in contemporary social society, just as it does in the quantum world and the musical world.

In charting the exploratory steps of this "Brave New World", art works have a special function, sometimes overlooked in the demeanor of music as a social / cultural artifact, that they not only express both conscious and unconscious affective meaning, but they also shape it through road-maps of structural identity. These road-maps are defined by means of constructional points of articulation, including suspension, digression, intensification and closure, through which the expressive contour is projected, and "reaches out" to the viewer or listener. What happens in this shaping is two-fold: one is that the artist transforms raw experience by means of material – design, pattern, sonority, motivic resonance, color – that is "offered" to the listener or viewer to respond to; and on the other, the listener actively *reconstructs* that world / work, bringing to bear his or her experiences and expectations in related contexts of listening and looking, through what Karl Popper called the matching of data against theoretical criteria (Popper 1959). Popper maintained that science advances by testing hypotheses. Scientists – and, by extension, artists – work by problem-solving, through trial and error. The reader, viewer or listener "tests" those ideas and reconstructs them within a framework of probabilities.

Through the artist's individual realization, such patterns of reference are fundamental in the search for meaning, where eruptive, and disruptive, emotional content has channels of projection, and, at the same time, modes of governance. Actual or incipiently emotional dislocation can be seen as a realization of Nietzsche's Dionysian background against which the language of representation constitutes both its communication and constraint; and by extension, its healing quality – as restoration from internal imbalance caused by the shocks of unpredictable life events. Art works are considered a magical illusion not only on account of the techniques that defy logical perception, but because they are symbolic mirrors – empathetic expressions in a form exter-

nal to our own lives that offer emotional resonance in an alternative world. Eric Kandel has called this ability to recalibrate emotional balance as: “an extraordinary capacity to *regulate the emotions* occasioned by such threats [of conflicts, failures, and losses that seem at times to conspire to ruin us]” (Kandel 2012: 434).

The Many Worlds Interpretation as a model for musical works can be summarized by the following ideas: first, as an alternative to underlying Schenkerian Form, where all kinds of unusual, aberrant or intrusive events that often give a work its distinctive profile – not least the famous “too early” horn entry at the first movement recapitulation of Beethoven’s *Eroica* symphony – are “smoothed out” and reregulated. In the present model, by contrast, rather than rhythmic characterization subsumed to the reductive harmonic / linear background, rhythm is propelled forwards from its unstable energy substructure as impact, force and action. The MWI model reinterprets quantum theory’s indeterminate particle world as a background Dionysian energy field, constrained, for the most part, by its defined Apollonian characters that hold in check implicit conflict in a continually shifting balancing act. But Expressionist musical works with attenuated language and dislocated surfaces, and not just those of the early twentieth century, may be especially threatened by breakthrough as a kind of volcanic entropy.

Secondly, the MWI itself has two dimensions: one is the *integral*, where musical works are modeled on Hugh Everett’s proposal that holds that at a decisive point of measurement, the world splits into parallel alternative worlds, some of which are identical or very close to our world (weak decoherence), whereas others, while inhabited by the same people and places (us, primarily, may exhibit totally different outcomes (strong decoherence). Following their own logic, digressions and interpolations, they were called “Escher worlds”. The larger level of the MWI, is *multi-dimensionality*, which sees the individual work as a world not just in the context of our galaxy, but part of the enormously expanded view of the universe called the multiverse. Musical works can be construed as worlds in the multiverse, not only because patterns repeat at extraordinarily huge googleplex distances from Earth, but because



the multiverse is constituted of complex layers of structure within individual worlds as well as between them. It is these multiple layers of context in the contemporary world that enable us to construe the model of alternative worlds and articulate new criteria of explanation. The contemporary multiple world may have a variety of such frameworks on offer, but as in Orwell's cautionary tale, not all are equal: some are more equal than others.

Perhaps what lends persuasive credence to the models of Many Worlds and Black Swans is contextuality, a sense that the intellectual framework can be referred to different kinds of social discourse and artistic activity. In today's ambivalent, fragmentary world, the present models provide an explanation with significant parallels to other spheres of activity. The foreground of contemporary social, economic and musical events often proceeds by unforeseen directions – and the ruptures that challenge musical continuity within a recognizable formal process end up, in extreme contexts, by undermining it. Ruptures are like underlying primal energy that has breached the pitted surface of the musical foreground. The Black Swans that dislocate expectations of social continuity and erupt in unforeseen stock market crashes are also symptomatic of increasingly dissonant procedures in compositional technique in twentieth and twenty-first century musical modernism: images of energy and entropy, today's Eros and Thanatos, thread through contemporary existence like Thomas Mann's *Faustus* lament.

So it is to Roger Penrose's two opening questions that we now return: the first is whether it is possible to trace convincing principles of community between different realms of intellectual discourse. We have seen striking similarities of characterization between the physical quantum world, the inner world of the mind and the reconstructed world of the stage. These argue persuasively for such a community of ideas in fields of discourse where a random, indeterminate background force is superimposed by protocols of order in everyday behavior and other realms of action; but under extreme pressures, these control mechanisms buckle and break. Penrose's other concern was the necessity for bold designs, and thinking outside the box in devising new theoretical and philosophical paradigms. By constructing innovative

new criteria, we become part of that essential enterprise. Concepts of musical works are reinterpreted as an array of conjured artifacts that spread out, like Prospero's in *The Tempest*, to:

“the great globe itself,  
Yea, all which it inherit.”

The dialectics of probability are grounded, on the one hand, in their diverse realization in Many Worlds through blueprints of action; and, on the other hand, undermined by the unpredictable, eruptive violence of Black Swans in multiple dimensions of the contemporary world.

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### *Барбара Бару*

## ЦРНИ ЛАБУДОВИ И ВИШЕСТРУКИ СВЕТОВИ: САВРЕМЕНИ МОДЕЛИ У МУЗИЦИ, УМЕТНОСТИ И ИДЕЈАМА (Резиме)

У својој студији *Музика, уметност и идеје (Music, the Arts and Ideas)* Леонард Б. Мејер (Leonard B. Meyer) на убедљив је начин истакао значај концепата дисонанце и плуралности на подручју музике с почетка XX века и указао на њихово отеловљење у везама између музике, уметности, књижевности и историје идеја. У овом раду се

Мејерове поставке проширују кроз ослањање на два нова модела – један из области савремене физике и други из области социологије – који омогућавају увид у поменуте везе почетком XXI века у оквиру плурално и фрагментарно обликованог савременог света. Дати модели, осим тога, отварају нове перспективе посматрања музике и уметности из прошлости. Уколико идеја вишеструких светова (*Many Worlds*) доноси другачији поглед на проблем вероватноће и иновативности, појаве попут црних лабудова (*Black Swans*) блокирају нас кроз ерупције које прете да избаци из колосека процесе и продукте савременог живота.

schrien die Ra-ben vom Dach, da war es kalt und fin-ster, es

schrie-en die Ra-ben vom Dach. Doch an den Fen-ster.

schei-ben, wer mal-te die Blät-ter da? doch an den Fen-ster.schei-ben, wer

mal-te die Blät-ter da? Ihr lacht wohl ü-ber den Träu-mer, der

Blu-men im Win-ter sah, der Blu-men im Win-ter sah?

F.S.889.

Example 1. Schubert, *Die Winterreise*, no. 11, Frühlingstraum (NY: Dover Publications, 1970, p. 91)

XX.  
Der Wegweiser.

Mässig.

Singstimme.

Pianoforte.

*pp*

Was ver - meid' ich denn die We - ge, wo die andern Wäandrer gehn,  
 su - che mir versteck - te Ste - ge durch ver - schneite Fel - sen - höhn? — su - che  
 mir versteck - te — Ste - ge durch ver - schnei - te Fel - sen - höhn, durch Fel - sen - höhn?

*cresc.*

*p*

Example 2. Schubert, *Die Winterreise*, no. 20. Der Wegweiser (NY: Dover Publications, 1970, p. 118)

Example 3. Schubert, *String Quintet* in C major, D. 956, 1<sup>st</sup> movement, exposition (Münich: Henle, 2006, p. 3)

9

I  
 Fl.  
 Ob.  
 p  
 f  
 (dim.)  
 pp  
 espressivo  
 cresc.  
 sf p  
 I. H.  
 Edition

Example 4. Beethoven, *Piano Concerto* in G major, op. 58, 1<sup>st</sup> movement, exposition (Frankfurt: Peters Edition, n.d., p. 9)



20

Cl. *cresc.* *p* *più p*

Fg. *cresc.* *p* *più p*

(B) *cresc.* *p* *più p*

(Eb) *p*

Timp.

Vl. *cresc.* *p* *più p*

Vla. *cresc.* *p* *più p*

Vc. Cb. *cresc.* *p* *più p*

Andante moderato. (♩ = 63) 1.

Ob. *p*

Cl. *cresc.* *pp*

Fg. *cresc.*

Cor. (B) *pp*

Vl. *pp* *espressivo* *cresc.* *espressivo*

Vla. *pp* *cresc.*

Vc. *pp* *cresc.*

Cb. *pp* *cresc.*

Example 5. Beethoven, *Symphony no. 9 in D minor, op. 125, slow movement* (NY: Dover Publications, 1976, p. 237)

42

**20** *Molto pesante.*

zu 2. **Rit.** *molto cresc.* **Tempo I.**

1.2. Piccolo. *mf*

1.2. Fl. *mf*

1.2. Ob. *mf*

3. *mf*

1.2. Clar. in B. *mf*

3. *mf*

1.2. Fag. *mf*

Contrafag. *mf*

1. 3. Horn in F. *offen p*

3. 2. Horn in F. *offen p*

4. 6. *pp*

1. 2. Trup. in F. *offen p*

3. 4. *scmpre ff*

1. 2. Pos. *ff*

3. 4. *scmpre ff*

Tuba. *ff*

Becken. *pp*

Gr. Tr. *pp*

1. Pauko. *scmpre ff*

2. *pp*

1. Viol. *scmpre ff*

2. Viol. *scmpre ff*

Viola. *scmpre ff*

Cello. *scmpre ff*

Bass. *scmpre ff*

**20** *Molto pesante.*

1

*ff* **Rit.** *molto cresc.* **Tempo I.**

Example 6. Mahler, *Symphony no. 2 in C minor*, 1<sup>st</sup> movement, approach to the recapitulation (Vienna and London: Universal Edition, 1971, p. 42).