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Editorial

Welcome to *JMM*10!

*JMM*10 is our first issue to feature actual 'rolling publication' of articles; we publish texts as they become camera-ready, instead of waiting for an entire issue to be finalized before putting it online..This editorial is thus written at a time when we are about to wrap up vol. 10 of *The Journal of Music and Meaning* and move on to *JMM*11.

Introducing: Tablet-Friendly Issues

During the last few years, it has become increasingly common to own an iPad or a similar tablet device. We think this development is quite exciting, and would like to present *JMM* in a format that accommodates tablet devices to as great an extent as is technically possible.. Articles in pdf-format can already be read in tablet applications such as iBooks or similar Android alternatives, so in a way *JMM* has long been "ready for the future." We do, moreover, think it would be convenient for our readers to have entire issues available as complete documents that they can save to their devices and read without having to shift back and forth between their reading applications and the Internet browser. For this purpose, we will now conclude each issue with a complete pdf document containing all entries in the issue.

This brings us to at least one new role of the Editorial: In our blog-based format, we have included an author biography in the blog entry for each article, not directly in the pdf document itself. If you download a full issue in pdf-format, you would, naturally, want to read these biographies as well. Hence, we will now include them in the Editorial for your convenience, starting with this issue.

For a start, we present *JMM*9 and *JMM*10 in their entirety as full pdf documents. In *JMM*9, we have added the biographies at the end of the issue, in order to avoid changing the page numbering.

The Authors and Their Articles

The first peer-reviewed paper in this issue, "Theorizing Conceptual Change in Music Scholarship", is written by Karen Fournier, a professor of music theory at the University of Michigan, Ann Arbor. She holds a PhD in music theory and an MA in musicology from The University of Western Ontario (Canada), a BA in music from the University of Ottawa (Canada), and a BA in history from Carleton University (Canada). Fournier is an active scholar, having presented papers at over three dozen music and cultural studies conferences in Spain, England, Canada, and the United States. She has published articles in *GAMUT*, *The Journal of Musicological Research*, *Culture and Power*, *The College Music Symposium*, and *Music Theory Spectrum*, and is currently working on a book-length project on British punk rock.

Fournier's article is followed by Dennis Kurzon's peer-reviewed paper, "Hush... The Lights are Dimmed: A Case of Situational Silence." Kurzon is professor of linguistics at the University of Haifa, Israel, and has carried out research on silence as a pragmatic phenomenon. His book *The Discourse of Silence* appeared in 1998, in which he analyzed, among other things, silence in Schoenberg's *Moses und Aron*. Further articles on silence were published in 2007 and 2009. He has also written on legal language, especially from the perspective of speech act theory, on the sociology of languages in India, on adpositions, and on writing systems.

The third and final peer-reviewed paper in *JMM*10, "Harmonic Content Influence on Colour-Choice Association with Unaccompanied Tones," is written by Jeffrey N. Howard, who is currently an Assistant Professor of psychology at Northern State University in Aberdeen, South Dakota. Dr. Howard received his PhD in Human Factors Psychology at Wichita State University. His primary research interests are music cognition, audiovisual perception, and cross-sensory modality investigations. He holds master's degrees in clinical and experimental psychology, with a bachelor's degree in radio-television production-engineering, and has over ten years of experience in the radio-television field. As a self-taught keyboardist, guitarist, and drummer he has written, produced, and engineered his own smooth jazz CD entitled "Walking on the Moon" as well as a Christian Contemporary album titled "Leap of Faith". One of his primary directives is combining his music technology and software programming skills to create unique presentation environments to explore human processing of cross-sensory stimulus combinations.

After our Recent Publications list, compiled, as always, by our book review editor, Jens Hjortkjær, PhD in musicology from the University of Copenhagen, we conclude the issue with the article "'Creavolution' with Trevor Wishart" by Nicolas Marty. This article is part research report, part interview with the composer Trevor Wishart, and is therefore longer than the research reports we usually publish. The author, Nicolas Marty was born in 1990 into a family without musicians, and did not start studying music until at the age of 15, with guitar and piano studies at Jean-Pierre Malardel in Périgueux, France. From 2007 to 2010, he participated in Jean-Yves Bosseur's instrumental composition workshops and Patrick Mellé's Computer-Assisted Composition workshops at the Jacques Thibaud conservatory of Bordeaux, while attending the University of Bordeaux III, France, as a bachelor student in musicology. In September 2010, he joined the University of Paris-Sorbonne (Paris-IV) and began his master's thesis under the supervision of Professor François Madurell. Nicolas Marty's research field is narrativity and its perception in electroacoustic music (and in all music by extension). His master's thesis focuses on *Journey into Space* (1970-72) by Trevor Wishart. In September 2011, Marty begins graduate studies in psychology at the University of Paris-8, while pursuing his second year of masters at Paris-Sorbonne, with the aim of opening up to music cognitive and psychological research. He published his first paper, "Vers une narratologie naturelle de la musique", in December 2011, and will participate in the 12th edition of the Electroacoustic Music Studies Network Conference in June 2012.

We hope you will enjoy reading *JMM*10 as well as future issues.

Best regards, on behalf of the Editorial Staff,

Søren R. Frimodt-Møller, Managing Editor
Cynthia M. Grund, Editor-in-Chief

Theorizing Conceptual Change in Music Scholarship

Karen Fournier, School of Music, Theatre, and Dance,
University of Michigan, Ann Arbor

Abstract

This study aims its critical eye towards a conceptual narrative that current music scholars have inherited from their "New Musicological" forebears to describe the growth and development of knowledge in music scholarship. The narrative traces its origins to Thomas Kuhn, whose treatise *The Structure of Scientific Revolutions* (1962) proposes that knowledge will only advance through a series of conceptual crises during which a research paradigm that dominates within a particular field of study will be proven to be ineffective in the face of new research problems and will be discarded in a kind of conceptual "coup d'état." Kuhn's narrative, and the critical descriptions of music scholarship that have ensued, is premised on an either/or perception of the practice of research according to which scholars will be required to choose between an established research paradigm and a replacement methodology in times of conceptual crisis. His narrative does not admit the possibility that methodologies can coexist peacefully for long periods of time or that an approach that appears at first to be unsuited to a new research problem might adapt itself to that problem by merging with the new approach that is supposed to take its place in the Kuhnian narrative. This study will dispel this conceptual narrative with a statistical examination of the research interests represented in 171 sample articles drawn from a twenty-year period in the history of the field of music theory, which will show that the methodologies in that field appear to be more fluid and adaptable than the Kuhnian conceptual narrative would admit. The data presented here tracks new research trends in the field (such as the burgeoning interest in popular music, cognition, and critical theory) and demonstrates the degree to which established research trends like Schenkerian and set-theoretic analysis have been able to adjust themselves to newer trends. What the data proves is that existing research paradigms have been largely successful in their quest to fit into the new conceptual environments within which they find themselves. These findings suggest that a better metaphor for conceptual change might lie in the process of evolution, whereby an organism will be required to modify itself to fit into an ever-changing habitat and to respond to the demands made upon it by that environment. This study therefore concludes that the "revolutionary" description of conceptual change should be replace by an "evolutionary" description, and cites the work of the philosopher Stephen Toulmin to provide the basic plot of this new conceptual narrative.

1. Introduction

The interdisciplinary connections forged a generation ago between musicology and such scholarly arenas as cultural and gender studies, queer theory, philosophy, and sociology seemed at the time to suggest a new path for music scholarship that would open the field to the kinds of research questions that many existing analytical methodologies seemed ill-equipped to answer. The most outspoken critical observers of the time seemed to believe that music scholarship was poised to leave established modes of score analysis behind in favour of approaches that would engage more fully with issues pertaining to the historical and cultural circumstances under which musical objects were created by particular composers or experienced by individual listeners. And although many weighed into the debate through the late 1980s and into the 1990s, the reasons for the need for a shift from text to context as the locus of musical meaning were perhaps spelled out most clearly by Joseph Kerman, who has recently been characterized as having argued

> for a disciplinary revolution in musicology, urging a focus on musical works and their meaning.…[by diverting] musicology towards criticism and hermeneutics and away from composer biography, archival history, and strict formalism. (Abbate 2004: 506)

Kerman's critique seemed to have been leveled principally at North American music scholarship, where the boundaries between music history (as the study of "biographies" and "archives") and music theory (as the "formalist" analysis of musical score) have tended to be drawn more clearly in theory, if not in actual practice, than they are in Europe. Part of what Kerman proposed, beyond a "hermeneutic" future for music scholarship, was a realignment of the objectives of music history and music theory, which represented for American scholarship two seemingly separate subfields in music research prior to (and, as it has turned out, also after) his critique. Writing fifteen years after Kerman, Patrick McCreless illustrated the conceptual divide in America from the perspective of music theory when he wrote that "what has always distinguished us as theorists, what has enabled us to separate ourselves from musicology … was precisely our ability to do without history: to deal

with music synchronically rather than diachronically, to deal with it as structure rather than style, to approach it more as an object of an analysis than one of criticism." (McCreless 2000: paragraph 1) In some circles, the segregation of music theory from its sister discipline, music history, was seen as key to the preservation of former as something more than the mere "handmaiden of musicology (its role in European musicology)." Responding to Kerman's call to revolution, Allen Forte went on to warn that in their quest to merge with music history, theorists might "weaken one of the major characteristics of American music theory that has drawn international attention [which has been] the rigor, precision, and logic of the more abstract studies in the field" and he asserts that, for this reason, "music theory needs to preserve its essential independence!" (Forte 2000: paragraph 11.3)

Despite its particular cultural and geographical perspective, and the music-theoretical bent that I have assumed in my description of its objective to unite what has been a divided field of scholarship, Kerman's critique spawned a conceptual narrative that has been applied broadly across music scholarship to explain and hypothesize how knowledge in that field changes over time. This narrative, premised on the idea of a "disciplinary revolution," quickly became the predominant lens through which any new development in North American music scholarship came to read by critical observers of the field, many of whom viewed the rise of the so-called "New Musicology" in the 1990s, where music theory and music history presumably reunited in a common pursuit of "hermeneutics," as a decided break from an "archival," "biographical," or "formalist" past that it presumably ousted and replaced. However accurate that description of the apparent sea-change in the performance of music scholarship might have seemed at the time, an observer of musical research as it is practiced today would be left to wonder how this conceptual narrative could be used account for current research practices, which can only be viewed by those who subscribe to the revolutionary view as a curious and unexpected lapse into past practices. Further, a closer look at the way that scholarship has been practiced even in the immediate wake of Kerman's call for a conceptual shift towards hermeneutics also throws the revolutionary narrative into question. In music theory, for instance, the

narrative can offer no rationale for the ongoing practices of "formalist" scholarship through the 1990s, nor can it explain the appearance of such newer "formalist" paradigms as transformational theory. More akin to such text-oriented precursors as Schenkerian and set-theoretic analysis than to the interdisciplinary approaches touted by critical theorists like Kerman and his critical cohort, this latest analytical trend in music theory appears to shift scholarly focus back to the score, where the meaning of a musical object continues to be constructed, as it has been for those who practice the kind of "strict formalism" that critics urged us to abandon, from close readings of musical motives and themes or elements of musical form. Likewise, proponents of a revolutionary conceptual view would be challenged to account for the ongoing practice of historiography in the discipline of music history, whose academic journals have never fully abandoned issues that pertain to "composer biography" and "archival history," despite being urged to do so by critical scholars in the mid-1980s.

Critical observations about the current state of music scholarship have been considerably fewer in number and notably less vitriolic in tone than those associated with the purported shift in North American scholarship to post-structuralism in the early-1990s, and recent trends like transformational theory have not been marked by the kind of critical fanfare that heralded the alleged demise of their "formalist" world-view a few decades ago. Perhaps this comparative critical silence should not be surprising, since any attempt to explain current research practices would require that we take a close look at the narrative upon which critics have tended to rely in their accounts of scholarly change. Some scholars have, admittedly, raised questions about Kerman's conceptual model, which has recently been dismissed by one observer as a "heroic and self-serving narrative according to which our benighted "positivist" ancestors who limited themselves to collecting facts have been replaced (presumably after 1968 in Europe, or after 1985 in America) by our enlightened "hermeneutic" selves [that] is too much of a caricature to be illuminating. There was plenty of interpreting going on before 1968 … and quite a few of our contemporaries continue to bring out critical editions in the morning even as they wildly speculate and interpret in the afternoon." (Berger 2005: 492) If the bifurcation of the scholarly field into

"positivism" and "hermeneutics" is seen to be a misrepresentation of the practice of music scholarship, as this observer suggests, then the revolutionary view of conceptual change, which depends upon an assumed polarity between these conceptual positions, will be, by extension, a distortion of this change. The problem, however, is that while critical scholars may have begun to question whether the disciplinary transformations of the 1990s should be described as "revolutionary," current scholars are left to wonder, in the wake of recent scholarly developments, how disciplinary change might *actually* work in the field of music. Without "revolution" as its plot, what conceptual narrative might explain where music scholars find themselves today, and how their work has come to be practiced in the ways that it is? This the central question to be explored in the current study.

With an appeal to a representative sampling of scholarly literature published since 1990, this study will demonstrate that critical observers of music scholarship in the 1980s bequeathed to us a narrative that was inherently flawed. The purpose of the current study will therefore be to propose an alternate narrative of conceptual change that is grounded in, and supported by, a statistical analysis of research drawn from the field of music theory, which is the author's area of specialization. I recognize and acknowledge that my decision to focus on solely on music theoretical research will limit the extent to which I am able to comment upon conceptual change as it has taken place in such subfields as music history, ethnomusicology, cognition, and the burgeoning field of popular music studies, however a study of this size restricts the extent to which I can engage in these fields. Nonetheless, the conceptual model that I will propose, and for which I will advocate, here can be tested by others to see the degree to which it will "fit" in scholarly environments other than music theory. Before this model is described in detail, however, shortcomings in the revolutionary narrative must be highlighted, and illustrated with reference to music theory scholarship, in order to carve space for an alternate description of conceptual change.

2. Conceptual Change and the Metaphor of Revolution

As the foregoing characterization of Kerman's critical project reveals, those who sought to describe conceptual change in the 1990s often relied upon an analogy to political upheaval, and suggested that the seismic disciplinary shifts that music scholarship was purported to have experienced at that time find their parallel in the process of social or political revolution. The analogy requires that we accept a correspondence between music scholars who seek to change the course of their discipline and individuals who find themselves incited to rebel against a particular political regime, both of whom will come to question the ideological underpinnings of the establishment within which they exist and who will therefore advocate for a framework that will invite input from those who would otherwise feel excluded and disenfranchised. Similar to their political counterparts, those involved in a conceptual revolution will aim to establish a type of "new world order" that will embrace research objectives that differ from those of the immediate past and that will allow for new modes of participation in the construction of knowledge in a particular field of research. In the early 1990s, the analogy to political revolution appeared to make sense as a description of the state of music scholarship, given the apparent crisis brought about by the appearance of different kinds of research interests in the field. From her position as an observer of the field in 1991, for example, Susan McClary shows the extent to which critical scholars of her generation relied upon the analogy in their descriptions of musical scholarship when, in language that captures the critical *zeitgeist* of that time, she maintained that

> cultural interpretation … cannot be grafted on [to existing research programs] without transforming to a certain extent the field as a whole—bringing on, in short, a paradigm shift. And it seems as though our work is already calling into question many of the premises of earlier models of historiography and analysis. But if some degree of destabilization has occurred, the new questions and horizons that have been opened up more than compensate. (McClary 1991: xiv)

The extent to which this perspective has endured is evidenced in Abbate's description of the field, written thirteen years later and cited in the first section of this paper, which appeals to the idea of "revolution" to describe the way that music scholarship

needed to change in order to accommodate to hermeneutic approaches. The "revolutionary" narrative that is embraced in the foregoing quotation by McClary and that is reflected in the writings many of her critical contemporaries traces its origins to Thomas Kuhn's theory of the "paradigm shift," which asserts that

> once it has achieved the status of paradigm, a scientific theory is declared invalid only if an alternate candidate is available to take its place. …the decision to reject one paradigm is always simultaneously the decision to accept another, and the judgment leading to that decision involves the comparison of both paradigms with nature [i.e., with the object of study] *and* with each other. (Kuhn 1962: 77)

The term "paradigm" is used in Kuhn's treatise to refer simultaneously to a philosophical perspective held in common by a group of scholars and to its embodiment as a methodology or as a set of methodologies. In using the term in two different ways, Kuhn conflates theory with practice, and we shall see that this becomes a stumbling-block in his theory. For the moment, however, and to avoid confusion, the former type of paradigm will be identified as a "conceptual framework," to symbolize a shared set of hypotheses and beliefs about a given object of study, while the latter will be identified as a "methodological framework," to denote a set of research tools that define how a group of practitioners will undertake their study of that object. In the Kuhnian model, the history of any scholarly discipline can be traced through periods that are dominated by a particular conceptual framework and by the research practices that support the perspective that lie behind this framework. Like their political counterparts, reigning conceptual frameworks are believed by proponents of the model to assist in defining questions and directions for researchers in a field, but they are also seen to become so entrenched over time that they eventually prove themselves incapable of adapting or responding to new research problems and discoveries that appear in the field. Kuhn suggests that the emergence of new challenges to the field will serve as the catalyst for conceptual change and will force the scholarly community to retool the methodologies associated with a reigning conceptual framework or to risk its invalidation and elimination from the field. In cases where the framework cannot adjust, and its methodologies fail to adapt to new

challenges, a competitor framework will seize control of the discipline in a kind of conceptual coup d'etat, and will establish itself, and its research methodologies, as the new reigning perspective in the field. Kuhn explains that

> the emergence of a new theory breaks with one tradition of scientific practice and introduces a new one conducted under different rules and within a different universe of discourse, [and] is likely to occur only when the first tradition is felt to have gone badly astray. … The resulting transition to a new paradigm is scientific revolution. (Kuhn 1962: 85-86, 90)

The "revolutionary" narrative played itself out in descriptions of musical scholarship in the 1990s in an alleged shift from the established "tradition" of "composer biography, archival history, and strict formalism" to the "new" analytical models that arose out of "criticism and hermeneutics." At the level of the conceptual framework, this shift expressed itself in the move away from the musical text as the locus of music's meaning and towards the cultural context of its creation or reception, and this description of the state of the field seems entirely accurate in light of the many studies undertaken at that time that explored issues of cultural and historical context. However, if we accept that musical scholarship experienced this kind of shift in orientation vis-à-vis meaning, Kuhn's theory of scientific revolution would lead us to expect that this change would also be reflected in the adoption of new research methodologies that are, as Kuhn says, "conducted under different rules and within a different universe of discourse." Specifically, we would assume that formalist methods designed for the analysis of the musical text, like Schenkerian and set-theory, would be replaced by approaches that are more suitable for interpretations that arise from a study of the relationship of musical objects to the cultural environment that produces and sustains them. But despite critical predictions, like McClary's, that the field would emerge "transformed" after the "destabilization" of the 1990s, the enumeration and statistical study of research published during the past twenty years in the field of music theory that will appear later in this essay will reveal that our methodologies have tended to remain relatively consistent over the last several decades, suggesting that scholarship has not experienced the degree of change prophesied by critics a generation ago. For now, we might illustrate this conceptual

stability with the following description of the 2007 reissue of David Lewin's *Generalized Musical Intervals and Transformations*, which was timed to commemorate the twentieth anniversary of its original publication in 1987. Using terminology that is oddly reminiscent of Kuhn, Joseph Dubiel suggests that our renewed scholarly interest in Lewin-style formalist analysis represents yet another

> shift in the discipline's conception of its methods, even its goals, to the point where imitation of the books (of their imitable aspects) could become a career path. In a renewed encounter with the originals, we are confronted once more by Lewin's intellectual probity, his intense concern with every construction's relation to hearing (which need not mean anything so simple as that every construction is heard), his fastidious eschewal of hype. With these tokens as exemplary, the field would change again. (Dubiel in Rings 2006: 111)

Dubiel is not alone in his praise for the book, and most scholars would agree with his description of its importance to the field of music theory. However, it's popularity among current practitioners of music theory also poses an interesting problem for those who would ascribe to a Kuhnian model of conceptual change, because this model cannot account for a "shift in the discipline's conception of its methods [and] goals" that would continue assert formalism as its conceptual framework, particularly in light of predictions that this framework would be abandoned the apparent disciplinary "crisis" of the mid-1980s and the 1990s.

The inability of the Kuhnian model to account for the type of "shift-back" to an older conceptual framework described by Dubiel, and the ongoing interest in formalist research that will be illustrated in the ensuing discussion, forces current observers to rethink the analogy to political upheaval and to consider the possibility that

> paradigm-switches are never as complete as the fully-fledged definition implies; [that] rival paradigms never really amount to entire world-views; [and that] intellectual discontinuities on the theoretical level of science conceal underlying continuities at a deeper, methodological level. … we must ask ourselves whether the use of the term 'revolution' for such conceptual changes is not itself a rhetorical exaggeration. (Toulmin 1972: 106)

Indeed, it is Stephen Toulmin, himself, who provides a valuable alternative to the model that he critiques here and to the description of conceptual change that it has

spawned for those who have attempted to explain the growth and development of knowledge in the field of music theory.

3. Conceptual Change and the Metaphor of Evolution

A conceptual model that seems to hold more promise than one premised on the analogy to political upheaval is one that has tended to be overlooked by critical observers of music scholarship, likely because the narrative that it presents is less dramatic than the one just described and therefore fails to capture and to sensationalize the sense of crisis felt by those who observed the changes in music scholarship the 1990s. The proposed model draws an analogy between conceptual change and biological evolution, and posits a correspondence between the research methodologies that populate a given scholarly field and the species of living organisms that are native to a particular natural environment. Put differently, the embodiment of a given species by a group of individuals who share common and defining characteristics finds its equivalent in the embodiment of a conceptual species by a group of research projects that emanate from a common methodology. Implicit in this analogy is the further correlation between a natural environment, as the ecosystem that sustains various life-forms that are subject to change through evolution, and a conceptual framework, as the habitat of research methodologies that are likewise subject to change.

According to this theory, a natural or conceptual environment is, by definition, rich with various species of organisms that have found unique ways to adapt to their ever-changing surroundings. In this model, conceptual change, like its biological correlate, will occur when a species of research is faced with a problem that lies outside its immediate environment. Each new problem that presents itself to a given scholarly habitat, like each new change in a given natural environment, will alter that field, and, by extension, its methodologies, in subtle ways. These changes will tend to be gradual, ongoing, and often imperceptible to the observer or to those who inhabit the field. So while Kuhn might argue that methodologies exist solely as a reflection of

the philosophical positions that they are designed to support and that any change in these methodologies threatens the stability of an existing conceptual regime, an evolutionary approach to conceptual change conceives of methodologies as mutable in the face of the fluid environment that is believed to constitute a scholarly field. This model therefore embraces change as a necessary ingredient to the survival of a species of research in the field, and admits the possibility that, when faced with questions that arise from outside a given conceptual framework, scholars do not necessarily have to abandon a given research methodology if it can made to adapt to the new environment within which it finds itself. The philosopher Stephen Toulmin, an early proponent of the analogy between conceptual and biological evolution, argues that

> through most of intellectual history, the stability and universality of our fundamental forms of thought has been regarded as proper and natural: intellectual change has been the "phenomenon" needing to be explained, or explained away. Our present stance reverses the situation. Intellectual flux, not intellectual immutability, is now something to be expected: any continuous, stable or universal features to be found in men's actual patterns of thought now become the "phenomenon" that call for explanation. (Toulmin 1972: 96)

Toulmin suggests that conceptual change, like its biological counterpart, is an ongoing process that arises in response to the ever-changing environment within which methodologies and their users exist. However, he also insinuates that species of research, like any other kind of species, face the possibility of extinction when faced with an environment to which they cannot adapt. A form of conceptual "revolution" therefore remains a possibility in an evolutionary explanation of scholarship, since the demise of an existing species (in this case, a species of research) will open the field to a new species that is better suited to the challenges posed by a given environment. Acknowledging the possibility of "revolution" without invoking the term, one of Kuhn's harshest critics, Karl Popper, explains that

> Error-elimination may proceed either by the complete elimination of unsuccessful forms (the killing-off of unsuccessful forms by natural selection) or by the (tentative) evolution of controls which modify or suppress unsuccessful organs or forms of behaviour, or hypotheses. (Popper 1972: 242)

The theory of "natural selection" to which Popper refers has been the most contentious Darwinian concept, and likely needs some explanation here. The idea

behind the theory is that species will inherit certain observable traits, or "phenotypes," from their forebears, and that these traits will endure from one generation to another because they present advantages to the survival of the species. In a biological setting, for example, an organism might inherit a particular ocular structure from its forebears that has been proven to facilitate night-vision and to allow that organism to hunt and to be aware of its predators. The advantages presented by this trait would likely mean that it would endure from one generation to the next. On the flipside, organisms are also subject to mutation as they reproduce themselves over the course of many generations, to allow unfavorable or unnecessary characteristics to be bred out of the species. The progeny of the biological organism that possesses keen night-vision but whose skin color makes it visible to others with whom it coexists in a nocturnal setting, for example, might be predicted to darken in colour with each successive generation to ensure that the species is not hunted into extinction. In scholarship, the theory of "natural selection" can be used to explain how a conceptual species, or a species of research embodied in a particular methodology, behaves within the scholarly environment that it inhabits. Like its biological counterpart, a methodology possesses certain "phenotypes" that define the methodology for a set of practitioners and that differentiate it from other methodologies in the field. Some conceptual phenotypes will remain constant over time and will be retained because they have proven themselves able to respond adequately and effectively to the demands of the field in which they exist. For example, the species of research embodied as Schenkerian analysis defines itself by its retention of such phenotypes as its "background" structure and by the various graphic processes used by its practitioners to represent the functions of, and relationship between, pitches, motives, and harmonies that reside on the musical surface. However, like the natural environment that sustains biological species, the conceptual field is not static but, rather, poses ongoing challenges to the species that reside within it. In the case of Schenkerian analysis, for example, the appearance of new repertoire (most recently, popular music) and new kinds of research questions (like those that attempt to explain the cultural or social context of musical works) has tested the theory to see if it can

provide convincing solutions to the new research questions that have emerged in the field as a result of scholarly attention on new repertoire. The results of such a test will be that the species will either adapt (as this one has, according to the evidence presented below) or face extinction and replacement by a species that can respond more adequately to the new challenges in the field.

4. Evidence from the Field

The Kuhnian conceptual model of revolutionary change has been the subject of various criticisms over the years (notably in Lakatos 1970, Popper 1972, and Feyerabend 1975), and while my purpose here is neither to provide a comprehensive catalogue of its perceived failings nor to test or counter every charge leveled against it, I would like to focus upon a couple of particularly problematic aspects of the theory so that I might advocate in my concluding remarks for an evolutionary description of conceptual change in the field of music scholarship that follows the model proposed by Toulmin. While Kuhn attempts to prove his hypotheses about conceptual revolution with reference to such major scientific shifts as heliocentrism and atomic theory, his mistakenly concludes that any type of disciplinary change will echo the "seismic shifts" engendered by these rather extraordinary examples of conceptual change. However, in looking for further instances of revolutionary shifts, his theory obscures, and actually misrepresents, the everyday practice of research. Kuhn alleges that in day-to-day, "non-revolutionary," research, any research undertaken within a particular field will aim to preserve the integrity of that field by directing itself towards a single goal and by reflecting a common conceptual framework. In other words, he would assert that while different methodologies can coexist within a shared conceptual space, they can only do so it they are directed towards a common research objective (as, for example, the Schenkerian and set-theoric methodologies, which can presumably coexist because each is designed to cull musical meaning from the text and therefore represent different approaches to a broader formalist agenda). Second, Kuhn argues that the appearance in a conceptual

field of any alternative world view, embodied as a methodology whose perspective differs from that of the mainstream conceptual framework, will always represent a threat to the integrity of that field and will therefore spark a conceptual revolution. For example, the intrusion of "criticism and hermeneutics" in a field that was otherwise oriented towards "strict formalism" would represent a challenge by the former to the latter, the outcome of which would either be the replacement of formalist work by critical theory or the reassertion and reaffirmation of formalism as the dominant conceptual framework. In other words, research approaches whose objectives differ from each other cannot coexist peacefully in the revolutionary model.

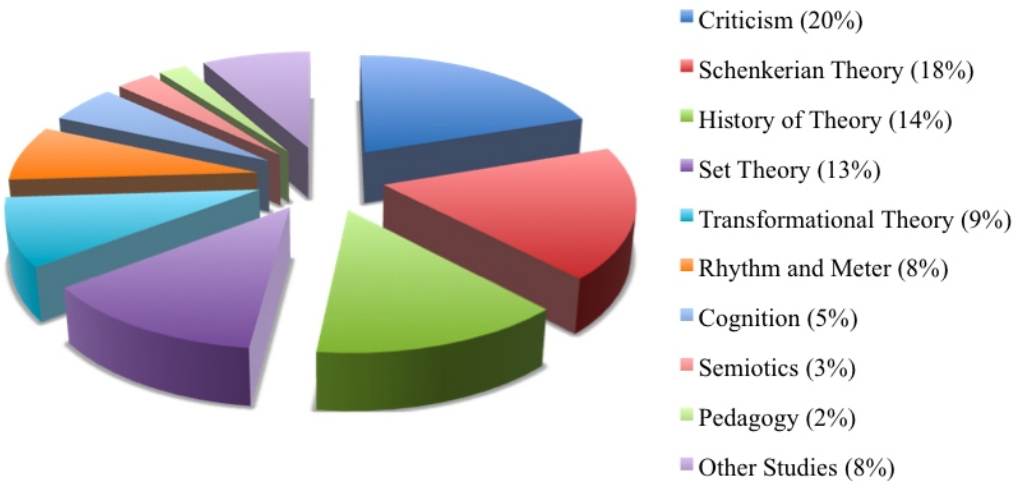
These basic Kuhnian assertions, and the "revolutionary" narrative that they support, can be summarily debunked by an examination of the practice of research in music theory. My critique is supported by data collected from a twenty-year period in the history of music theory, and in particular from a sample of 171 articles drawn from such preeminent publication venues as the *Journal of Music Theory* (hereafter, JMT), *Music Theory Spectrum* (MTS), *Music Theory Online* (MTO), and *Music Analysis* (MA). My sample comprises each feature article published in 1990, 1995, 2000, 2005, and 2010 (in the case of MTO, whose inaugural issue appeared in 1993, the sample will begin with the 1995 issue). One exception to my five-year cyclic approach to data-collection is MA, where I substitute the 2009 issue for the 2010 issue, which had not been released by the time that the data for this study was collected. These journals were chosen over others in the field of music scholarship because they have tended to define the subfield of music theory to its practitioners and because the musical focus of each of these journals is perhaps broader than such alternatives as *Popular Music* and *Perspectives of New Music*, where theorists have also published widely. A similar kind of study of the field could have culled its data from other sources – dissertations in the field, conference papers, or books – but each of these poses its own challenges to the researcher: dissertations are often hard to obtain and may not be as widely read as journal articles; conference papers are often ethereal, unattainable in hard copy, and subject to revision; and book-length projects

present the researcher with a substantial amount of reading before conclusions about the field can begin to be drawn.

Some of the articles collected for the current study have been categorized according to the analytical methodologies that predominate within (these include Schenkerian and set-theory, transformational analysis, studies of rhythm and meter, and semiotics). To give a couple of examples, an article like "ic1/ic5 Interaction in the Music of Shostakovich" (MA 2009) would represent a study that uses set theory as its analytical tool, whereas the article "The Cadential Six-Four as Support for Scale-Degree Three of the Fundamental Line (JMT 1990) would represent a Schenkerian study. In cases where the article is not music-analytical in scope, categories are proposed to embrace other types of scholarly pursuits, such as pedagogy, cognition, and the history of theory. Examples of each of these include, respectively, the articles entitled "Pedagogical Applications of the Video Game *Dance Dance Revolution* to Aural Skills Instruction" (MTO 2010), "Entropy as a Measure of Musical Style: The Influence of A Priori Assumptions" (MTS 1990), and "Rameau and Zarlino: Polemics in Traité de l'harmonie'" (MTS 2000). Some analytical studies in the data-set claim no overt allegiance to an existing methodology but, rather, propose their own unique solutions to the problems that they raise for study. These are grouped together under the rubric of "other studies" and include such essays as "Tolling Time" (MTO 1995) or "A Calculus of Accent" (JMT 1995). The largest category of articles in this study of the field comprises essays of a critical nature that deal predominantly with philosophical issues, aesthetics, or critical studies of music scholarship. These articles share as their common objective the quest for musical meanings from the relationship of music to other cultural artifacts, and either propose methodologies designed to assist in this quest (as in the study entitled "Gendering the Semitone: Fourteenth-Century Music Theory and the Directed Progression," MTS 2005), demonstrate how these methods might be used (for example, "Recursive/Discursive: Variation and Sonata in the Andante of Mozart's String Quartet K. 590," MTS 2010), or critique the field in order to advocate for extra-musical meaning (as in "Compromise, Conflation, and Contextualization in English Music(ology)," MA 2000).

Figure 1 illustrates the degree to which each type of study is represented as a percentage of the entire data-set of 171 articles. What is immediately apparent, and what challenges the Kuhnian notion of a single reigning conceptual framework, is that through the twenty-year period that spans 1990 to 2010, the field has been populated by many types of research approaches whose scholarly objectives may or may not overlap. On the one hand, fig. 1 demonstrates the strong presence of "formalist" methodologies in the data-set, where Schenkerian, set-, and transformational theory represent 45% of the 171 articles that comprise the survey. On the other hand, the figure also illustrates a sizeable representation by musical criticism, which contributes 20% of the articles to the data-set and which represents the largest single body of scholarly literature within the set. Fig. 1 thereby suggests a degree of peaceful coexistence among methodologies in the subfield of music theory, which would belie the idea of competition for hegemony between "hermeneutics" and "formalism" and the narrative of "conceptual revolution."

Figure 1
Share of the Field 1990-2010



Perhaps more telling than fig. 1, however, is the yearly break-down of some of the predominant approaches represented in the sample, which serves to demonstrate their growth or decline over time and relative to one another. In a narrative of "conceptual revolution," we would expect that the rise of "criticism and hermeneutics" would be matched by the decline of "formalism," however this does not prove to be the case in

the articles that comprise this survey. In fig. 2, the recent history of three of the most popular "formalist" approaches (based on their representation in fig. 1) are juxtaposed against the history of critical theory, and the historical trajectory of each approach is represented from 1990 (the lowest bar in each cluster) to 2010 (the highest bar). The data presented in fig. 2 represents the annual percentage of published articles in each area, calculated from the number of articles that use each approach in relation to the number of articles published in a given year. For example, out of a total of 42 articles published in the 2010 issues of the four journals polled for this survey, analytical studies that used the Schenkerian methodology totaled 4, or 9.5% of the total yield of articles in that year (see below).

Figure 2
Annual Yield of Articles by Research Interest

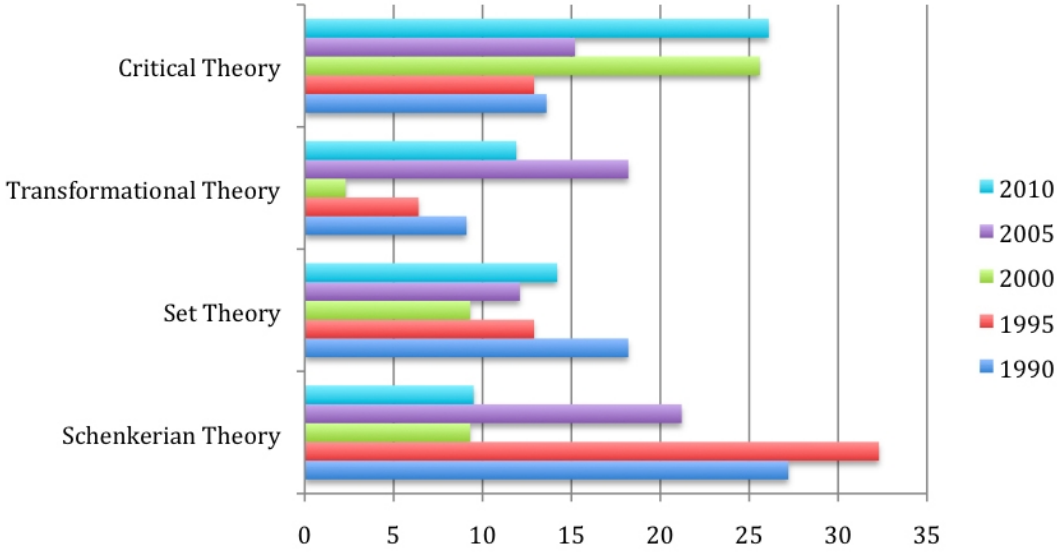
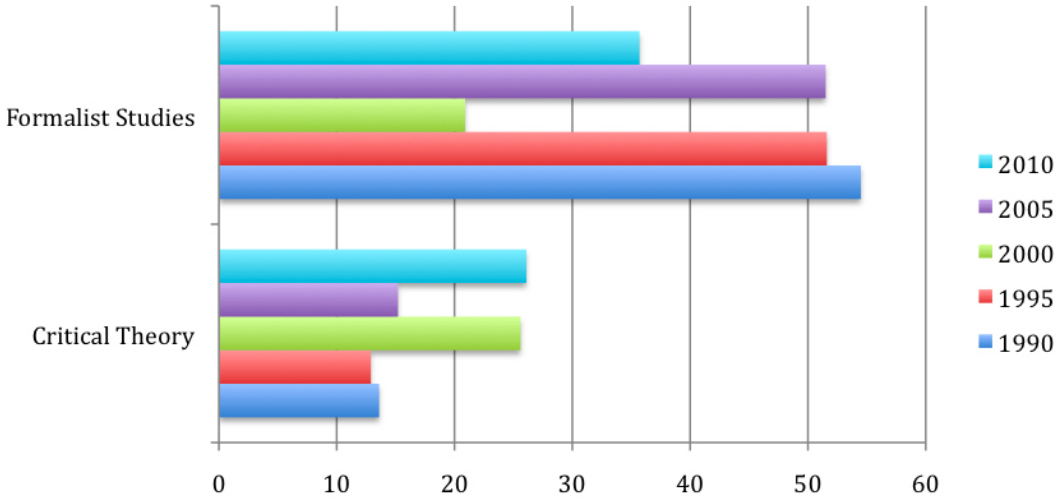


Fig. 2 demonstrates that while critical studies of music have gained ground steadily, rising from 13% of the data-set in 1990 to 26% by 2010, these advances have not lead to the obliteration of "formalist" research, as a "revolutionary" narrative of conceptual change would lead us to expect. While it might be true, based on the current data, that the use of Schenkerian and set-theory appears to have waned in this survey of music-theoretical scholarship, these methodologies nonetheless continue to exert their influence over analytical research in certain circles and, when taken together, articles

that feature these two methodologies nonetheless represent 23% of the studies surveyed that were published in 2010. Moreover, one might speculate that transformational theory, a formalist approach to analysis that tends to lend itself to a similar repertoire as Schenkerian theory, has benefitted as much as critical theory from the apparent decline in the use of Schenkerian analysis, so that the weighting of formalist analysis within the sample can be said, in part, to have redistributed itself from one such methodology to another.

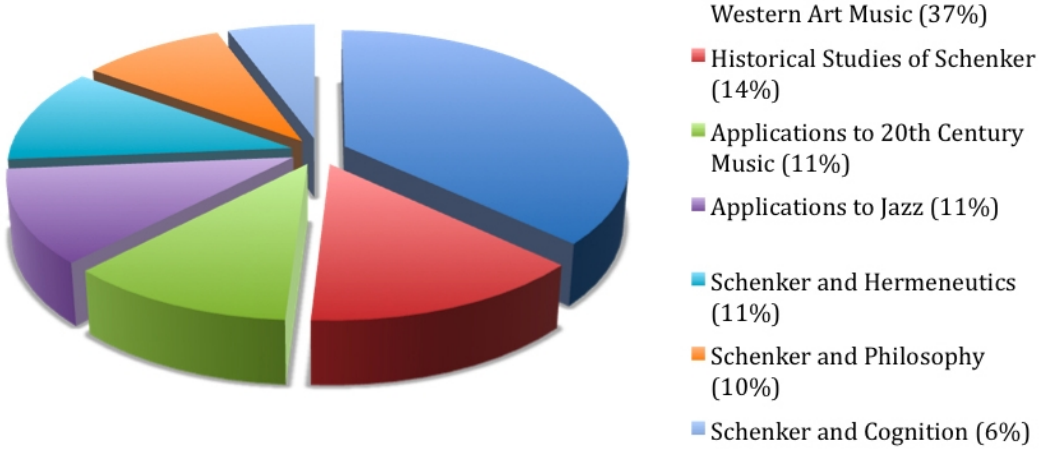
If we combine the three "formalist" methodologies represented in fig. 2 and compare their use in scholarly literature against "criticism and hermeneutics," we discover that, as a conceptual framework, formalism continues to maintain a strong presence in the subfield of music theory, regardless of the methodology through which it expresses itself. In fig. 3, the proportional representation of Schenkerian, set-theoretical, and transformational studies are combined under the rubric of "formalism," and their total numbers are compared to those of critical theory over the scope of twenty years. The figure shows that critical theory has yet to eclipse its formalist counterparts in terms of total representation within the field and, instead, appears to exist alongside the methodologies that it was meant to supersede, at least as Kerman and his followers predicted.

Figure 3
Annual Yield of Articles using Formalist and Critical Methods



While the three foregoing charts provide a bird's-eye view of the coexistence of different conceptual frameworks in the field of music theory, and thereby disprove the Kuhnian assertion that the interests of scholarship are served best by the adoption of, and adherence to, one conceptual framework, I remain unconvinced that a disciplinary "split" like the one that I have artificially constructed for the purposes of argument truly captures the nuances of music scholarship as it is practiced "on the ground." One of the difficulties in the current study has been to categorize the many articles that appear to span two or more categories – in order to make these representative articles fit neatly into one of the categories of fig.1, I have taken the rather heavy-handed approach that I have merely looked at the methodology used in each case and categorized the essays from there. A more nuanced reading of the field would therefore require a closer look at that individual studies that comprise each category in fig. 1, both to determine what it means to practice scholarship under one of its ten rubrics and to show the variation of research that might emerge from each of these approaches. As a preliminary foray into what would admittedly be an immense undertaking, even with the limited studies examined here, fig. 4 looks more closely at one of the methodologies identified with music theory:

Figure 4
Interdisciplinary Connections with Schenkerian Theory



The sample features 35 articles that address Schenkerian theory, of which 31 are analytical (these have been used in fig. 1 to determine Schenker's 18% share of the data-set) and 4 of which are historical (and have therefore been added to the other studies that comprise the "history of theory" in fig. 1). As fig. 4 reveals, the essays that coalesce under the "Schenkerian" rubric are highly diverse, and the application of the methodology ranges widely in scope from Western art music (the repertoire for which it was "conventionally" designed) through jazz and modern music. Examples include such essays as "Modes, Scales, Functional Harmony, and Non-Functional Harmony in the Compositions of Herbie Hancock" (JMT 2005) and "Prolongation in the Music of Benjamin Britten," MTS 2010, respectively. Schenkerian theory has also yielded several hermeneutic essays, among which "Aspects of Sexuality and Structure in the Later Symphonies of Tchaikovsky" (MA 1995) and "Grief in 'Winterreise': A Schnkerian Perpsective (MA 1990) serve as an examples, while other essays have examined the theory from a more historical perspective, as in the essay "Musical Form and Fundamental Line: An Investigation of Schenker's *Formenlehre*" (MA 1995). Other essays take a more philosophical view of Schenker, as in "Schenker's Value Judgements" (MTO 1995) or merge the methodology with cognition, for example the essay on "The Triad as Place and Action" (MTS 1995). What fig. 4 demonstrates more broadly is that the research approaches delineated in fig. 1 often overlap, so that while a study might invoke an analytical methodology that appears, on its surface, to derive from a particular conceptual framework, the degree to which this kind of characterization might be true requires us to look at each study in the data-set. The break-down of Schenkerian studies, for example, reveals that the assumed "formalist" mandate of the Schenkerian approach does not necessarily preclude fusion with approaches whose objectives may differ from those of Schenkerian analysis. The figure shows the versatility of the methodology in the face of research questions for which it was not originally designed, or, to use an evolutionary term, it shows the capacity of Schenkerian theory to "adapt" to, and to "fit," the ever-changing conceptual environment of music theory.

5. Making the "Shift" from a Revolutionary to an Evolutionary Conceptual Model

In the data examined here, it appears that "formalist" analytical approaches used in music theory scholarship, like Schenkerian theory, have adapted with relative ease to questions about the cultural context within which musical works are created and received, and also to questions about perception, pedagogy, and philosophy. This ability of a formalist method like Schenkrian theory to adapt to a changing disciplinary environment without recourse to the kind of upheaval associated with a conceptual revolution begs an observer of the field of music scholarship to consider the possibility that knowledge in the field has *evolved* during the time frame examined here, rather than to argue that the field has witnessed a "paradigm shift." In other words, it challenges us to consider that a conceptual model premised on the principles of evolution might provide a better representation of conceptual change overall for the field of music scholarship. As Toulmin suggests,

> [Kuhn's theory assumes] the existence of discontinuities in scientific theory far more profound and far less explicable than any which ever in fact occur. (Toulmin 1970, 41)

Given the trends that emerge from the data-set presented in this study, it seems more reasonable to assert that conceptual change is incremental, rather than revolutionary, and that change arises out of subtle alterations to the disciplinary environments within which research methodologies exist. It might also be possible to show that an apparent change in a conceptual framework does not require scholars to discard existing methodologies if they can be made to adapt to their new and changing surroundings. And it might be likewise possible to imagine that the field of music scholarship, as the environment that sustains various species of research, is even variegated at the level of the conceptual framework, itself. In other words, we might consider that a field can be dominated by coexisting frameworks that complement each other, rather than cancel each other out, which is an idea that would be anathema to Kuhn.

To test these hypotheses about conceptual change, we might refer again to the data that I have presented in the preceding section of this essay. This discussion

accepts the basic premise that lies behind such critical comments as those offered by McClary when it proceeds from the assumption that the appearance of certain questions in the field that arise, in this case, from the desire to seek a cultural interpretation for musical works has had the effect of "transforming the field as a whole." There can be little doubt that McClary's work on gender, as one of many examples of interpretative research from the 1990s, has brought a perspective on musical scholarship to the field that did not exist prior to her arrival in that field, and we should not question or minimize the transformative significance of her work, or of the work performed by any of her critical contemporaries. Rather, it is the *nature* and *degree* of the transformation that I would like to address in these concluding comments.

McClary's characterization of the critical observations of music scholarship in the 1990s "bringing on … a paradigm shift," and Abbate's later claim that Kerman-style criticism aimed to trigger a "disciplinary revolution in musicology," seems to be overstated in light of evidence drawn from the field of music theory. If we had, indeed, lived through a conceptual revolution of the magnitude, say, of the Copernican revolution presented by Kuhn as a typical example of conceptual change, we would have expected to see the abandonment of "strict formalism" in favour of "criticism and hermeneutics." And if this was truly the case, an observer of research performed in from 1990 through 2010 would expect to see little (or no) effort devoted to the pursuit of meaning in the musical text and, rather, would anticipate that scholarship would construct musical meaning almost exclusively from the context of the composition or reception of that text. The data presented here foils such expectations because it demonstrates that scholars have relied, and continue to rely, upon analysis and interpretation for the readings that they construct for musical work, or, as Karol Berger has said there is "plenty of interpreting going on" by those who "continue to bring out critical editions" (or, in the case of music theory, who continue to appeal to formalist analytical methodologies). What the data suggests, then, is that like a natural environment to which it is compared in an evolutionary view of conceptual change, the field of music scholarship cannot be conceived

monochromatically as the expression of a single reigning conceptual framework, since this characterization of the field forces an either/or choice that cannot explain how anomalies might thrive in the field. Put differently, a field that is believed to be dominated by one world view (say, "formalism") cannot explain the appearance of research that points to a different view (say, "hermeneutics and criticism"), particularly if the latter is used successfully to inform a reading that arises from the former (as we have seen in fig. 4). A more feasible explanation of the peaceful coexistence of analysis and interpretation arises from an evolutionary perspective. To draw the analogy to natural selection, we might argue that if two species of research merge and breed within a given conceptual habitat, the best characteristics of both will be retained by the next generation to ensure that each parent continues to survive vicariously through that offspring and to guarantee that the offspring will flourish in the field. The impulse felt by species of research to merge and to reproduce in this way will arise from the circumstances presented to these species in the field, whose challenges will force a methodology to adapt in any way possible or risk extinction. If, for example, a field that appears to lean towards a formalist perspective on musical meaning begins to entertain questions about the locus of meaning in the context of its reception, an existing methodology (say, a structural analysis of sonata form) can adapt to these questions by pairing with another methodology (say, literary analysis). Similarly, a field that appears to seek meaning in certain pitch structures (expressed, perhaps, as referential collections) can also posit broader cultural meanings for those structures (perhaps as they reflect the state of mind of a particular composer) through a merger with a methodology designed to facilitate that type of reading. If we accept that research practices are in a constant state of flux as they adapt to an ever-changing conceptual environment, we can finally bring the discussion full-circle to Dubiel's remarks about the most recent trend towards analysis in music theory, in which he describes current and growing scholarly interest in transformational theory as a "shift in the discipline's conception of its methods [and] goals." Where a Kuhnian reading of the field would be at a loss to explain what he means by a "shift," and could only account, albeit implausibly, for the appearance of transformational theory in the field

as a "shift back" to a conceptual framework that had presumably been abandoned during the supposed "disciplinary revolution" of the 1990s, a conceptual model based on evolutionary principles would never be required to admit a "shift back" because it perceives the field as fluid and ever-changing. The implication in Dubiel's statement is not that we have "shifted back" but, rather, that the conditions that characterize the environment within which we currently perform research represent a shift in and of themselves. And this shift in the field has made conditions favourable for the methodologies that are currently adopted and employed for research in the field of music scholarship. At the same time, and once incorporated into the field, those methodologies will also be subject to modification as they are forced to adapt to changes in their conceptual environment.

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Hush… The Lights are Dimmed: A Case of Situational Silence

Dennis Kurzon, Department of English Language and Literature,
University of Haifa, Israel

Abstract

The aim of this article is threefold. Firstly, the article attempts to use pragmatic analysis in the context of musical and other theatrical performances. Secondly, it offers further support for the typology the author has proposed in previous articles. Here he relates to the silence in live theatrical and musical performances, which, it is argued, are instances of situational silence. Thirdly, against the background of Goffman's frame analysis, in which the silence is regarded as a frame of the performance indicating that the performance is about to begin, and should not be regarded as part of the performers/audience interaction, the author argues that the silence is communicative for two major reasons: in certain registers of performances such as pop concerts silence does not occur at such junctures, and in musical performances, the silence of the audience and the performers may be considered part of the work.

1. Introduction

Live performances in the concert hall and the opera house, as well as in the theatre, begin with some introductory event that indicates to the audience that the performance is about to commence. The audience in many, if not in most, cases falls silent in readiness for the performance. The paper addresses the function of this silence, examining whether it may be regarded either as part of the performance or as part of the situation that exists before the performance, in other words whether or not the silence functions as the *frame* of the performance.

One of the basic meanings of the word "frame" relates to a physical object, usually made of wood, within which may be placed a painting or other objects to be displayed. A question that has arisen in the field of painting, for example, is the function of the physical frame in relation to the painting, whether it is external to the work of art, or whether it is part of the painting itself. If considered external, it does not seem to communicate in the usual meaning of the word, but it does silently signal the following situation to the observer: within the frame is a picture. If regarded as internal, that is if it is a part of the work of art, it is communicative – it may be interpreted in relation to the work itself. In that case, the frame is expressing something about the work it surrounds. The same question was dealt with by Kant in his discussion of the *parergon* in his *Critique of Judgment*, according to which the frame is outside the work of art. Derrida (1987), among others, however, has argued that it may be considered an integral part of the work. In his paper "The Silence Surrounding a Painting," Bernard Fibicher writes that the frame

> is enhanced by one single device: the purpose of which is not just decorative. The edges of the frame are a boundary, the end of the picture. The most rectangular plane looks as if it were cut from something indefinitely larger, from something we can only *feel*. Similarly, each verse of a poem is separated from the following one by a blank space: a margin of silence. The less said in the poem, the bigger the white margin of silence grows. (1982: 14)

If this interpretation of the frame of a picture is acceptable, then, the frame is communicative, or, as we shall see, metacommunicative.

The concept of frame has been metaphorically extended to other phenomena – to auditory and articulatory acts, for example, as argued by Bateson (1972), who was one of the first in the field of discourse analysis to introduce the term "frame", a concept he considered metacommunicative, that is, an act of communication which says something about how to interpret the act itself. “Any message,” he writes, “which either explicitly or implicitly defines a frame, *ipso facto* gives the receiver instructions included within the frame”. This concept was adopted by Goffman in his *Frame Analysis* (1986 (1974)) and in other works, in which he argues that "definitions of a situation are built up in accordance with principles of organization which govern events – at least social ones – and our subjective involvement in them” – this is frame" (1986: 10). In other words, the boundaries of an activity or event and limitations as to the contents of the activity are defined by the frame.

The question to be discussed in this paper, then, is whether silence functions as the frame in performances in the opera house or concert-hall. The idea that the frame of a picture may be considered some type of metaphorical silence may be reapplied with regard to real silence that functions as a metaphorical frame in musical performances.

In the second section, a typology of silence will be presented, which distinguishes four types of silence, one of which may be considered to be the silence in the specific situation under discussion, to be followed in section 3 by a discussion of frame in relation to live performances. Section 4 presents a survey of types of audience/performer interaction, while in section 5 the question will be asked whether pre-performance silence is a frame in its communicative or metacommunicative sense. A conclusion is presented in section 6.

The term "performance" in this paper is taken to refer to the proceedings that occur on stage (or in some similar functional area) in front of an audience, as defined by Beeman (2010: 119): "performance is purposeful enactment or display behavior carried out in front of audience". In other approaches, e.g. Schechner (1988), performance is used to cover the entire set of activities which includes people going

to the theatre, "ticket-taking, passing through gates, performing rituals" (1988: 169), as well as interacting in some form or another with the performers. The term "speech event" or simply "event" – used in discourse analysis and sociolinguistics – would adequately cover this series of activities.

2. A Typology of Silence

In Kurzon (2007a), a typology of silence was proposed consisting of four types of silence in social interaction. Firstly, we have conversational silence, which is the type of silence usually examined in discourse analysis. Here, we are referring to the silence of a person who does not respond when being addressed, or as Sacks et al. (1974) put it, the addressee is selected by the current speaker but does not take the floor. Conversational silence may also occur when an apparent participant in a conversation does not in fact take part. S/he is physically present, but psychologically non-present (Gurevich 1989; Kurzon 1998). Interestingly enough in this case, it is the person's silence that may draw the attention of other participants to him or her, making the silent person present.

The second type of silence, termed textual silence, occurs when a person or a group of people are reading a text in silence, for example, when a person in his or her living room is reading a book or newspaper, or when a class of schoolchildren have been told by their teacher to read a passage in silence. Thirdly, there is situational silence, which is similar to textual silence, but in this case, while a person or, more usually, a group of people are silent, they are not reading or reciting any particular text. This type of silence may be illustrated by the one- or two-minute silence during war remembrance ceremonies, and by silence in certain types of theatrical performance (see Kurzon 2007b, and this article). Lastly, we may talk of the silence of a speaker who does not relate to a particular topic or theme, termed thematic silence. A frequent case of this is the politician who does not speak about a topic that may embarrass him or her, or that may be tactless to speak about in the particular circumstances.

What the first three of these types of silence – conversational, textual and situational silence – have in common is that these types may be timed. We may talk of a silence of half a second in a conversation (usually called a pause), to the few minutes it may take to read a newspaper article, and perhaps to a lifetime in the case of a monk who has taken a vow of silence. Thematic silence, on the other hand, is in effect not silence. The speaker is speaking, and his or her silence about a certain topic may be glossed as "s/he is silent about" a topic. This is metaphorical silence. The word *silence* is used in everyday language to refer to this silence, too, even when speech is taking place. In many languages, by the way, e.g. French, Korean, Russian, the word for "silence" or "silent" is not used in such a case (see Kurzon 2009).

Jaworski (1997: 17) distinguishes a number of silences involved in a theatrical or musical performance. One is what he calls narrator's, or performer's, silence which is addressed to the audience in the "performance" frame, as opposed to the characters' silence addressed to one another in the "inner" frame (for 'frame', see section 1 above and section 3 below), for example, the pauses and silences found in the drama of Chekhov, Beckett and Pinter. In this paper, the silence I shall be focusing on is that of an audience in an opera house or concert hall, and not on the silence that may occur on stage in the dialogue of the various characters in a play, which constitutes conversational silence.

The situation I will principally examine is the silence of the audience and performers in the opera house or concert hall before the performance begins. While I argue that this silence may be an instance of situational silence and is communicative, another approach using the concept of frames suggests that this silence may be considered to be metacommunicative.

3. Frame analysis and performances

This section expands on Goffman's Frame Analysis (3.1) introduced in section 1, and discusses the concept of breaking the frame (3.2) in the context of theatrical/musical performances.

3.1 *The Frame*

In his discussion on the relationship or interaction between performer and audience, Goffman argues that

> in considering legitimate stage performances, it is all too common to speak of interaction between performer and audience. That easy conclusion conceals the analysis that would be required to make sense out of this interaction, conceals the fact that participants in a conversation can be said to interact, too, conceals, indeed, the fact that the term "interaction" equally applies to everything one might want to distinguish. (1986: 127)

Goffman regards the audience in some way alienated from what is happening on stage:

> During a performance it is only fellow performers who respond to each other in this direct way as inhabitants of the same realm; the audience indirectly, glancingly, following alongside, as it were, cheering on but not intercepting. (1986: 127)

Hence, Goffman searches for the frame to a performance, and this may be the silence of the audience before the performance begins, when the lights are dimmed. This silence is a frame and, Goffman argues, does not indicate performer/audience interaction.

Goffman reflects, too, the traditional approach to the role of the audience at a performance, as maintained by Susan Sontag (1969: 8):

> Elites presuppose masses. So far as the best art defines itself by essentially "priestly" aims, it presupposes and confirms the existence of a relatively passive, never fully initiated, voyeuristic laity that is regularly convoked to watch, listen, read, or hear–and then sent away.

This suggests a substantial distance between the performers and the performance, on the one hand, and the audience, on the other. Sontag's approach seems to indicate that in a given situation, e.g. at a theatre performance, silence is the rule. The members of the audience are external to what is happening on stage; they are not considered participants.

The audience, writes Anna Danielewicz-Betz (1998), who adopts Goffman's frame analysis of musical performance, "has neither the right nor the obligation to

participate directly in the dramatic action" onstage, although the audience may show appreciation (1998: 183). She sees this silence as a phenomenon which is related to the silence in ritual contexts, where the "silence may be the only form in which the event's communicative goals can be achieved. Silent reverence is typically equated with religion" (1998: 185), which is similar to Sontag's concept of the performance. Danielewicz-Betz adds that there "is nothing more impressive than the silence that originates from keeping silence on the part of a large group of people" (1998: 187). She relates specifically to the silence of the audience when the lights are dimmed, calling it "pre-performance silence" (1998: 191), which sets up an expectancy within the audience. But she then maintains that "the deeper the silence, the closer the contact between the performer and the audience" (1998: 191). Such a suggestion, however, seems to contradict Goffman's view that this silence is a frame and not part of interaction. On the other hand, Danielewicz-Betz, referring to audience reaction after the performance ("post-performance silence"), which would be considered the end frame in Goffman's approach, quite rightly notes cultural differences – from the resounding applause ("rudely") in western concert halls, to the silence after the performance of Hindu sacred music (1998: 191).

3.2 *Breaking the Frame*

If the pre-performance silence, in Danielewicz-Betz's terms, is to be considered the opening frame of the performance, then the instances in which the audience reacts to what is taking place on stage would be instances of breaking the frame. Goffman describes the situation in the following way:

> On just coming onstage, a well-known actor may be applauded, the applause being addressed not to the character he will project but to himself qua actor. He responds in that role by a show of pleasure or by holding up the action for a moment while freezing in his part. […] During a production a particularly deft piece of work may also be applauded, the theatergoers addressing themselves not to the unfolding inner drama but to the skill of the actors. Opera institutionalizes much more of this "breaking" of frame by audiences. (Goffman 1986: 129)

"Interestingly, here, too", continues Goffman, "there have been marked changes in conventions through time" (1986: 129). The examples in section 4 below illustrate in part the audience breaking the frame especially in the concert hall. But performers may also break the frame in that they may cease at a specific moment being performers and turn into private people again. An example of the performers not following the conventions of an artistic performance is the occasion when on February 22, 1968, country singer Johnny Cash proposed marriage to his co-singer June Carter on stage in the middle of a performance in London, Ontario. This scene was the climax in the 2005 film *Walk the Line*.

4. Silence of the Audience in the Theatre

Unlike the approach relating to Frame Analysis discussed in section 3 above, however, one may consider the audience as a participant in an interaction with the performers. The audience need not remain silent during the performance, and the performers may cease performing at any given moment during the performance.

These two possibilities may be illustrated in the following way: There are occasions when audiences react to what is occurring on stage, either positively or negatively. After an aria in an opera, the audience may disturb the flow of music and express their appreciation. This would be a positive reaction to the performance, although the silence of the audience is broken. Audience silence is not sacrosanct, as Sontag (1969) would have it. On the other hand, a bad performance or aspects of the performance that do not appeal to the audience may lead them to boo and catcall, and may even bring the performance itself to a standstill. A well-publicized instance was the performance of Verdi's *Nabucco* at the Deutsche Oper in Berlin 2002 when the chorus came on stage dressed as bumblebees. Audience reaction stopped the performance (see, e.g., Kurzon 2007b).

The modern tradition of an audience sitting quietly during the performance of a play, and especially of an opera or concert, emerged in the nineteenth century with Wagner's appearance on the world stage of opera. In the classical period, audiences

would applause after each movement of a symphony, and movements were not only applauded but even encored. For example, in Haydn's London concerts, the composer put in *forte* chords at the end of soft slow movements in order to ensure applause, e.g. his Symphony in C major, No. 97 (Ricks 1995: 67). Cone in his "The Picture and the Frame" (1968: 16) writes:

> The modish demand for silence between movements not only inhibits spontaneous demonstrations of enjoyment, but also often imposes such a strain on the listener that he cannot attend properly to the latter half of a long symphony.

The lack of applause, then, is Wagnerian in origin. He imposed it on the audience at his annual opera festival at Bayreuth. They sat in darkness "to ensure [their] quiet attention", which the British writer, George Bernard Shaw called "the Bayreuth hush" (cited by Ricks 1995: 70). In 1882, at Bayreuth during the Wagner festival, the composer came on stage during a performance of the opera *Parsifal*, and

> begged the public not to applaud again as they had *during* the course of the performance. So the second performance passed with a calm and reverent silence. This called for another speech from the Master [Wagner]. He must explain, he said, that it was only during the performance itself that he objected to applause; but the appreciation due to the singers at the fall of the curtain was quite a different matter. So, at the next performances, the people expressed their enthusiasm at the close of each of the acts. (Hartford 1980: 129; emphasis in original)

The American writer, Mark Twain, who visited Bayreuth in 1891 after Wagner's death, describes the silence inside the opera house as if one sits "with the dead in the gloom of a tomb" (Twain 1891). It took some years before this silence spread to other concert halls and opera houses. Twain compares the situation at Bayreuth with the Metropolitan in New York: there at Bayreuth, he writes,

> the Wagner audience dress as they please, and sit in the dark and worship in silence. At the Metropolitan in New York they sit in a glare, and wear their showiest harness; they hum airs, they squeak fans, they titter, and they gabble all the time. In some of the boxes the conversation and laughter are so loud as to divide the attention of the house with the stage. (Twain 1891)

A programme note of the cycle of the *Ring of the Nibelungs* in Chicago alluded to the same phenomenon: "The audience is respectfully but urgently requested not to interrupt the music with applause" (quoted by Ricks 1995: 66).

Even well into the twentieth century, performers would not have minded that audiences revert to the behaviour of audiences in the early nineteenth century. The violinist, Joszef Szigeti, wrote about one of his performances with Richard Strauss, who was conducting:

> At one playing of a Mozart concerto […] when we met with polite and stony silence instead, Strauss turned to me and muttered in his thick Bavarian dialect: "The so-and-so newspaper scribblers and commentators! This is their work – making people skeered [=scared] to clap when I know they feel like doing it." (Szigeti 1947: 195, quoted in Ricks 1995: 67-8)

Despite the generally held "Wagnerian" rule, there are circumstances in which audiences – by convention – do not remain silent, for example at the Last Night of the Promenade Concerts, held every summer in the Royal Albert Hall in London. At the last night of the 2008 proms, for example, after a number of traditional classical works such as opera arias (by Verdi, Wagner and Puccini), Beethoven's *Choral Fantasy*, and various commissioned works, the concert continued with Elgar's *Pomp and Circumstance* March No. 1 with the jingoistic song "Land of Hope and Glory" written by A.C. Benson especially for Elgar's music. During the performance of this work, the audience is traditionally expected to participate, and sing the song, which they do enthusiastically. This happens, too, with the subsequent works in the programme: Thomas Arne's "Rule Britannia" and Charles Parry's "Jerusalem" set to music by Edward Elgar, not to forget to mention the National Anthem at the end of the proceedings.[1]

[1] These may be viewed on internet websites: *Pomp and Circumstance* No.1 from 2006 Proms http://www.youtube.com/watch?v=ECUpc71b3js&feature=related; "Rule Britannia" from 2008 Proms on http://www.youtube.com/watch?v=_cWz9MrHskk; "Jerusalem" also from 2008 Proms on http://www.youtube.com/watch?v=d7geFBbda-g&feature=related, and the British National Anthem from the 2009 Proms on http://www.youtube.com/watch?v=OUTeRGigUjU&feature=related (all accessed June 14, 2010).

These unconventional moments in the opera house or concert hall where the audience is not silent may be considered, if the frame analysis approach is accepted, as instances of breaking the frame, as discussed in 3.2 above.

5. Communication or Metacommunication?

The argument, then, is between the following two positions. One may either ask whether we view the silence just before the performance as a frame which indicates, metacommunicatively, that the performance is about to begin. Alternatively, the silence is part of the performer/audience interaction, and may be labeled – not conversational silence, since nothing is happening on stage – but situational silence. It may be considered a silence that is conventionally accepted in specific circumstances, i.e. according to the situation. It has the characteristics of situational silence briefly presented in section 2 above. Situational silence in this case is usually several seconds long (although it could be much longer depending on what is going on behind the curtain), the entire audience is silent, and no text is being read or recited (which rules out textual silence).

In the following two subsections, the claim that we are dealing with situational silence will be illustrated by musical performances (5.1) and by situations in legal contexts (5.2), by way of comparison. The analysis of one specific performance will not exemplify the variety of situations in which it may be shown whether silence may or may not function as a frame to the performance; nor will the analysis of one performance illustrate those cases in which silence is not maintained.

5.1 *Musical Illustrations*

Unlike the situation in which the audience is silent while a performance is taking place on stage (an instance of conversational silence), a complete performance may be considered to be an instance of situational silence when both the performer(s) and audience are silent. A performance of John Cage's well-known – if not notorious – *4'33"* would be such a case. In the first performance, the pianist, David Tudor, sat by

the piano and apart from lifting and putting down the piano cover and turning some pages, did nothing. He did not play any music. The audience was also silent, as they conventionally are during a performance (see Kahn 1997). Noise from the audience may be heard when members of the audience do not yet realize that nothing is to be played or when they realize what the nature of the piece is, and this is what Cage wanted his audience to know.[2] The difference between a performance of Cage's *4'33"* and, say, Beckett's *Act without Words*, is that while in Beckett's play or mime action is taking place on stage, albeit in silence, in Cage's work nothing is happening on stage.

Our principal interest here, however, is on more frequent occurrences of situational silence – not throughout a work – but before the performance begins. We now have to ask whether this case of situational silence is a frame, thereby metacommunicative, or whether it is communicative, and therefore not a frame. Support for this latter contention comes from two sources: (1) cases in which silence is not "observed" at such junctures, and (2) cases in which the silence is considered to be part of the work performed. The reason why any one of these cases would constitute a criterion to decide on the function of this silence is based on a basic tenet of communication and meaning. If there is a choice between silence and non-silence in a given situation, then the silence is communicative. As Lyons (among others) wrote some time ago, "'having meaning' implies choice" (1968: 413).

The first type of occasion at which the audience is not silent in the seconds or minutes before the performance is at a pop concert. At such concerts, the audience does not seem to be quiet at all. When the lights go down, and the musicians are coming on to the stage, they are welcomed by applause, shouts and other encouraging

[2] There are a number of YouTube renditions on internet of this piece, e.g. with a small ensemble (http://www.youtube.com/watch?v=04F22C_u658&feature=related), with David Tudor (http://www.youtube.com/watch?v=HypmW4Yd7SY&feature=related), and with an orchestra (http://www.youtube.com/watch?v=hUJagb7hL0E) (all accessed June 14, 2010). In the last example, a televized concert by the BBC Symphony Orchestra, the audience behaves conventionally between movements by coughing, and the conductor by wiping his brow with a handkerchief.

noises from the audience. I would like to illustrate this from a pop concert, which was a reunion of a group that had been disbanded many years previously. This is the concert given by the British pop group Genesis in Rome's Circo Massimo on July 14, 2007, called "Genesis - When in Rome".[3] After an introduction of 20 seconds, the next one minute of the video film of this concert consists of visual effects while the audience are cheering and clapping. This is followed by the band warming up, repeating over and over again the same notes; this takes another four minutes and twenty seconds. Finally, after five minutes forty seconds from the beginning of the video, the singer, Phil Collins, comes to the front of the stage and begins to sing the first song.[4] A similar example may be seen at another pop concert which also celebrated the reunion of a disbanded group: the Led Zeppelin concert at the O2 Arena in London on December 11, 2007.[5] Because of such cases, we may argue that there is here a choice between silence and non-silence. The frame is not the silence – although it is often concurrent with the silence. The frame of a performance may be considered the dimming of the lights; it is the darkness which metacommunicatively indicates to the audience that the performance is beginning, and therefore different modes of behaviour are called for. Even at more conventional or traditional theatrical or musical performances, dimming of the lights – indicating the beginning frame of the performance – may not lead automatically to audience silence. This may be achieved by other members of the audience hushing the talkers, or by the stage lights being turned on, or by the conductor walking out to the podium.

The second set of cases in which the situational silence may not be considered a frame occurs when the silence is considered part of the work itself. This may be illustrated by the example of Cage's *4'33"*, discussed above, since the performer or performers go through the usual ritual though the performer or the conductor of an

[3] This was viewed by the author on a flight from Tel Aviv to Frankfurt on September 7, 2008.
[4] This was the largest concert since the group reunited "after more of a decade of silence", reads a website devoted to Genesis (http://www.genesis-news.com/forum/european-tour-2007/525-genesis-concert-july-14-rome.html; accessed June 14, 2010).
[5] http://www.youtube.com/watch?v=tbA7bVouieI&feature=related (accessed August 4, 2008; no longer available).

orchestra does nothing. But Cage's work is not a typical instance of a concert piece. A more conventional example is called for. The conductor/pianist, Daniel Barenboim, in the BBC Reith lectures of 2006, spoke of this initial silence as part of the work. In the first lecture[6], he spoke of "the physical aspect that we notice first":

> sound does not exist by itself, but has a permanent constant and unavoidable relation with silence. And therefore the music does not start from the first note and goes onto the second note, etc., etc., but the first note already determines the music itself, because it comes out of the silence that precedes it.

Barenboim, in this lecture, illustrated this point by playing on the piano, among other works, the beginning of the Prelude to Wagner's opera *Tristan und Isolde*. He states that "the music is not from the A to the F, but from the *silence* to the A" (my emphasis). The Prelude, says Barenboim, "is built on the use of silence as a means of expression". Needless to say, the orchestral score of the Prelude does not begin with a rest but with a quaver in A. But, in a video recording of this work, Barenboim may be clearly seen conducting – moving his hands holding the baton – before any music is heard. Hence Barenboim's interpretation includes the silence. This is also true for several other video clips available, e.g. Leopold Stokowski, Zubin Mehta and Simon Rattle as conductors. Stokowski's silence is far shorter than the others, but it may still be noticed.

Jaworski (1997), in his analysis of silence in Laurie Anderson's "Violin solo", also argues that silence may be part of a work in its initial stage, and does not function as the frame of the work. The role of the silence, he writes, is not "to give the listener time to anticipate a piece which is about to begin or to contemplate its reception when it is finished". Rather, "sound defines silence as much as silence defines sound" (1997: 22).

An audience's silence, which may be both situational and conversational silence, may occur in performances which take place in a place of worship. While a

[6] http://www.bbc.co.uk/radio4/reith2006/lectures.shtml#lecture1 (accessed August 4, 2008). The video is no longer available, but the printed text appears on http://www.bbc.co.uk/print/radio4/reith2006/lecture1.shtml?print (accessed June 14, 2010).

performance of, say, Bach's B minor Mass may be regarded for all intents and purposes as a concert – with the audience becoming silent after the conductor and solo singers are settled on stage, a performance in a church may be treated as a religious ritual, though tickets are sold to the public while publicizing the performance as a concert. After all, to attend mass or any other religious service in a church does not usually entail buying a ticket. Traditionally, the audience in such a situation does not applaud before the performance and does not show appreciation afterwards. On the other hand, a concert may take place in a building that has served in the past as a church, and indications of this are visible, but such a concert is treated in the same way as a concert in a concert hall – with the audience observing silence – situational silence before the conductor begins his or her work, and conversational silence during the performance. But before the "pre-performance silence" (Danielewicz-Betz, 1998), and after the performance, the audience reacts by applauding the performers. Here, I have to be anecdotal, since I am relating to two experiences I have had. The first, in the late 1960s in a Sheffield church, where Handel's *Messiah* was performed; there were total pre-, post-performance and conversational silences. On the other hand, at a concert of sacred music by Pergolesi (including his *Stabat Mater*) at the Church of Notre Dame in Abu Gosh, just outside Jerusalem, Israel, on June 6, 2008, the fact that the building does not seem to function any longer as a church may have led to it being treated as a regular concert hall. Fashion, however, may be changing. At a concert on April 12, 2008, at St. George's Bloomsbury Church in London, which is still functioning as a church, the audience did applaud the two singers (singing "Evening Prayer" from Humperdink's opera *Hansel und Gretel*).[7]

[7] http://au.youtube.com/watch?v=_wG8Jb3z0Ok (accessed June 14, 2010).

5.2 *Non-musical Illustrations*

In discussing the Miranda warning – the warning American police officers give persons who have just been arrested[8] – Marianne Constable (2005: 167), citing the original Supreme Court decision,[9] argues that

> the utterance of the warning marks the formal entry of the accused into the legal process: it occurs at "the outset" of interrogation or at a moment when significant deprivation of the subject's "freedom of action" begins.

She continues,

> The warning tells the accused of the risk that what he is about to say has different import than what he is used to insofar as it will be used "against" him. (2005: 167)

In this case, too, it is the warning about the right of silence that constitutes a frame. However, the suspect's silence in not answering questions addressed to him or her is a straightforward example of conversation silence (see 2 above).

On the other hand, in another legal situation, the court bailiff's "silence in court" when the judge is about to enter the courtroom may constitute the frame, but the silence that follows is situational silence. Any conversation that takes place is among the performers – the judge, the lawyers and witnesses. The public present in a courtroom is not in the same position as the audience in the theatre. There, they may disturb the proceedings if in their eyes the situation calls for such a disturbance – the acting or playing is poor, for example. The public have paid money to see the performance and they demand their money's worth. In the courtroom, on the other hand, if the public do not agree with the proceedings, any disturbance – any breaking of situational silence – will not end the performance, but the public will be ordered to leave, so the legal proceedings can continue without an audience. In Goffman's terms (1986: 125-6), the opera house or concert hall performance may be considered "pure" in that in normal circumstances (not in rehearsal, for example) when the audience

[8] "You have the right to remain silent. Anything you say can and will be used against you in a court of law. You have the right to have an attorney present during questioning. If you cannot afford an attorney, one will be appointed for you."
[9] *Miranda v. Arizona*, 384 U.S. 436, 86 S.Ct. 1602 (1966)

walk out in the middle of a performance, the performance comes to an end. The courtroom proceedings, on the other hand, constitute an "impure" performance, "where viewers openly watch persons at work who openly show no regard or concern for the dramatic elements of their labor" (1986: 126). The performance goes on even when there is no audience.

6. Conclusion

One solution to the question as to what constitutes the frame to a performance, or in our context, whether silence is the frame or part of the frame, or is not a frame at all, is to speak of dialects of silence. Here, however, we cannot speak of phonological, morphological or lexical features that distinguish dialects of silence, but differing functions of silence according to the context in which the silence occurs. So, in the pop music concert "dialect", there is no silence that may be considered the frame of the concert, while at a symphony concert the silence may be considered part of the frame.

However, this solution does not seem to hold if we regard the concept of silence as part of the artistic work, and not as part of the frame. If we return for a moment to the literal frame and the painting in it, we may say that the frame is not equivalent to silence. It metacommunicates that within the border is a painting. The blank spaces in the painting may be considered to be silence. Likewise, in the opera house, concert hall or theatre, the silence is regarded as part of the interaction between the audience and the performers. So, given types of performances in which audience silence does not occur, e.g. in pop concerts, the frame of performance must be seen elsewhere – in the dimming of the lights. Audience reaction to this situation, the dimming of the lights in the hall, may lead to their silence, which is part of the subsequent performance.

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Harmonic Content Influence on Colour-Choice Association with Unaccompanied Tones

Jeffrey N. Howard, Northern State University

Abstract

This study investigated simultaneous auditory and visual sensory processing. It was hypothesized that visible spectrum colours ROYGBIV (red, orange, yellow, green, blue, indigo, violet) would specifically map to tones of the 88 note piano keyboard, and presence/absence of harmonic content would manifest as measurable variability differences regarding colour choice associations between sine and harmonic tones. A sinusoidal wave colour-picker image was presented upon which participants subjectively defined borderlines between colours ROYGBIV, and then listened to 77 sine or harmonic tones/semi-tones ($G^{\#}_{1}$-C_{8}) while clicking on the colour-picker image to render colour choices. Results indicate: 1) A consistent colour-across-octaves pattern demonstrating piano keyboard mapping of pitch with colour; 2) Presence of harmonic content in tones manifests via increased variability for colour-choices—choices tending toward 'blended' colour borders such as yellowish-green, or greenish-blue.

1. Introduction

There are few natural stimulus relationships that fascinate us more than the relationship of sound and colour. A brief inquiry to an internet search engine will yield hundreds, if not thousands, of references to sound-colour, music-colour associations —associations endorsing everything from therapeutic facilitation benefits via proper colour-sound combination exposure, to potential architectural/décor-design applications.

For thousands of years, scientists and laypersons alike have sought the joining of these two stimuli in some harmonious and substantive way. From Pythagoras to Sir Isaac Newton to the present, theories promulgating the marriage of the visible range of electromagnetic spectrum radiation colours red, orange, yellow, green, blue, indigo, violet (ROYGBIV), with the physical environment of sound conduction via air pressure change have arisen—all thus far, resulting in lack of empirical validation.

2. Research and the Sound-Colour Relationship

Perhaps the most profound influence upon the ongoing sound-colour fascination was Newton's (1704) prismatic light spectrum experiments whereby he parsimoniously decomposed visible white light into its individual spectrum components ROYGBIV by sending it through a prism, and subsequently engineered the recombinant inverse using a second prism to create white light again. Newton himself, reflecting on his knowledge of music, assigned the seven notes A, B, C, D, E, F, and G within an octave (while ignoring sharps and flats) with the ROYGBIV spectrum (Levenson, 1994). Heralded as one of the most elegant and profound discoveries within the field of optics, this decomposition of the visible light spectrum and Newton's subsequent attempt at tonal correspondence with colours set off a wave of associative inquiry that has continued for 300 years. Thus was born the assumed relationship of "do, re, mi, fa, so, la, ti" with the seven visible spectrum colours ROYGBIV—a relationship that even Newton himself never fully explained (Figure 1).

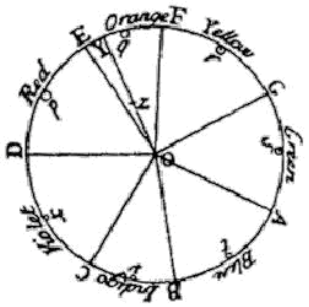

Figure 1. Newton's "colour wheel" (Newton, 1704)

In line with the theory of Newton is that of Russian composer Alexander Scriabin, who also theorized the association of colors and piano tones (Galayev, B.M., & Vanechkina, I.L, 2001). Scirabin's 'color organ' (Peacock, K., 2001) led to his own theoretical mapping of tones across the piano keyboard, and seemingly builds upon the foundation of Newton's work using a circle-of-fifths type of design. Scriabin actually manifested his theory in a 1915 live performance titled *'Prometheus: A Poem of Fire'* by utilising audience members as a sort of musical 'canvas' for the projection of colors simultaneously with his music (Moritz, W., 1997; Peacock, K., 2001).

The importance of such a relationship cannot be underestimated, as it is likely that such a relationship would extend well beyond that of theoretical purposes to potentially clarify the way in which colour is responded to and utilized (West-Marvin & Brinkman, 2000). Interestingly, much of the research continues to associate the seven member musical octave with the seven member visible light spectrum octave. The Newtonian-driven attempt to assign constant hues to all occurrences of a single categorical variable (i.e., a musical note) identically across all octaves, seemingly self-perpetuates and has yet to be defeated.

Though there exist few empirical studies directly addressing the association of colour with sound/music, there are some which do deviate from the static Newtonian perspective of the last couple of centuries. One such study by Sebba (1991), though lacking in statistical analyses beyond that of simple descriptive statistical comparison, provided interesting results. Sebba's inquiry addressed questions such as: In what way does one express, via choice of colours, their impression of a piece of music? What

are the characteristics of 'colour' scales that are shaped according to a musical scale and what is the visual effect of a colour scheme that was built according to the formation of notes of a musical piece? Sebba found apparent commonality in the expression of music using colour, via correspondence between hierarchical organization of hues and hierarchical organization of sounds. Additionally, Sebba's findings indicated a ratio between the width of coloured areas and choice of hues, to be similar to ratios of tone duration to pitch—that level of contrast between adjacent hues creates an effect similar to the level of contrast between adjacent tones—and that the arrangement of colour areas creates an expressive whole, similar to that of tone groupings.

In a simple paradigm that investigated brief musical passages and colour association, Cutietta and Haggerty (1987) looked at the subjective music-colour associations rendered by 1256 participants aged 3 to 78—perhaps one of the largest studies to date. Participants listened to three musical excerpts, and then indicated what colour they thought each excerpt was best associated with. Results indicated strong music-colour associations that were consistent across all the musical excerpts and all represented generations from age 9 and beyond.

Marks (1987) used a visual and auditory processing paradigm aimed at addressing how cross-modal similarities between sensory attributes in vision and hearing reveal themselves in speeded, two-stimulus discrimination. Marks found a prevalent cross-modal influence and interaction within pairing presentations of stimuli such as dim/bright lights, and dark/light colours accompanied by high/low pitched tones. Results indicated concurrence with findings on cross-modal perception, synesthesia, and synesthetic metaphor, by indicating direct similarity between cross-modal combinations such as pitch and lightness, pitch and brightness, and loudness and brightness.

In a meta-analysis, Marks (1975) addresses 'coloured-hearing' synesthesia, as manifest by numerous collective reports of synesthete colour experiencing with English language vowels. Marks' paper provides specific list containing forty-four such studies from history regarding this colours-vowels association/experience alone.

In addition, and perhaps most telling, forty-seven entries from this list contain the words colour, music, pitch, and brightness, or some combination thereof. This investigation by Marks also develops an insightful methodology of meta-analyzing the results from a large number of these studies. Ultimately, the fruits of Marks' labor here effectively show the indisputable relationship of brightness to pitch in visual-auditory synesthesia. This paper by Marks also provides evidence of the association of colour and music for the non-synesthete (as per his own empirical research; see Marks 1974) whereby he graphically shows sound frequencies in Hertz as a function of Munsell Value of colour composition.

In another study by Marks (1974), participants matched the brightness of gray surfaces with pure tones. Varied results indicated increasing loudness to be associated with increasing brightness—with some participants associating it to increasing darkness. Further results indicated that when brightness of surface was held at a constant, most participants offset increasing pitch by decreasing loudness of tones. Marks indicated these results to be mimicry of a synesthesia effect, suggesting that most participants will match auditory brightness to visual brightness.

Taking this line of research a bit further, Hubbard (1996) investigated this synesthetic-type effect by addressing visual lightness vs. auditory pitch along with visual lightness vs. melodic interval. Ratings elicited from participants regarding how visual lightness and auditory pitches "fit together" indicated that lighter stimuli fit better with higher pitches, and darker stimuli fit better with lower pitches. Additionally, Hubbard's investigation found that larger melodic intervals produced more extreme (lighter or darker) choices by participants.

Cuddy (1987) looked at the manner in which colour principles might operate within musical melody, hypothesizing that such principles occur at higher levels of auditory organization rather than at the level of the individual tone. In addition, Cuddy theorized and found support for the idea that higher-order processing of tonal information would follow colour mixture principles at a general level.

Musical keys (e.g. major/minor) have also been tied to colour association—particularly as colour relates to that which can be assigned to 'darkness' and/or

'brightness'—such as human emotion (e.g. happy vs. sad), or even atmospheric ambiance (e.g. gloomy vs. pleasant). Steblin (1983) presents an example of this via her translation of Schubart's work on colour and musical key associations (Schubart, C., 1806) —a relationship that goes beyond simple colour-tone associations and hints at the manner in which elements such as colour, mood, and music might be seen as inextricably intertwined.

In a study by West-Marvin and Brinkman (2000), the effect of key colour (black and white keys) and timbre, on absolute pitch recognition was the focus. It was found that the colour of the key was an integral part of identification response time and thus suggests a cognitive relationship between response times and expected frequency of occurrence of black and white key pitches. Additionally, West-Marvin and Brinkman found that timbre presentations of piano vs. a string instrument had little effect on participants' performance within all presented experimental paradigms, and suggest the pervasiveness of piano tones in western culture may well have an effect on their expected frequency. The simple fact that colour (albeit simple black and white) is an inherent part of a piano keyboard stirs curiosity that colour and sound/music may have a far more intimate relationship than was once thought.

These types of studies, whereby an attempt is made to show a relationship between a stimulus processed within a specific modality with another stimulus processed within a different modality, are often called "mappings"—with one of the more commonly studied synesthetic mappings being that between visual lightness and auditory pitch. Thus, a piano keyboard is an excellent example of the physical manifestation of "mapping" in that specific pitches "map" directly to specific keys in specific locations on the keyboard.

In another study by Marks (1982) using synesthetic metaphors (e.g., "the dawn comes up like thunder"), it was found that language metaphors are able to influence perception of the music/sound and colour connection. Across a series of four experiments, participants utilized loudness, pitch, and brightness scales in evaluating the meanings of a variety of synesthetic auditory-visual metaphors. Results indicated loudness and pitch were expressed metaphorically as greater brightness; in

turn, brightness expressed itself as greater loudness and as higher pitched. This type of scientific investigation of semantic influence related to sound/music colour connectedness perpetuates the Newtonian ideology of matching the seven major note names with the seven prismatic rainbow colours ROYGBIV across all octaves. Though valuable and interesting in its own right, this Newtonian ideology perpetuates a scientific endeavor that has yielded little if any palatable scientific 'fruit' over several centuries.

With linguistic/semantic study results in line with Newton's first assignation of tone names to colours, it is no wonder then that the bulk of most available information, scientific or otherwise, on the music/sound colour relationship seemingly continues to disseminate the ideology of seven principal tone names corresponding somehow to the seven prismatic colours of the rainbow—a mere categorical marriage of nominal variables.

It seems that the music-colour correspondence quest has taken a form parallel to that of Johannes Kepler's search for symmetry in planetary orbits—a decade long search in which Kepler all but exhausted potential circular orbital pathway combinations only to find that the simple elegance and symmetry of a circle had obscured any consideration for the simple elegance and symmetry of an ellipse. With respect to music-colour correspondence, here too nature appears to require a different 'elegant' explanation. In attempting to break free from the Newtonian ideology, one must consider that correct and incorrect solutions may have nearly equivalent parsimony—that nature is perhaps compelled toward such illusory occurrences. It therefore appears the answer to the 'Newtonian driven' music-colour correspondence enigma may lie elsewhere.

Despite the range and relatively comprehensive nature of pitch and colour investigations to date, these studies have omitted the main thrusts of the current investigation—1) the direct mapping of ROYGBIV spectrum colours to the notes of a standard piano keyboard; and 2) investigating the influence of presence or absence of harmonic content with respect to pitch-colour associations.

3. Hypotheses

An experiment was conducted with the intent of testing the hypotheses that ROYGBIV visible light spectrum colours would systematically map to a piano keyboard via a 77 tone sine/harmonic tone sequence. Additionally, it was hypothesized that between sine tones and tones containing harmonic content, there would be measurable response variability regarding colour choice.

4. Method

The experimental design directive was four-fold: 1) testing the influence of harmonic overtone content based upon colour borderline definitions as rendered uniquely by each participant; 2) presenting highly related but subtly different auditory stimuli in the form of tones and semitones, so as to reveal any natural affinity for colour-tone matching which might be prevalent at differing levels of pitch sensitivity; 3) testing any influence on the part of natural harmonic content and natural amplitude content of harmonic tones vs. sine tones; and 4) presenting a 'blended' ROYGBIV sinusoidal-wave grating colour-picker (Figure 2), which might best reflect response subtleties to the aforementioned harmonics and amplitude content of tones.

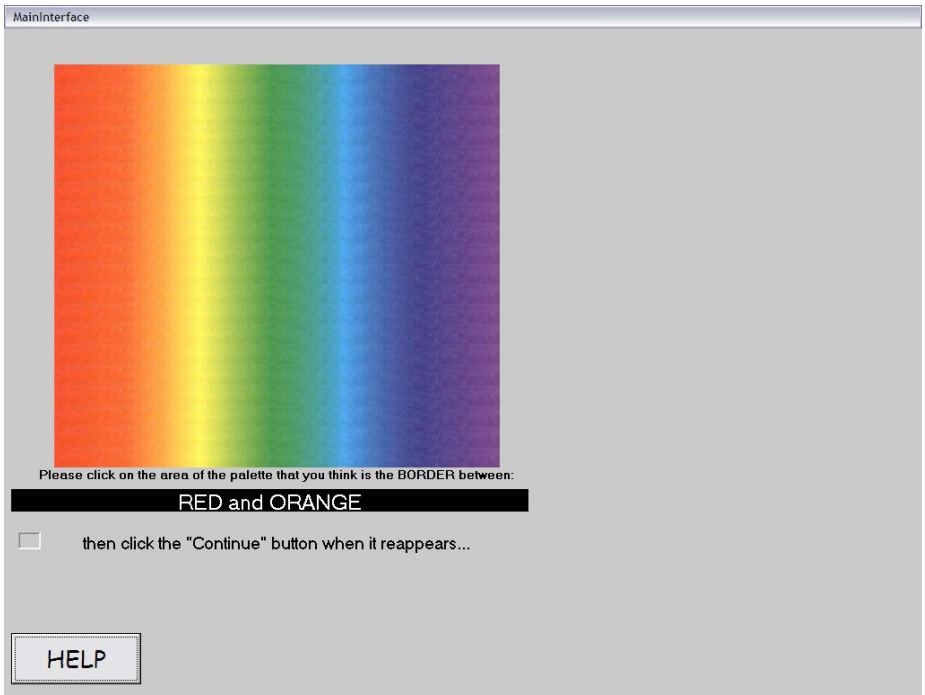

Figure 2. Screenshot of main interface showing "colour-picker" visual stimulus

Thus, there were two groups that differed only with respect to auditory stimulus exposure to either sine tones or harmonic content tones. The continuous scale colour-picker stimulus enabled participants to actually speficy their own borderlines between colours of the colour spectrum ROYGBIV, and allowed exposure to a more natural and complete range of hue options.

4.1 Participants

Seventy-eight graduate and undergraduate students (60 females and 18 males) participated and received partial course credit.

4.2 Materials and Apparatus

The experiment was presented on-screen as a computer program written using the Microsoft Visual Basic 6.0. Program elements included sequentially: 1) demographic information collection; 2) instructions to participants; 3) participant defining of colour borders on the colour-picker stimulus; 4) practice stimulus trials/samples; 4) experimental stimulus trials; 5) completion screen; and 6) debriefing information.

Computers utilized were Dell Dimension model 4100 with Windows XP-Pro software, a 1 GHz Pentium-3 processor, and 256 MB RAM capacity. The monitor display was a Dell Ultra-Scan P991 in conjunction with an NVIDIA RIVA TNT2 Model-64 32 MB graphics card. The screen resolution for stimulus presentation within all three experiments reflected a factory default setting of 1024 x 768 pixels, 32-bit colour quality, 96 DPI display setting. A standard mouse and QWERTY keyboard were available for data entry of demographics information and responses. Participants listened to the tones through Aiwa HP-X222 model stereo headphones with an externally accessible volume control available to them for any preferred adjustment.

4.3 Auditory Stimuli

Two types of auditory stimuli were presented, sine tones and harmonic tones. Sine tones were generated by mathematical equation using GoldWave version 4.25 audio waveform editing program. Audio stimuli were created as .wav files and subsequently

converted via Microsoft Windows Media Converter compression formatting to .wma files so as to decrease file size and possibly eliminate any potential latency in the auto-start loading process of the Windows Media Player as demanded by the software program code. Audio samples were not constructed for equivalent amplitude presentation and the natural sound energy/amplitude of each individual tone was present. All sine tones were audible for 3 seconds. Sine tone stimuli encompassed a full range of 77 tones and semi-tones from the $G^{\#}_1$ to C_8 frequency range of 51.91 Hz to 4186.0 Hz. The 11 tones and semi-tones below $G^{\#}_1$ were not utilised because of concern that the greater vibrational energy of lower frequency notes, and their ability to transmit this vibration physically to participants via the headphones, might influence color choice contrary to the hypotheses. It has been shown that vibrational frequencies, via controlled application of proprioceptive stimuli, can also influence systematic association of color with vibrational stimuli (Howard, J., 2006).

Creation of harmonic tones consisted of recording a series of waveform samples of an acoustic grand piano (program number "000 AcGrandPno") from an Alesis QSR 64-voice synthesizer default General Midi sound bank. The harmonic tone set also included 77 tones and semitones for the range $G^{\#}_1$ to C_8. Sampling rate was 44.1 KHz for all tones which were then converted from .wav file format to CD quality 128 mbps .mp3 file compression format using dBpowerAmp music converter program. Each harmonic tone was approximately 3-4 seconds long and merely varied in length as a function of the natural decay of the differing frequencies. It should be added that although highly realistic, this type of waveform sample would most likely fall short of full natural harmonic overtone production as would be provided by a real instrument influenced by the acoustical properties of a more natural listening environment.

It would be helpful here to add basic and brief clarification of harmonic overtone content so as to further clarify its role. Middle C (C_4) on an acoustic piano will vibrate at 261.63 Hz when the key is struck, thus producing the 'fundamental frequency' for this note. Different segments of a string will also 'sub-vibrate' at different frequencies. For example, the C_4 string will vibrate as a whole entity at

261.63 Hz; each half of the string also vibrates creating the 'first overtone'; each third of the string vibrates to create the second overtone, as will each quarter of the string vibrate to create the third overtone and so on (Seashore, 1938). Therefore harmonic overtones are directly related to their fundamental frequency, and certain overtones are simply even multiples of this fundamental frequency. A frequency analysis comparison of actual 261.63 Hz (C_4) tones utilized for the harmonic tone and sine tone conditions of these two groups is presented in Figure 3 and Figure 4 emphasizing presence and absence of harmonic overtones for C_4, which clearly shows the differences in harmonic content between these two types of tones.

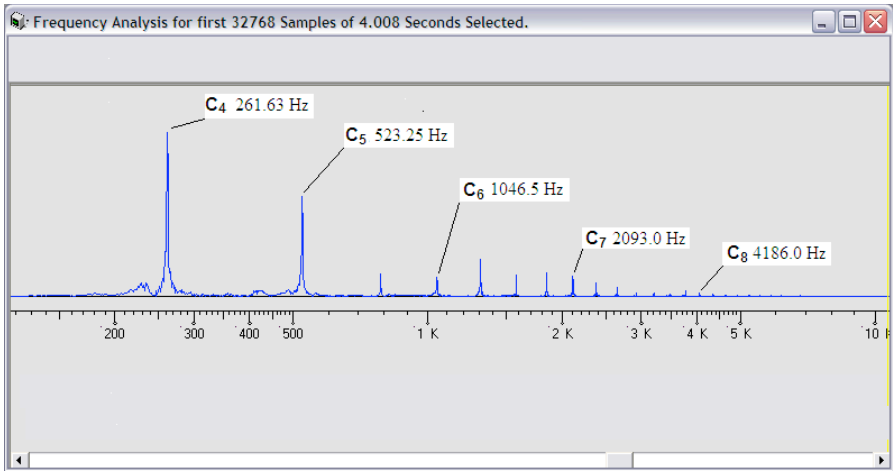

Figure 3. Harmonic tone C_4 (261.63 Hz) with harmonic content. Note how equally spaced harmonics are even multiples of the fundamental frequency (Bryan, 2002)

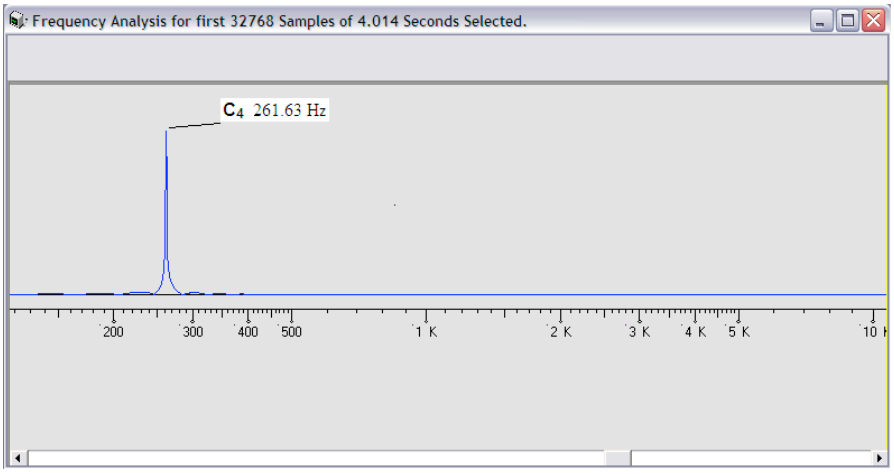

Figure 4. Sine tone C_4 (261.63 Hz). Note total absence of any harmonic frequency content (Bryan, 2002)

4.4 Visual Stimulus

The visual stimulus was a sinusoidal –wave grating replication of the visual light spectrum colours ROYGBIV, and was presented via a "colour-picker" tool comprised of continuous colour gradations similar to that found on a graphics design program (see Figure 1). Participants would render their colour choices by clicking on the colour-picker image, which allowed varying shades of colour to be chosen. On-screen dimensions of the colour-picker itself were 168mm in width by 152mm in height. The colour-picker was positioned in the upper left-hand corner of the screen, 25mm from the top, 19mm from the left, 162mm from the right, and 88mm from the bottom.

To record responses at a high level of sensitivity, horizontal 'X' axis and vertical 'Y' axis coordinates representing horizontal and vertical cursor position over the colour-picker image were captured and recorded. These values are 'pixel-distance' values reported by the program, and provide a means by which to track cursor movement direction and position over an image stimulus. Thus, having participants initially specify where the lines were that divided the colours on the colour-picker, allowed for any 'X' axis coordinate value obtained after a mouse click to register as a specific colour having been chosen on the colour-picker image.

The colour-picker stimulus was not neutralized for presentation of equal "perceived brightness" (albedo), allowing for those perceived as seemingly brighter (such as yellow) to be perceived as such. This is due to the fact that any positive results of an experiment such as this would likely garner greatest attention from the domain of real-world multimedia interface design/applications. Of the simultaneous audio-visual experiences of the average person, few if any would be 'isoluminant' in their nature. Human everyday audio-visual experience is variable in its nature and is not highly controlled on-screen for albedo equivalency across colours—and evidence exists that perceptually isoluminant colours are not optimal as a design choice—that there is increased difficulty in separating figure-ground elements when both are presented in isoluminant colours (Hoffman 1998; Livingstone & Hubel 1988).

4.5 Procedure

Upon entering the lab, participants were randomly assigned to either the sine tone or harmonic tone condition via roll of the die—odd numbers were assigned to the sine tone group, and even numbers assigned to the harmonic tone group. Thus, there were 39 participants in the sine tone group and 39 participants in the harmonic tone group.

The experiment was comprised of six stages: demographics information collection; experiment instructions; practice tones; the 'colour-defining' task; 77 experimental trials; and debriefing screen. The instruction phase presented a screen where participants read instructions regarding the task. For the practice trial phase, participants listened to two randomly selected tones from their assigned tone set. During the colour-defining phase, participants were sequentially prompted to choose the dividing lines between the various colours of the colour picker (ROYGBIV). Participants would define the area for a colour by clicking the place on the colour-picker where they thought the "dividing-line" between any two colours should be placed (e.g., the dividing line between red and orange). When a participant clicked on the colour-picker, a black line would be placed on the colour-picker. This black line would move to wherever they clicked, and when a participant was satisfied with the position of the line, they would click the 'continue' button which would "anchor" this line and then prompt them to place a new line to define the next colour in the sequence. After defining the six borderlines between all ROYGBIV colours was completed, participants entered the experimental trial phase. The 77 experimental trials were comprised of either sine tone or harmonic tone auditory stimuli presented randomly by the software program, along with the presence of the on-screen colour-picker that allowed a colour choice to be made after hearing a tone. In this phase, participants would choose a colour on each trial that they felt was most 'representative' of the tone they had heard.

Upon completion of the experiment, participants were presented the on-screen debriefing statement. All participant responses along with all demographic information were collected automatically by appending to a text file that was created by the program and stored with the program files for later retrieval. This text data

from participant responses was then inspected and 'set-up' where necessary so that a comma delimited import of the text file data could be effectively completed to place the data into a Statistical Package for the Social Sciences (SPSS) file for analysis.

5. Results

Chi Square analyses were conducted so as to identify any tones associated with specific spectrum colours. In addition, the experiment provided unique insight via captured horizontal 'X' axis cursor position values from mouse movement and mouse clicks on the colour-picker image, which according to their value reported, would indicate exactly where the colour-picker image had been clicked and could be directly associated with specific colours. These 'X' axis values are reported by the Visual Basic program in 'twips', whereby one twip equals 1/1440th or .0006944 inches ('X' axis value range = 0 to 7440). Capturing these values on the colour-picker gave a more heightened level of measurement sensitivity regarding subtleties of colour-blending and potential influence over colour choice by presence or absence of harmonic content. Figure 5 and Figure 6 present Chi Square analyses results for all harmonic and sine tones presented across the 77 tone sequence, as mapped to an 88 note piano keyboard.

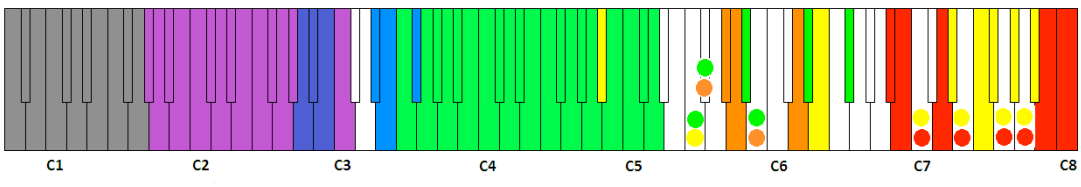

Figure 5. Harmonic tone Chi Square analyses results as mapped to standard 88 note piano keyboard.

Solid gray = not used in study
Solid colors = single colors as associated with specific notes
White keys = not significant at/below .05 level for any colour
Double dots = pitches with dual colour association

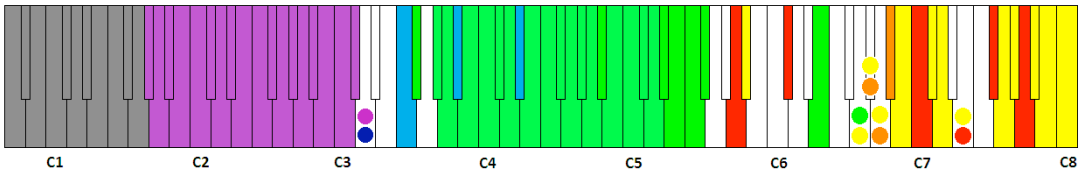

Figure 6. Sine tone Chi Square analyses results as mapped to standard 88 note piano keyboard.

Solid gray = not used in study
Solid colors = single colors as associated with specific notes
White keys = not significant at/below .05 level for any colour
Double dots = pitches with dual colour association

Note the clustering of specific colours for specific octaves, as well as long-wavelength/bright colours mapping to high-frequency bright pitches, and vice versa. Individual tone frequency counts, Chi Square statistics, and significance values for the harmonic tone group can be seen in Tables 1 through 14 with gray shaded cells indicating highest response frequency.

Table 1. Harmonic and Sine group colour-choice frequency counts for G#1 through G2

Hue	G#1	A1	A#1	B1	C2	C#2	D2	D#2	E2	F2	F#2	G2
R	5	5	5	3	4	5	8	1	4	3	4	4
O	0	0	0	2	1	0	1	4	1	2	1	1
Y	0	0	0	0	0	1	0	0	0	1	1	0
G	0	0	0	2	0	0	2	0	5	2	1	0
B	1	1	5	1	2	2	0	0	1	3	1	3
I	5	7	7	5	5	8	8	12	10	10	13	15
V	28	26	22	26	27	23	20	22	18	18	18	16
R	2	1	0	2	1	1	0	2	2	2	1	2
O	1	0	1	0	1	1	1	0	2	0	2	0
Y	0	2	1	1	1	1	1	1	2	0	1	1
G	2	3	3	3	2	2	2	2	3	3	4	2
B	0	0	0	0	1	1	3	2	3	0	2	7
I	6	4	7	6	5	4	3	6	7	8	6	7
V	28	29	27	27	28	29	29	26	23	26	23	20
Total	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**

Table 2. Harmonic and Sine group χ^2 values and significance for tones G#1 through G2

	G#1	A1	A#1	B1	C2	C#2	D2	D#2	E2	F2	F#2	G2
χ^2	46.64	38.03	20.79	71.61	60.35	40.87	29.33	27.15	32.84	41.94	53.07	26.00
p	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000
χ^2	67.28	72.66	62.15	60.87	107.6	116.2	94.07	72.53	53.15	38.23	67.07	39.00
p	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000

Table 3. Harmonic and Sine group colour-choice frequency counts for G#2 through G3

Hue	G#2	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3
R	2	2	6	1	1	2	4	4	1	9	6	5
O	0	2	1	4	0	4	2	3	3	2	0	1
Y	0	2	0	1	1	0	2	2	3	1	1	2
G	7	7	4	6	1	6	10	6	8	10	10	12
B	7	4	6	7	10	12	10	13	11	8	13	9
I	9	12	14	12	8	9	6	7	7	4	2	6
V	14	10	8	8	11	6	5	4	6	5	7	4
R	3	2	1	3	0	2	3	4	3	3	1	4
O	0	0	1	0	0	0	0	0	0	0	3	0
Y	0	2	0	2	3	1	0	0	1	4	1	3
G	2	5	4	3	5	7	4	6	7	8	11	10
B	2	2	5	1	6	6	8	10	9	14	6	6
I	10	9	11	12	12	10	12	9	10	5	10	7
V	22	19	17	18	13	13	12	10	9	5	7	8
Total	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**

Table 4. Harmonic and Sine group χ^2 values and significance for tones G#2 through G3

	G#2	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3
χ^2	9.59	18.61	14.69	16.82	15.00	9.76	12.15	14.66	12.87	13.23	16.23	16.10
p	.048	.005	.012	.010	.010	.082	.059	.023	.045	.040	.006	.010
χ^2	38.05	34.69	30.69	36.53	10.10	16.23	9.33	3.69	10.38	12.53	17.89	5.76
p	<.000	<.000	<.000	<.000	.039	.006	.053	.449	.065	.028	.006	.329

Table 5. Harmonic and Sine group colour-choice frequency counts for G#3 through G4

Hue	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4
R	4	3	2	5	7	6	6	2	5	6	3	2
O	3	2	2	0	1	4	2	2	3	3	7	4
Y	1	1	2	4	4	0	2	3	3	5	7	4
G	13	19	16	19	14	15	13	18	20	19	12	20
B	9	9	11	6	9	10	8	9	0	5	6	8
I	5	2	4	3	2	2	4	3	5	1	1	1
V	4	3	2	2	2	2	4	2	3	0	3	0
R	1	3	0	3	3	6	1	6	2	3	5	4
O	2	0	0	0	2	2	2	1	4	3	3	2
Y	2	1	3	1	1	2	3	4	2	1	3	2
G	12	15	11	17	15	13	18	12	16	17	18	19
B	11	9	12	8	11	7	8	13	9	9	8	10
I	6	5	10	7	2	8	3	0	2	2	0	2
V	5	6	3	3	5	1	4	3	4	4	2	0
Total	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**

Table 6. Harmonic and Sine group χ^2 values and significance for tones G#3 through G4

	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4
χ^2	17.89	45.17	34.41	30.38	24.00	20.23	16.46	39.07	34.38	31.30	14.30	38.07
p	<.000	<.000	<.000	<.000	.001	.001	.011	<.000	<.000	<.000	.026	<.000
χ^2	21.12	19.00	10.10	25.76	30.82	19.69	37.64	18.69	29.38	34.41	27.92	36.23
p	.002	.002	.039	<.000	<.000	.003	<.000	.002	<.000	<.000	<.000	<.000

Table 7. Harmonic and Sine group colour-choice frequency counts for G#4 through G5

Hue	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5
R	7	9	2	5	3	2	6	5	6	5	3	10
O	4	7	7	4	11	8	3	5	7	5	11	7
Y	4	3	12	4	5	7	6	7	8	10	7	5
G	17	15	11	20	12	16	14	10	10	10	12	7
B	5	4	4	5	5	3	8	6	5	6	4	7
I	2	0	2	0	0	2	0	3	2	2	2	1
V	0	1	1	1	3	1	2	3	1	1	0	2
R	5	6	2	4	8	8	4	6	6	9	10	5
O	4	5	7	2	4	2	5	5	7	9	9	9
Y	2	5	4	7	7	9	8	6	7	2	5	7
G	16	14	16	19	11	12	13	14	13	13	12	9
B	8	5	6	4	6	6	7	5	4	4	2	6
I	2	2	1	2	2	1	0	1	1	1	1	3
V	2	2	3	1	1	1	2	2	1	1	0	0
Total	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**

Table 8. Harmonic and Sine group χ^2 values and significance for tones G#4 through G5

	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5
χ^2	22.38	19.61	21.84	35.30	12.23	30.46	14.07	6.41	11.07	13.23	13.76	10.71
p	<.000	.001	.001	<.000	.032	<.000	.015	.379	.086	.040	.017	.097
χ^2	27.94	17.53	27.59	41.94	13.23	20.41	11.30	18.97	18.61	24.35	15.61	4.23
p	<.000	.007	<.000	<.000	.040	.002	.046	.004	.005	<.000	.008	.517

Table 9. Harmonic and Sine group colour-choice frequency counts for G#5 through G6

Hue	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6
R	8	8	5	5	9	8	4	7	5	6	8	9
O	10	13	7	11	4	6	11	6	9	9	8	9
Y	5	3	8	6	7	6	9	8	11	8	6	6
G	9	7	9	11	7	6	7	12	6	6	12	6
B	4	6	8	4	8	7	4	3	4	7	2	2
I	1	1	1	1	2	4	3	2	1	0	1	2
V	2	1	1	1	2	2	1	1	3	3	2	5
R	8	13	6	9	7	12	11	7	8	11	11	6
O	9	1	10	8	10	8	9	7	9	10	6	9
Y	8	8	13	8	9	6	4	6	5	7	9	10
G	6	11	3	9	8	9	7	11	12	5	8	10
B	6	4	6	3	4	3	6	3	3	5	3	2
I	2	2	1	2	1	1	0	2	2	1	2	1
V	0	0	0	0	0	0	2	3	0	0	0	1
Total	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**

Table 10. Harmonic and Sine group χ^2 values and significance for tones G#5 through G6

	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6
χ^2	13.23	20.05	12.15	18.61	8.92	4.25	13.59	16.10	12.87	3.308	17.89	8.92
p	.040	.003	.059	.005	.178	.642	.035	.013	.045	.653	.006	.178
χ^2	4.84	18.69	15.00	7.61	8.84	12.53	8.23	10.71	11.30	10.38	9.46	18.97
p	.435	.002	.010	.179	.115	.028	.144	.097	.046	.065	.092	.004

Table 11. Harmonic and Sine group colour-choice frequency counts for G#6 through G7

Hue	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7
R	9	11	14	12	12	11	12	10	11	12	12	10
O	8	6	4	4	4	10	3	3	3	3	4	7
Y	8	6	6	11	12	6	9	14	11	13	14	10
G	6	6	7	2	5	3	3	3	4	2	3	3
B	4	5	3	6	3	5	5	5	4	4	3	4
I	4	2	2	3	0	0	3	1	3	2	2	2
V	0	3	3	1	3	4	4	3	3	3	1	3
R	6	4	9	9	10	10	11	12	13	12	13	12
O	11	12	11	7	9	7	5	5	7	8	6	5
Y	10	13	7	10	9	12	12	9	13	11	10	15
G	6	5	9	8	4	4	6	7	2	3	5	3
B	2	3	1	2	5	3	3	6	3	5	3	4
I	3	2	2	2	1	2	2	0	1	0	1	0
V	1	0	0	1	1	1	0	0	0	0	1	0
Total	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**

Table 12. Harmonic and Sine group χ^2 values and significance for tones G#6 through G7

	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7
χ^2	3.61	8.92	18.25	20.41	14.38	8.23	13.59	23.64	15.02	24.71	29.02	12.51
p	.606	.178	.006	.002	.013	.144	.035	.001	.020	<.000	<.000	.051
χ^2	16.10	17.46	12.84	15.38	15.74	18.97	13.15	3.94	22.69	7.53	22.20	14.71
p	.013	.004	.025	.017	.015	.005	.022	.413	<.000	.110	.001	.005

Table 13. Harmonic and Sine group colour-choice frequency counts for G#7 through C8

Hue	G#7	A7	A#7	B7	C8
R	12	11	14	14	15
O	2	2	2	1	0
Y	13	11	15	12	13
G	4	4	0	2	2
B	3	6	3	4	4
I	2	1	0	2	1
V	3	4	5	4	4
R	10	13	13	14	11
O	3	6	4	4	4
Y	21	11	14	15	20
G	3	2	4	3	2
B	1	5	2	1	0
I	1	0	1	1	0
V	0	2	1	1	2
Total	**78**	**78**	**78**	**78**	**78**

Table 14. Harmonic and Sine group χ^2 values and significance for tones G#7 through C8

	G#7	A7	A#7	B7	C8
χ^2	24.71	17.53	19.84	29.38	27.30
p	<.000	.007	.001	<.000	<.000
χ^2	47.30	16.23	33.33	41.59	30.87
p	<.000	.006	<.000	<.000	<.000

The hypothesis that the 77 tones would be systematically associated with colour choice appears to garner support at this point as evidenced by the sequence of Chi Square analyses in Tables 1-14. In addition, Figure 7 presents a graphic that approximates this relationship—a seemingly inverse relationship between ROYGBIV visible light spectrum colours and sound frequencies, as represented also via the harmonic and sine tone keyboard mappings in Figure 5 and Figure 6.

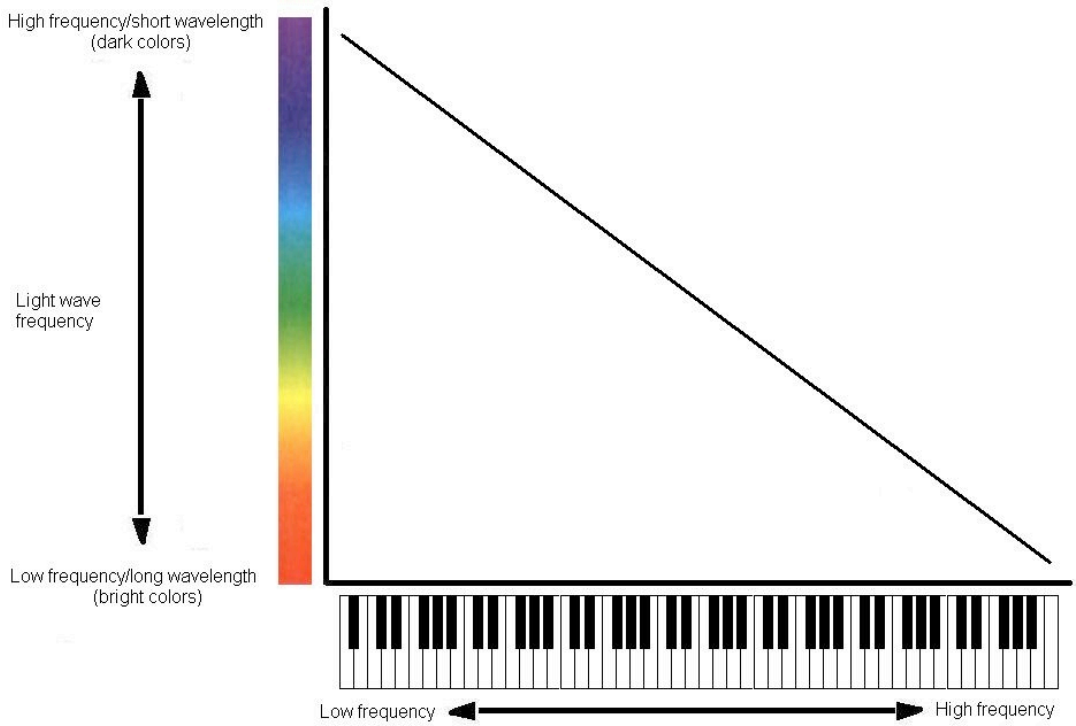

Figure 7. Theorized inverse relationship between wavelength frequency of light and wavelength frequency of sound for single tone presentations

Another interesting result of these data analyses involved that of comparing variability differences displayed by the sine vs. harmonic groups regarding the captured 'X' axis values for all ROYGBIV colour choices, as derived from mouse clicks on the colour-picker. As previously mentioned, these colour-picker image 'X' axis values representing the left-to-right distance on the colour-picker image itself, allowed blended colours, such as 'bluish-green' or 'reddish-orange' to play a role in the analyses, and examines how these subtle colour blends might be associated with

the presence or absence of harmonic content. In support of this, the data do appear to indicate that overall harmonic tone colour-choice variability on the 'X' axis of the colour-choice stimulus does vary from overall sine tone colour choice variability on the 'X' axis of the colour choice stimulus. A test for sine vs. harmonic tone 'X' axis values was conducted (Table 15) to compare these standard deviations of colour-choice 'X' axis values of both groups against one another—the hypothesis again being that presence of harmonic content should influence variability of colour choice across all notes. Thus all 77 sine tones, and the standard deviation of the 'X' axis value garnered by each, were t-tested against these same 'X' axis value standard deviations for all 77 harmonic notes. The results of this comparison, t (113.49, df adjusted) = -5.63, $p < .00$, indicates significant differences—albeit results assume non-equal variance due to a Levene test statistic indicating violation of the homogeneity of variance assumption. It must be emphasized that a violation of homogeneity of variance would be in order for a test on these data—sine and harmonic tones are not homogeneous—harmonic tones contain greater variability (e.g. harmonic overtones). Thus a manifestation of color choices that demonstrate this same lack of homogeneity for X-axis values on the color stimulus places these color-choice data points in line with the hypotheses as stated—that color choice variability would be influenced by presence or absence of harmonic overtone content.

Table 15. Independent samples t-test: Standard deviations of mean 'X' axis values for 77 sine tones vs. Standard deviations of mean 'X' axis values for 77 harmonic tones

	Harmonic tones	Sine tones	*t*	df
Means of the standard deviations of mean 'X' axis values	1739.62 (290.16)	1530.31 (149.04)	1.97*	152

Note. * = $p \leq .01$. Standard deviations appear in parentheses below means.

Thus the indication is that 'X' axis variability between the two groups for all 77 tones is significantly different, and that perhaps the harmonic content of notes could have contributed to this discrepancy. It is important to mention that the resulting variability differences could also be due to amplitude differences between harmonic tones and sine tones as the sine tones presented were natural and thus contained their natural sound energy. The influence of such amplitude differences on colour selection was not analysed separately as extracted variance in the analysis of the data, and could clearly have contributory influence on the results. Albeit the nature of the experiment was to analyse the naturally occurring association of color with the presented tones, further research should indeed look at extraction of qualitative components of variability so as the further clarify the full extent of the relationship.

Additionally, the analysis of variability differences between groups revealed another interesting pattern in the data. Calling attention to this pattern is Table 16 and Table 17, which present the mean sine group and harmonic group 'X' axis values for all ROYGBIV colours, and the standard deviations of these dependent measures.

Table 16. Mean sine group 'X' axis values for all ROYGBIV colours

Sine tone colour choice	N	Minimum	Maximum	Mean	Standard Deviation
Red	39	294.75	1440.00	704.04	299.72
Orange	36	1251.82	2185.91	1692.91	210.77
Yellow	39	2187.27	2992.86	2406.64	135.77
Green	39	3200.36	4968.89	3530.98	281.30
Blue	39	4383.33	6172.50	4865.76	265.15
Indigo	36	4877.86	6105.00	5645.04	279.60
Violet	39	6176.25	7233.00	6705.36	286.15

Table 17. Mean harmonic group 'X' axis values for all ROYGBIV colours

Harmonic tone colour	N	Minimum	Maximum	Mean	Standard Deviation
Red	38	110.00	1296.00	689.55	279.61
Orange	36	1134.00	2378.57	1645.72	246.02
Yellow	38	2035.00	3033.33	2399.49	186.04
Green	39	397.50	4155.88	3414.81	544.52
Blue	39	2691.20	5170.00	4792.79	403.92
Indigo	38	4899.55	6416.25	5712.81	324.19
Violet	39	5886.59	7248.00	6679.72	322.49

Upon closer examination, one will note the unusual 'ratio' relationships between the standard deviations of colours YGBI (yellow, green, blue, indigo) for these groups, as demarcated by the shaded numerical values in Table 16 (sine) and Table 17 (harmonic). These values appear to reveal a systematic relationship regarding the ratio of variability between harmonic and sine standard deviations of 'X' axis values. Figure 8 shows this ratio relationship as derived by dividing the harmonic tone standard deviation for each colour by its corresponding sine tone standard deviation.

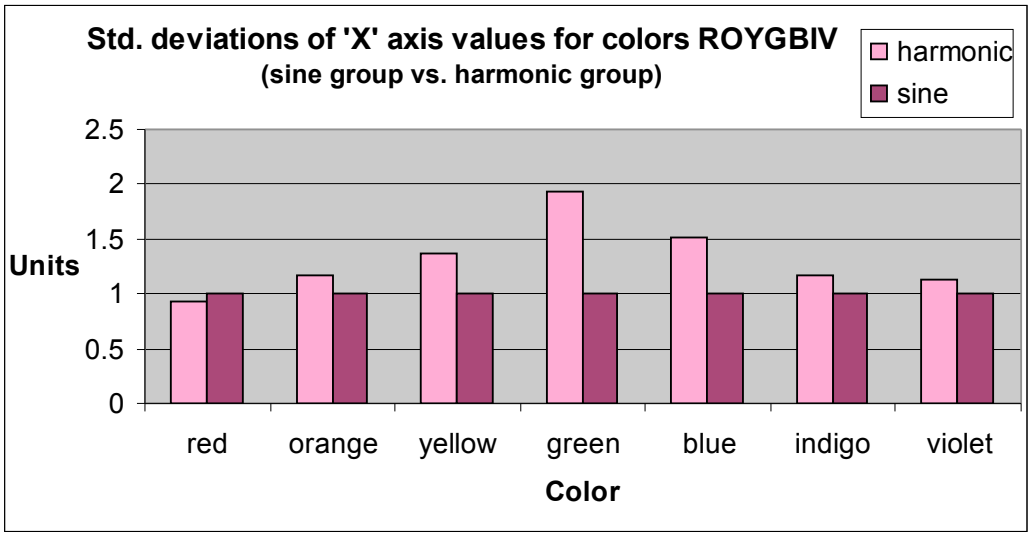

Figure 8. Ratio of harmonic tone 'X' axis variability to sine tone 'X' axis variability

Additionally, the colours YGBI that show differences in Figure 8 were virtually the only colours to be associated with specific tone clusters as per the earlier sequences of one-sample t-tests. Note how the colours red, orange, and violet have nearly equivalent variability ratios of 1:1 between sine and harmonic tones, as opposed to the comparisons of colours YGBI.

The ratio sequence for Figure 8 was derived by dividing each harmonic standard deviation for the colours YGBI by its colour-matching sine tone standard deviation. These calculations indicate that the amount of harmonic variability for every 1 unit of sine variability equals .933 to 1 for red; 1.167 to 1 for orange; 1.36 to 1 for yellow; 1.936 to 1 for green; 1.523 to 1 for blue; 1.159 to 1 for indigo; and 1.127 to 1 for violet. This relationship appears to reflect the hypothesized influence that harmonic content may have on participant colour choice however, as mentioned earlier, there are clear amplitude differences at work within the two groups. The natural sound energy of the sine tones changes at the higher frequencies and thus there may be an interaction of several effects that facilitates varied responses.

It is also important to address a discrepancy in standard deviation sizes in Tables 16 and 17 with respect to the colour red and the remaining six colours. For example, in Table 16 the colour red garners a standard deviation of 299.72—nearly

half the size of its mean 'X' axis value of 704.04. The remaining six colours do not show such drastic variability between their means and standard deviations. A plausible explanation for this is the fact that within the visible light spectrum, the colour red occupies the greatest bandwidth or 'range' with respect to the colours ROYGBIV—130 nanometers in width for red, as opposed to 20 nanometers in width for a colour such as yellow—a more than six-fold difference (Hyperphysics, 2010). As presented earlier, the Figure 2 screenshot of the main interface showing the "colour-picker" visual stimulus provides an excellent visual example of this red-yellow visible spectrum bandwidth difference. Thus the colour red not only has wider representation on the sinusoidal wave colour visual stimulus, but it also has greater bandwidth representation within the human visual system as per the visible light spectrum. Therefore it is possible that this greater bandwidth perception for the colour red translates into greater variability in 'X' axis clicks on the part of participants.

6. Discussion

The experiment produced all indications that there is a consistent pattern of responding regarding association of basic colour with harmonic and sine tones. In addition, it strongly corroborates previous research indicating high tones being associated with bright colours, and low tones being associated with dark colours (see Marks 1975; 1987). Also, the fact that the experiment utilized a sequence of tones and semi-tones was of great importance in that it allowed for a precise tone content analysis and thus a more sensitive measure of any occurring effects. Similarly, the inclusion of tones with harmonic content allowed a more precise measurement of how colours and tones might be associated—a relationship that is perhaps more indicative of 'real-world' music listening and tone exposure.

For several hundred years Newton's mapping of tones to a wheel representing an octave of sound has persisted—the result s of this study directly challenge this Newtonian theory. The results of this investigation appear to indicate that dispersion of colour association with tones occurs contrary to that which Newton theorized, and seemingly occurs linearly *across* octaves rather than repetitively *within* octaves. In

addition, the current investigation utilized a colour sinusoidal wave stimulus that is strongly in concert with Newton's early experiments revealing prismatic decomposition of the visible light spectrum results in a sinusoidal waveform.

As per the hypotheses as stated, the result s of this experiment do support an observable systematic mapping of tones to the piano keyboard and do support the hypothesis that sine and harmonic tones would manifest measureable variability—with both hypotheses as stated being confirmed at levels of statistical significance. Serendipitously, it was found that the relationship of the sine and harmonic tones manifests not only as simple measurable variability, but as a clearly defined ratio-related systematic patterned relationship that actually reflects the physical differences between these different types of tones.

The results as garnered by this experiment appear to indicate that human colour vision, when coupled with a tone presentation paradigm, responds to colour stimuli differently—that is, in a very systematic way with with respect to presence or absence of tonal harmonic content. Thus the converse idea that a presentation of specific colours could lead to accurately mapped specific tonal responses on the part of individuals, is a very plausible reality. Such a relationship would not only be interesting, but could be a relationship that could be exploited to assist in everything from music composition to strengthening brain pathways that share the common processing of such information. The idea that a system of colour presentations could one day be used to assist those with damaged auditory pathways would bring new meaning to the sound-colour relationship by taking it further out of the artistic realm and placing it within the treatment realm. In addition, such a system could lend itself to the treatment of visual system deficits via reverse application.

Albeit, this experiment provided insight in how this relationship of tones and colours may be founded, it cannot provide full support for the definitive relationship of tones and colours. Further research should look into other tone sequences to determine exactly where the borderlines of this tone/colour relationship effect truly lie. For example, a set of tones that do not reflect natural or 'obvious' tones that one would be exposed to, would be of great interest.

Perhaps the human ear is naturally tuned to the tones that are indeed reflected on the piano keyboard, and that the historical development of the piano keyboard and its tones was unconsciously guided by this natural response attunement. This experiment may be a furthering of what constitutes a truly systematic relationship that can be capitalized upon. It is also important to acknowledge the role that timbre might play in results such as those generated here. One cannot distinctly or remotely draw the conclusion that these results will generalize to other instruments or listening environments. As the oboe yields a different sound and listening experience from that of the flute, so might colour association vary across the multiplicity of musical timbres (e.g., West-Marvin & Brinkman, 2000). As equally important would be the dynamic qualities of tones, such as sound envelope parameters of attack, decay, sustain, and release. It may well be the case that combinations of envelope parameters themselves can influence colour choice—or perhaps variation of timbre in concert with variation in envelope parameters has a distinct influence on synesthetic experience and response.

Analyses within this series of experiments provide clear indication that a greater spread of tones via larger intervals on the keyboard, gives the best insight into how the association of colour with pitch is manifest—a parallel to that found by Hubbard (1996). Additionally, as per Hubbard (1996), Marks (1975), this experiment gives precise support for the existence of 'mappings' between visual lightness, visual darkness, and auditory pitch—and more specifically via colour-tone mapping to a universally recognized instrument, bolsters this relationship with far greater empirical evidence.

One could also consider the appearance of this type of result as the potential revealing of a new direction regarding auditory and visuo-sensory mappings/associations. In fact, Figure 10 is an intended visual representation of this potential tone-colour mapping relationship in its basic form. Additionally, and as important as any pure psychophysical result derived from this experiment, this investigation appears to reveal additional insight into the apparent relationship between the visible light frequency spectrum and the sound frequency spectrum.

But, as is always the case, one must approach new findings, no matter how enlightening, with cautious optimism and the attitude that further investigation will always clarify things to a greater degree. By having participants individually define the colours beforehand, this experiment was susceptible to what could be termed as 'differential perceptual agreement'—that is, although people may actually 'perceive' colours differently, as long as there is consensual agreement (e.g., categorical and descriptive) between people despite these differences, these differences go unnoticed and unchallenged. Thus, additional individual differences can clearly exist, but are perhaps masked by participants' personal categorical nomenclature of the perceptual world.

7. Conclusion

The purpose of the current investigation was to reveal the association of basic tones with colours, and to determine any influence that the presence/absence of harmonic content may have on such a relationship. Experimental results as per this study do indicate that there is a systematic relationship between tones and colour as well as a systematic relationship between harmonic content and participant colour response. Such results confirm the hypotheses as stated and are highly intriguing in that they are clearly contrary to the relationship of sound and colour as Newton put forth several hundred years ago. However, it is difficult to fully conclude this relationship is definitive without more in-depth studies inclusive of the relevant perceptual and processing areas of the human brain.

Cross-sensory modality processing and its influence on human behaviour is an extremely important research endeavor for a future of computerized virtual interaction between machine and man. It is without doubt that there remain a plethora of discoveries to be made in the field of cross-sensory modality studies—as of yet we have only scratched the surface. Perhaps one day such studies will reveal the manner in which we can use auditory information to treat vision problems; proprioceptive information to treat auditory deficits; or multi-sensory combinations of vision and audition to strengthen damaged neuro-motor pathways. Ultimately, the importance

and urgency of understanding cross-sensory modality relationships is underscored by our ever-increasing reliance on technology itself, and its value to science across all endeavors of human exploration.

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"Creavolution" with Trevor Wishart

Nicolas Marty, graduate student at the University of Paris-Sorbonne (Paris-IV), France, under the supervision of Professor François Madurell

Abstract

Trevor Wishart is an electroacoustic composer who obtained his PhD at the University of York in 1973 . books *On Sonic Art* (1984 and 1996) and *Audible Design* (1994), which present his ideas about sound treatment, perception and composition. All of the theories and ideas I talk about here are related to my research as a graduate student in music and musicology, entitled *Sound identification, listening strategy and narrativity in Trevor Wishart's* Journey into Space *– Agentization, objectization and narrativizations* (translated from the French: *Identification sonore, stratégie d'écoute et narrativité dans* Journey into Space *de Trevor Wishart – Agentisation, objétisation et narrativisations*). The present essay is mainly the transcription of an interview with Wishart himself, in which we talked about *Journey into Space*, sound identification ("landscape"), voice (both recorded and improvised), symbolism and narrativity. I will add some comments and ideas throughout the essay; these will deal with music and meaning, the main subject of *JMM*, as well as with my own research on electroacoustic narrativity.

1. Introduction

Trevor Wishart's work oscillates between music, symbolism and what he calls *sonic art*. Focusing my master's research[1] on narrativity in electroacoustic music and radiophonic art, I chose *Journey into Space* (1970-72)[2] as a basis for a series of tests, the first of which has already been completed...

Three thirty-seconds samples from *Journey into Space* (1 / 2 / 3) were presented to forty listeners who were then asked to write down their thoughts and sensations on a piece of paper. The main findings showed that listeners tend to "objectize" sounds that seem to be produced by a human or anthropomorphic agent or an event, and to "agentize" human or anthropomorphous sounds[3], thus "narrativizing" music (for details about narrativity and narrativization, see Hermann & Vervaeck, 2005 and Prince, 2003).

Moreover, it seems, as many soundscape composers would acknowledge (Schafer, 1994), that sounds carry a certain symbolism which is often transmitted to the listener. Mainly, I distinguish between three sorts of *contextual identities* that can help the analyst define the symbolism and "meaning" a sound can have. Those identities are based on chronological, spatial and anecdotal potentialities of the sound production. This approach posits that the listener relates elements of a narrative work to what Laure Ryan calls the rule of *minimal departure* (Ryan, 2004), which states that when not provided with information, a narratee – in our case a listener – will complete the narrative worldmaking by him- or herself, assuming that the missing information can be related to the real world, or at least to a world that is plausible to him or her (Herman, 2009).

On March 15th, 2011, Trevor Wishart welcomed us into his home and agreed to be interviewed about his music, and more specifically about *Journey into Space*, the *VOX-Cycle* (1980-88) and his ideas about narrativity and meaning in music. This conversation took place over a cup of tea, with Trevor Wishart and Roxane Villeneuve, a graduate English student who came as a backup interpreter. It tends to show that musical meaning – or maybe we should say music's meaning to avoid confusion – far from being one-

[1] As of today, my research is not available in print. Details and publications will be available soon on my website, http://marty.nicolas.chez.com/

[2] Throughout this essay, musical works are dated but not referenced in the references list. Complements about Wishart's works can be found on his website, http://trevorwishart.co.uk/

[3] "Human sounds" would be sounds that have a certain quality of "voiceness" (Wishart's utterances). "Anthropomorphous sounds" would be sounds that seem to be both self-produced (as events) and willing, thus acquiring a "voice-like" quality.

dimensional, can go from socio-politics to more private domains, and from purely "musical" – i.e. formal – meaning, to meaning connected with more realistic considerations. All in all, the composer's mind is but one of the aspects of this meaning, and narrativity in itself cannot exist without the listener's narrativization of a work.

2. Sonic Art

Nicolas Marty. Where do you come from as an electroacoustic composer?

Trevor Wishart. I became interested in using sounds from the real world for personal reasons. At the time, I had just written a very big piece for orchestra. I was very much influenced by Xenakis, whom I did my thesis about: I used random number tables and seven or ten different tone rows and… all that stuff, you know – 1960s stuff.

And my father, who worked in a factory, died, and I thought: 'What's this music got to do with anything?' (*laugh*). So I just bought a little portable recorder, very cheap, it ran at three inches per second, which is like a sampling rate of 6,000 hertz. It had a built-in microphone, and I went out around power stations and factories for making recordings without any idea what I was going to do. And then I applied to the University of York, which had a studio, with some vague idea that I was going to make a piece with sounds from the real world. And that's how I got involved, really, I wanted to make a piece that related to my father's experience and somehow relate what I was doing to the real world. (*silence*) That's essentially how I got involved.

It wasn't through the influence of listening to electronic music. I knew that there was the electroacoustic music, I knew there was the great debate about electronic music versus *musique concrète*, but I didn't really know a great deal of music. Richard Orton, from the group *Gentle Fire*, was my supervisor, and played one or two pieces. Richard was really into the American experimental things. So it was more those kind of things that I knew about, rather than the French tradition of electroacoustics – I really got to know that a little later, when Dennis Smalley came.

And I came across Xenakis' piece from the Brussels exhibition, *Concret PH* (1958). It was a multi-channel thing, with a sort of breaking glass going on for ever (*laugh*). I was fascinated by Xenakis, he was a genius, but I had – and still have – a more humanistic attitude toward music: I'm more interested in some conception of how music communicates. I guess Xenakis' idea is that music is a kind of ideal object, a mathematical object which you make, which is logically coherent. But in fact, it's a bit like Stockhausen, there's the theory on the one hand, but when you listen to the music...

I'm quite interested in things rigorous because I do computer programming, but in the end, it has to have an expressive purpose. I find pieces which are technically complex without expressive or poetic intent…boring. And pieces which have poetic intent without any technical complexity…boring! (*laugh*) So the trick is to link those two things.

I was also interested in improvisation. And so a lot of the work I did with the electroacoustics – because there was hardly any equipment here, there were just tape recorders, essentially – was to find objects or to get people to blow down scaffolding tubes, or all kind of things. Recording improvisations, which I structured in some way. And then editing those to make a piece: I call that music-montage. And although I'd say even now my electroacoustic composition involves a certain amount of improvisation – because you never know what you'll get, no matter how experienced you are – what I do now is much more contrived, and tends to be in the studio, with material I collected and I'm working extensively on.

NM. When people listen to your music, do you want them to listen in a certain manner?

TW. I'd like at least people listening from the beginning to the end. It's not an installation; it's a piece of music. It has a beginning, it has an end. I don't really mind how people listen to it. In general I feel that there must be something in a piece that grabs you on the superficial level at the very least. It shouldn't be so complex that unless you study a textbook you won't listen to it again. It must have at least one thing that goes to 'That was horrible, I must find out about it' or 'That was fantastic, what was going on?'.

Then, it must have some layers. I think as I have grown older, my music has become more complex, but there's always this immediate surface that you can grasp. When you listen several times you can hear more and more things. That's thinking musically, I guess. A non-musician would listen to things and enjoy them or not. As a musician, I tend to take things apart as I listen – I can hear this different levels going on, because I'm trying to listen. I tend to like music like that, with three things going on at the same time. With more than three things, it becomes too complicated because it is not possible to hear more than three things going on in music, in my view.

NM. What could you say about your musical style?

TW. I felt the term 'sonic art' was a good thing which was able to include these things like music that approach documentary, or music that approach representational mythology. It's a more general term.

> I've been taking my new piece, *Encounters in the Republic of Heavens* (2006-11), around places where I did recordings. I played some samples in a retirement home, and they really enjoyed themselves. Then one lady came out to me afterwards and said: 'Before you did this stuff, did you use to write real music?' (*laugh*)
>
> So it's very difficult, and sometimes it's useful to describe to people what you do as 'soundscape', or 'sonic art', because then they don't have to think 'It's not quite a tune' or 'It's not like the music that I like'. But as far as I'm concerned it's all music, because it has to do with the organization of sound in time. It has to have sound. And it has to be organized in time, because those are the two critical things about music: you're taken on this journey through time, using sound. And that's the essence of the medium.
>
> It's very confusing because sometimes you get these debates about what is sonic art. Sometimes sonic art is being taken by people coming out of the art world. Then sonic art is Art, which you make, but using sound: installations, happening in galleries, which you can go and stay in for one second or three hours. That's very interesting. It's not music. But that's fine. (*laugh*) Then there's sonic art which is music using sound. For me, music has a beginning and an end. You have to hear it from the beginning to the end, because it's all about the logic of time. It's a different thing.
>
> I do music. (*laugh*)

3. Transformation

Computers (and before them tape manipulation) allow the transformation of sounds, whether in themselves (reverberation, time-stretching …) or between several sounds (hybridizing, interpolations). Those processes were and still are widely used by Wishart, who participated in the programming of the Composers' Desktop Project, an open-source computer interface for sound manipulation and composition.

Apart from the obvious formal and compositional uses they imply, I prefer to focus on the meaning of those transformations, particularly in works like *Journey into Space* or the *VOX-Cycle* where sounds are easily recognizable. At this point, transformation may lead to a surrealist, or at least metaphorical, musical language. Wishart named this concept the *concrete metaphor*. According to him,

> the sound-image 'bellow/water-pump' may be interpreted as the functioning of the machine or the functioning of a human body and when our perception of it changes from one to the

> other, a metaphor is implied. […] Using concrete metaphors (rather than text) we are not 'telling a story' in the usual sense, but unfolding structures and relationships in time.
>
> (Wishart, 1996. 166)

Such metaphors do not seem prominent in the perception of a work when the listener is not told that they may exist, or when they are ambiguous (like the 'bellow/water-pump' metaphor). However, from the moment the listener is aware of their existence, they take on an important role in the perception and the perceived meaning of the entire work.

NM. In *On Sonic Art* (Wishart, 1996), the concept of transformation seemed very important to you. Is that still true today?

TW. Well, actually, it has changed since *Red Bird* (1973-77). I think the pieces led up to *Red Bird*, where I crystallized the idea of using sounds in a mythological way. So instead of saying 'this is the sound of something', I thought 'this is a sound of something which probably represents something else, and I can work with it in a mythical world of sound transformation'. *Red Bird* distils that idea and develops it as far as it would go, from my point of view.

The change really came after that, when I became more interested in sound transformation as a musical formal idea. In my later works, the other extreme is *Imago*, which is about transformation, but not with a mythological content. It's poetic, but it doesn't have any referential uses… Well, that's not true (*laugh*), it has one or two; but most of the time, you're just aware of the transformational processes. It's more abstract.

NM. And when you are aware of the source, it's a 'concrete metaphor'.

TW. Yes. You are aware of the source, but the source has some kind of mythological resonance as well. In *Red Bird*, and before, these extra-musical relationships are the important thing. What's the relationship of the birds to the machines? It's not just that they sound like each other; it has to do with how they refer, and what they might be referring to. In the later works, it's more about the transformation itself.

NM. In *VOX-2*, we have human beings right before us, which can be imitating birds, animals, or whatever. Then in *VOX-5*, we don't have any visual dimension. But still, we have a voice, a human voice…

TW. Well, the point of *VOX-5* is that it's not a human voice. It's strange, it's too great, it's too loud, it fills the space. It's a mythological voice. But as with all mythological beings, we tend to think of it as human. (*laugh*) We can talk of the voice in all kinds of ways. We can talk about The Voice, by which I mean everybody's voice. We can talk about the voice of the people. So what is this voice? It's one of those kinds of voice: a generalized voice. It has something to do with human creativity and human destructiveness. I don't think it is the voice of God, literally speaking, but it's using the Shiva metaphor. In *VOX-5*, this voice is the source and fountain of everything, it creates and destroys everything. So it's a metaphor of everything for life, a metaphor of the world.

There's a sort of drama. You've listened to nearly an hour of music, performers in front of you. At the end of *VOX-4*, they gradually sit down, it goes dark, and this voice seems to emerge out of nowhere and fills the entire space. It has this very dramatic contrast with everything you've heard. It is… it is literally disembodied. (*laugh*) There is no one there. So the theatre, it's quite important.

NM. Then there is the idea of 'landscape'.

TW. Yes. The original idea of landscape was to differentiate the ideas of where sounds come from and where sounds appear to come from. A simple example is a symphony that you hear on the loudspeakers. You don't think to yourself 'I'm listening to loudspeakers'. You think you're somehow listening to an orchestra. Landscape is the imagined world from which sounds come.

In the popular or classical music world this is extended, because most performances that you hear on record are not realistic representations of performances. They're constructed in the studio, not only in terms of getting everything right and recording people on different days, but also in terms of where people are in the space, and all kinds of other things. You can therefore move into this other sphere where you're in an imaginary space, just as in a film.

It's a theatre of sound, because there is nothing to look at, so there can be anything to look at, and you can create whatever illusion you like in front of the listener. And it becomes an aspect which you can work with as a musician. I think it's really important to understand that. A lot of students who come to the studio compose in a traditional way, like if they were composing for instruments. And they have no sense that they're working in this theatre of sound.

I tend to use space a lot. Because you can add gesture to a sound, by the way it moves. It can accelerate towards you or move off in the stage, or hover in the distance or whatever. And those are kind of musical expressive qualities. Again, the same development has happened as with the other things in my work. Now I think more abstractly about that. I tend to make gestures in the space that feel powerful musically, rather than using them as if they were representations of sounds. The gesture of a thing accelerating towards you has a sort of musical impact, whereas the gesture of the same thing accelerating away is kind of the opposite. This is more formal, but it doesn't mean that it's less powerful. The gestures have to be emotionally or expressively justified. I'm not doing it because I have a scheme which says that this moves to the left and that moves to the right. I'm doing it because this sound feels like it wants to do *that* in this particular context when I'm trying to do *this*. Theatre of sound, of the articulation of space is really crucial to all my music.

NM. In *On Sonic Art*, I think, it was more about identification of sound. Recognizability of realistic sounds, maybe.

TW. To some extent, yes. But the key idea is that there is an imaginary space behind the loudspeakers, where you recognize things that you recognize; or you think you recognize them because they sound familiar. There are all kinds of other interesting psychological issues. There's more of that in *Audible Design* (Wishart, 1994): even sounds that are completely synthetic, unless they're extremely contrived, will tend to be thought of as being hit, stroked, shaken, ...

We tend to have archetypes which we impose on sounds. Even with music that derives directly from instruments or things that are played, you have this conception about how they came into being, about what they are. It's not so much 'Oh yes, that is a bird'. It's 'That's something that's being hit', or 'That's some creature-like thing', 'It's a voice articulation'.

In the electroacoustic domain, where there is no performance in front of the audience, it's sort of foolish to ignore this while composing. Firstly because the audience is probably not going to ignore it (*laugh*). And secondly why ignore it? You can use it, you can play with it. I guess in general I work with a slightly abstract view of recognizability. (*laugh*)

NM. And without having to verbalize it, the listener will take it into account?

TW. Yes. It's not theoretical in the sense that it's not like I construct them and then you have to agree with me on things. When I hear sounds, these things strike me about them. And I think that they will also strike everybody else in that way. I have a more empirical view of these things. But this is how sounds work, and this is how sounds are interpreted, because we have these Gestalts in our minds about the nature of sound.

4. "Creavolution"

Analysis of the samples used for my first experiment led me to believe that most people would perceive a religious resonance while listening to the samples (it can be seen in the first animation, in which I used a church background). This was apparent from two main things: firstly, the numerous (church) bells, used recurrently during the samples, were identified with daily, community life but mainly with the anecdotal identity of the church celebration itself; secondly, the chanting present in the third sample was apparently in a foreign, smooth (without consonants) language – even though it was in fact English –, sung over single repeated notes and regular rhythm. This led me to believe that most listeners would relate it to oriental religious chanting, often presented this way in big screen movies.

The test showed that the religious aspect was in fact important to the manner in which listeners verbalized their experience of the samples, and that for the few who didn't relate the bells to church itself, the bells were a symbol of an announcement, whether joyous (birth) or dark (apocalypse). It is interesting to note that even for those listeners who didn't mention religion at all, the bells were still related to the church and the functionalities it inherited from religion. It then seemed more than logical to ask Wishart about his link with religion. His answers show that again, the composer's vision of a work is not at all the only one to be considered when analyzing the meaning of the work.

NM. About recognizability, do you remember where the sounds used for *Journey into Space* come from? Particularly the bells…

TW. (*laugh*) It was a very, very long time ago... Some of the sounds came from sound-effects records, because at that time, sometimes I used those rather than making my own recordings. I can't remember. The baby was a recording I made or I got from a friend. (*pause*)

I can remember there's a thing with chanting in bells in the middle. At that time, the gas people were changing gas fires, because we were changing to North Sea Gas. So everyone had their gas fire changed. There were these metal bits inside the gas fire, which were all roughly the same shape, but not quite. And if you hit them, you got this sequence of sounds which were similar but not quite the same. So those bells are the insides of gas fires! (*laugh*)

There are all kinds of things in *Journey into Space* like sort of toys, and blowing down scaffolding pipes, but there are things mixed in from what I made in the studio, and some things from sound-effects records. It's a very eclectic gathering of sounds.

NM. What about the church bells?

TW. There might have been church bells, I can't remember! (*laugh*) I'm not a really religious person, so it's unlikely that I recorded any church bells. But if they sound like church bells, they're church bells. (*laugh*)

NM. Well, I did an experiment, with a sample from *Journey into Space*, at the end of the 'birth dream', with those church bells, a baby crying and children singing. Almost everybody thought of 'baptism', or at least 'religion'.

TW. (*laugh*) Oh, dear! (*laugh*) Well, that certainly wasn't intended to do that, but if that's how people interpreted it, well we have to accept that. The bells, I guess, would be just a joyful thing. I'm fairly atheist, so that's very interesting! (*laugh*) I don't associate those bells with religion at all… but I guess they are religious. They're used on occasions like weddings or baptisms… It's a sound of celebration. I didn't make that conscious connection, not with religion.

NM. What about the rest of *Journey into Space*? The 'creavolution' chant for example. This seems pretty involved.

TW. Yes, that was political. (*laugh*) It's very strange to talk about it, because I feel like I'm a different person by now. It was the 1960s, when the people felt the society could change and was moving in a new direction – it did a tiny little bit, but not as much as people thought. I was interested in the idea of creativity from a political point of view. I felt that by creating things, people would learn that they can have an influence on the world, that they don't have to just do the things that they're told to do, or even to do things in the way you're supposed to do them. You can actually make something yourself. This was a slightly naïve idea, but essentially I had this idea of creativity as a form of political action. (*pause*)

If the world is entirely deterministic – it was the general scientific view – how is it possible to be creative? I spent a lot of intellectual energy thinking about that kind of crisis. (*pause*) It's quite interesting how evolution works. Roughly speaking, everything's determined if you know the starting point, the initial conditions. If you knew the initial state of the entire universe, you would be able to predict everything that would happen. But the point is: nothing in the world can ever know that, so the idea that everything is determined is a kind of philosophical construct. It might be determined, but it's not determinable.

Well, it's a long, complicated philosophical discussion about the nature of creativity; I could go on for hours about that, I approached various biologists and thinkers to discuss some ideas about creativity. I'm linking the ideas of biological evolution and social change. How does society change? *Journey into Space* is a little bit about that, about the journey through life, evolution, change, those things. I'm quite an optimist.

NM. So it was more of a physics / political view, rather than a religious one?

TW. From my point of view, yes. I don't think that things are completely determined, and I think it's possible to create new things. I'm not very deterministic or materialistic. There are things that we don't understand, and it is possible to create new ideas. Human beings create things all the time. It's not possible to contradict the laws of physics, but from what we know it is possible to create. I have a kind of religious view about that… Creativity is part of what makes life meaningful. Certainly for me. The fact that your life can actually bear fruit, that you can create something that has not existed before. But I don't have any traditional religious views.

NM. The word 'creavolution' has then nothing to do with the antagonist theories of Creation and Evolution?

TW. Quite the opposite, no. (*laugh*) No, no. Essentially I'm opposed to religion, I think it's a bad thing. It divides people, and it makes people kill people. I'm also a scientist. I was trained as a scientist, and I just don't think there's any evidence for a religious view of the world. But you don't need God to be creative; humans are creative, that's really my point of view. And that's to be celebrated.

NM. What about the 'being is becoming' chant? Many listeners heard this as some Tibetan monks, or…

TW. Well, it's probably influenced by that, because it was the time when we were listening to all that music from different countries. We were exploring singing harmonics and things

like that. Stockausen's *Stimmung* (1968) was around, I think. I was exploring my voice, and I was able to sing these harmonics. (*pause*)

But, I don't think Tibetan chanting is being religious (*laugh*) because I'm not a religious person. I can see people celebrating the earth, or humanity, or creativity. If they want to express it in religious metaphors, that's okay, I don't have a problem with that. As long as they don't kill each other (*laugh*)…

I guess religion for me is a metaphor. All gods and things are metaphors, they're not real. In *VOX-5*, Shiva is a metaphor of the creation and destruction of things, the internal creativity of the world. That is what the fifth movement is about… (*pause*) You go through the cycle of things, through the social breakdown, and then you hear the voice which represents this combination between chaos and creativity. Fascinating, that. (*pause*) Well, interpretation by listeners is okay for me, because it's like when you have a child. They grow up, and end up doing things you never thought they would do, and you probably don't agree with. That's what happens to your work, because it becomes independent from you. In the end, it's what other people take it to be. It certainly wasn't my intention to come by any religious matter, but it may, in a very broad sense, go with the importance of creativity and development. Change in the world.

The *Sounds Fun* booklets come out of this interest in creativity. Through my career, I've done a lot of workshops, getting people to create their own music. The *Sounds Fun* are a way of getting people to work musically, to gather material, to get the workshops going. We play these little rhythmic and melodic games, and I give people tasks to do, like 'make a piece on one note, where there's only one event'. It has to last two minutes, you can't change the note and you can't have any events happening. You've just got to think what to do. That would be the start of a bigger project.

While recording people in the north-east of England for my latest project, when I went to schools to record, I also ran workshops with the children. All these workshops had to do with polyrhythm. We took a phrase like 'Lockwood school is the best school in the world', then we said it in triple, quadruple, quintuple meter. Then they had a task where they had to think of a hundred of ways to say the sentence, and to make a piece. They made those pieces and then we brought the pieces together, rhythmically. That's a simple compositional task. (*pause*) I'm really interested in unlocking people's creativity… They can make it, they can do things… It's all part of that *Journey into Space* thing, it's all part of that mission.

NM. And that's the meaning of 'being is becoming'.

TW. I guess so, yes. (*pause*) I have to say, I find that now, very embarrassing. It's very 1960s. (*laugh*) Some people really like it, though, so that's fine! Six years ago, I went to Los Angeles to do a concert, and I discovered this whole cult of people really into *Journey into Space*! Now I find it quite embarrassing, a sort of juvenile work; but it doesn't matter, because it's gone off into the world.

NM. So you think the *ideas* were juvenile?

TW. I think the ideas were the ideas of a young man, and as you get older you have a more sophisticated view of the world. Also I think technically it's not very good. It's too long. I find it slightly embarrassing, to listen to. If you come to it afresh from the start, maybe you don't notice those things, they don't matter. You hear, and you either like the events or you don't like the events, but it's not like you're going to go back and hear lots of other things in it, that you didn't hear the first time.

But now listen to *Red Bird*. My views have become more sophisticated, it is really organized, worked out in terms of the mythological structure of the sounds, the gestures, the timing and everything. Even after you hear it for the first time, you can go back and hear lots of other things, and so it has this richness about its construction.

Going back to *Journey into Space*, this feels… (*laugh*) This is a first attempt at doing something! *Machine* (1969-71), I find satisfying as a piece, but it's not technically good: it has all kinds of distortion, those kinds of things. More primitive equipment, and in more difficult circumstances. *Journey into Space* is more ambitious, and for me it falls on its face with it. Whereas *Red Bird* is… my first really good piece. I managed to get these ideas to come together and really work.

5. Symbolism and Narrativity

Murray Schafer posits that

> a sound object is symbolic when it stirs in us emotions or thoughts beyond its actual mechanical sensation as sound. / The sounds of nature are most pleasing to man. Water in particular has splendid symbolism. Rain, a fountain, a river, a waterfall, the sea, each make a unique sound but all share a rich symbolism. They speak of cleansing, of purification, of refreshment and renewal.
>
> (Schafer, 1973. 37)

Moreover, birds and their songs symbolize delicacy, freedom and protection (Schafer, 1994. 106), sounds of travel carry mystery and vocal articulations : "On the prairies – so flat that one can see the full train from engine to caboose, spread out like a stick across the horizon–the periodic whistling resound like low, haunting moans" (ibid. 81). Closer to our samples, the sounds of bells marks (or marked) the passing of time and the limits of human community. But Schafer says that "while the contemporary church bell may remain important as a community signal or even a soundmark, its precise association with Christian symbolism has diminished or ceased; [...]" (ibid. 175). As we have seen in the third part of this essay, this is not entirely true.

Still, the idea of sound symbolism and "associationism" has widely spread among composers, and particularly among soundscape composers (for details, see Copeland, 1997; Copeland, 1998; Westerkamp, 1995; Westerkamp, 1999). Since Wishart seemed quite involved with sound-symbols himself, I asked him about his use of them and their narrative implications in *Journey into Space* and in *Red Bird*.

NM. In the *Journey into Space Travelogue* (Wishart, 1975), you speak of sound-symbols used for their *obvious* symbolic content…

TW. *Obvious* symbolic content… (*pause*) I think it's clear that someone is going on a journey, because you hear him set off, and then get into a car and drive away. Then that journey becomes abstract or more 'dream-like'. *Journey into Space* is a dream. Or it's not. It's that kind of mythological thing. I suppose those things are obvious. (*pause*)

Then, the sequence of the bells that becomes the keys that unlock the doors: it's the 'revelation' through the opening of a door, and moving into a different space. Then you hear the beginning recapitulated, or maybe developed. (*pause*) It's difficult to tear apart these meaning threads and musical threads, because it's a recapitulation, it's a standard musical procedure. I always think like that, because I'm a musician. I put things together from a musical point of view, even when there's a lot of narrative going on. (*pause*)

I can talk more easily about *Red Bird*, because I remember it. In *Red Bird*, you have the birds, the animals, the voices and the machines. The way they're organized, the machinery has obviously some relation to both advanced industrial society and the way we organize society as well. Some voices, human or animal, are dragooned into the shape of machines.

Obviously the animals represent the natural world. But they also represent things that are not in this mechanistically controlled society; so they're a metaphor for freedom.

The symbols are naïve, in a way, but what's important is what you do with them. I wanted to use symbols that everyone would just get, without having to read or put a huge program note, or several books on mythological theory. If you take the symbols together without organization, people might say: 'Oh, how naïve and stupid'. Then you develop in complicated ways the relationship between them, the way they transform themselves, and that becomes interesting. You grasp the symbols at an intuitive level, but you're captured by the mythological storytelling and transformations.

I can't remember so much about *Journey into Space* or what I was thinking about. This idea of the journey was also about space flight at the time, because of all this recent successful explorations of space. There was an excitement about the possibilities of technology, which is related to the metaphor of what is possible in the creative space. (*pause*) I guess the best in *Journey into Space* is the opening. I really like that thing with the scaffolding pipes, toys, all those which are nearly all live recordings of people moving around to get the sensation of space. That, and the thing with the keys at the finale.

NM. What about the baby?

TW. Well, I suppose there are about three journeys going on. There's the journey getting up in the morning, going off in the car; there's the journey of life: you are born, you develop and so on; and there's the journey of discovery, which is some kind of mythological journey. These things are melded together in the idea of a universal journey. Life is a journey, which moves towards some kind of creative realization.

That's the idea, except there's no realization, since when you come to the end the piece just stops. (*laugh*) That was a very conscious idea: the journey just stops. There isn't a conclusion. Because to have a conclusion would be to say he was searching and now he knows… so okay we can go away, there's nothing to learn anymore. Here I have to go through this journey, and suddenly I'm left here: that's a metaphor for life. You're right here, and you set off for this journey. You don't know where you're going. There isn't any natural conclusion where you can say 'Okay, I've got the point of life, yes' and tick the box (*laugh*).

NM. And since the piece lasts one hour and twenty minutes, even at the end you don't know if it's really finished, for at least thirty seconds.

TW. Yes, because there are long gaps in the middle anyway.

NM. Plus I think that there's this idea of *silence* that goes in the space. In the 'journey' part, you have fifteen minutes with almost only little bells. And still, even with sound, you hear the *silence* in background.

TW. I guess the idea is this mysterious landscape. You don't know where you are. I don't think it's *silence* – rather a floating, strange world. (*pause*) There's some mystery about the world. Not religious, but… You can look at space and see things that are forty million million million million million million miles away… and they are actually millions of years older as well. They've been there from a time there was, never mind humans, no life. And they will be here afterwards. It is this amazing spectacle of the universe. It's almost impossible to capture that feeling. The beginning is this kind of mysterious…thing. This atmosphere in which things float about… (*pause*) And it works as if it were a dream… But obviously it is both a dream and something metaphorical. The end is more conscious while building momentum towards the great climax and then stopping, leaving us here. 'Where are we going? What happens now?'

NM. So *Journey into Space* might be a narrative rather than a musical form?

TW. I don't think so; I think it definitely has a musical shape. If you set it out as a narrative, like if someone tells you the story, it's not very interesting. It's a musical sound experience, it has the recapitulation, the developments; but it's not polyphonic, it doesn't have a lot of musical layers.

NM. Still there are narrative layers. The man wakes up, gets in his car, and disappears for a journey…into space! Then twenty or twenty-five minutes later, he comes back asking for gas. Then I thought: 'So all I heard until now was happening in his head'.

TW. I think it's meant to be ambiguous. It could be what he dreams. But as it goes along, the dream becomes what the thing's about. He disappears, entirely, from the narrative. And we go on this journey, whatever it is.

NM. He comes back again, with the keys…

TW. Well, he may be. (*laugh*)

NM. A key can't just turn itself in the door except if we're okay with it being a dream and being totally dream-like. But as long as we get this as a 'turning key' sound, this sound cannot exist without a human agent. So it's him, it's the man.

TW. For me, these threads, it's meant to be confused, confusing: is it a dream or isn't it a dream? Sometimes you come out of it, and then the man disappears again. And by the time you get to the end, he has disappeared altogether.

NM. The title of the first part, 'birth dream' is really… restrictive for the listening strategy.

TW. This was continuously composed, it wasn't conceived in movements. My intentions were that you start off in this mysterious world, you don't know where you are, and then suddenly… oh yeah, it was a dream. But was it a dream? I'm not sure. Oh yes it was a dream. So that's the strange thing: it was a dream, but was this a dream? That's part of it, it's not clear. It's mythology. His journey is also mythological.

NM. It was almost like *Red Bird*, then? A contemporary myth?

TW. Yes.

NM. You thought of it like that?

TW. *Red Bird* was written after reading Lévi-Strauss' *The Raw and the Cooked* (1983), and I consciously tried to construct a mythological structure, where I could do what I wanted without it being a narrative. There are various sections in the piece, but it doesn't have a storyline like *Journey into Space*. It has a set of mythological objects which relate to each other, in all kinds of ways. That is better for me, because you're allowed much more complexity in the relationships, in what to suggest, in the way the people will interpret it.

Journey into Space is a narrative that's going somewhere whereas *Red Bird* has a kind of complexity about it, about getting things together. I prefer that. From my perspective, *Journey into Space* is an interesting experiment, and *Red Bird* is the conclusion of that experiment. The greater formalization in the use of the material allows *Red Bird* to work more successfully.

NM. *Journey into Space* seems to be more of a *hörspiel*, a radio work. *Red Bird* too…

TW. Yes. When they were written, no one wanted to put them on the radio, because they weren't music, and they weren't drama. They weren't anything. Then somebody invented the new *hörspiel*. (*laugh*) But they still wouldn't put it on the radio, because there was the tradition of *hörspiel*. (*laugh*).

I worked with this world of sounds; it could be narrative, music, documentary, and all kinds of things. That was completely new at the time. This flow of ways of looking at it was quite interesting. I've always been interested in things that fall between categories.

NM. At the time you composed *Journey into Space*, there was already one experiment that existed, the *Almost Nothing n°1* (1970) by Luc Ferrari.

TW. Yes, Luc Ferrari. I didn't know that work. That's a very different technique. That's a representation without being narrative. That piece is kind of… a photograph. A very well-crafted photograph. Which is another way of looking at things.

6. Voice

Another extremely important point in Wishart's work is the concept of *utterance*: "[...] there's utterance, in the sense of when I laugh or scream, or something which tells you about my age or health or attitudes" (Witts, 1988. 454). Definition is extremely complex, but it can be clearer using an example: a cry of fear is an utterance, whereas a fixed-pitch *fortissimo* sung by a soprano female is not an utterance, even if we can find utterance characteristics in it (at least telling us that we're listening to a woman). We can plainly say that utterance is that which, in human or animal voice, does not stand in the verbal or musical domains. As a matter of fact, "many of the signals communicated among animals–those of hunting, warning, fright, anger or mating–often correspond very closely in duration, intensity and inflection to many human expletives. Man also may growl, howl, whimper, grunt, roar and scream" (Schafer, 1994. 40). Utterance is then the vocal characteristic that relates man to the animal he is. It is also the sound object that calls the most for "agentization".

Wishart, as a skilled improvisator, has always used voice in his composed works. Even *Machine*, his first work, is composed of only group voices and machinery sounds. Voice is thus an inescapable element of the meaning of his work.

NM. You used voices a lot. And still do.

TW. I explored extended vocal techniques, improvising with my voice. I catalogued them, noticing that you can manipulate one sound by doing a particular thing, for example changing the vowel shape. Eventually I wrote a piece, called *Anticredos* (1980), which explores that whole catalogue of vocal techniques. The point is about openness. It starts with the word 'Credos', and what it does is that it takes apart the syllables and develops them, and so they evolve through sonic transformation. It finishes with a complete rewriting of the word 'Credos' where the sounds are almost unrecognizable.

The idea is that things change. And the human beings can have some impact on that… You can't pick that up from the music. You can only tell that the word 'Credos' dissolves. This is one of my most abstract pieces. But any piece I write has some poetic impact, some idea behind it. All the transformations structure the piece.

When it came to writing the pieces of the *VOX-Cycle*, I adopted a different style of notation for each, because the approaches to the voice are different. There are so many things you can do. That's why the scores are very different: it depends whether I'm focusing on rhythm, sonority, … I came to the conclusion that you can't have a universal notation system, which was what I was trying to do in *Anticredos*. In the end, you can't do everything. If you're writing for the voice, you have to decide what the key feature of what you're doing will be, and to adopt the notation that's best suited to it.

The voice is such a powerful sound-maker: you can do almost anything with your voice, you can imitate any instrument, … It's connected with language, with all the things, primeval things like laughing and crying, screaming,… (*pause*)

NM. That's 'utterance'. Have your ideas about that changed since *On Sonic Art*?

TW. Oh probably yes! (*laugh*) For example, I've discovered new ways of using the voice. And the other thing is that I tend to move on from one project to another. I like the research aspect of being a composer, so if I know how to do something, it's not interesting to do. For example, *Globalalia* (2004) uses lots of syllables, looking at how you can musically organize the sounds of language. But then I moved on to the latest piece I've just finished, *Encounters in the Republic of Heavens*. I have recordings of people telling stories, and I'm looking for the melodic and rhythmic shape of actual speech phrases, at a large scale. What I'm interested in is the music that's actually inside the material. You extract the melody, you extract the rhythm, you extract the sonority, and then you use those as part of the music-making.

NM. That's quite like…Steve Reich's 'speech melody', then?

TW. It's not quite the same. He worked with loops, and things that I'm not interested in. For example, I take various people's phrases, and then I discover what their melodic content is, and I attempt to put them together in harmonic fields. So they speak, and the whole thing is in harmony. That's partly choosing the material, but it's also making very fine adjustments. And abstracting those things, too.

The voice has a particular quality that allows you to recognize a person. Originally that was my chief interest: can you extract that essence? … The answer to that is no. (*laugh*)

It's too complicated, it rests on so many factors. With some voices you can extract particular sonorities like grittiness, or breaks, or nasality, projection. You can extend that into more abstract things. This piece uses instruments, melodies, …derived from the voices. It's a very long piece, it's an hour and twenty minutes.

NM. But the stories still count as semantic material?

TW. They still count, yes! There were a lot of issues surrounding that. I was recording people who live in the north-east of England. It's not like recording a performer of contemporary music. It's someone who probably never listens to art music. So there's kind of an ethical issue. With someone from the community, you can't make them sound stupid or stretch their voice like you might do with your own, if you're going to play it back to them. So I decided I would preserve that, I would restrict the sort of transformation I would do on the actual voices, but I'd still abstract material from them.

It is an eight-channel piece. The point of this is that you hear what I call the 'portraits' – because they're not just stories – of people in very wide stereo. There are eight loudspeakers and you hear them on the four frontal ones. Then you hear the other sections with all these voices around you, sometimes circulating around you, so you're enveloped by the community, you are part of this community of voices. That's part of the poetic of this piece, the human community, and also the uniqueness of individual voices.

NM. And the people, the audience will be able to turn around?

TW. Well, they can if they want, but they're sitting because it's a direction thing – this way (in front). The portraits are here, they're in front of you, they are people talking, accompanied by things, sounds moving, stereo images. There are two portraits, and then you have sound all around you. But it's still organized with the view that this is the front. Key events will emerge at the front. But sometimes things will rotate around.

Generally, you can follow the story complemented by the instruments that are derived from the voices. It's a crossover between storytelling and sonic art. The crucial thing is: what happens when you take it somewhere else? There's a very strong accent in the north-east of England and even if you take it to the south, a lot of people won't understand what is being said. Still, it's about the music of speaking. If you understand the story sometimes they're funny or engaging or whatever. If you don't, you still hear the music of the speech, which is what it's about.

NM. It may even be easier. You might lose the music by understanding the text.

TW. Yes, that's right.

NM. What about when you improvise? How do you choose your sounds?

TW. (*laugh* then *pause*) When I improvise, it depends on the situation, very much. What I'm concerned with is sound, and I'll begin with sounds like breath, and as I improvise I gradually transform. They are often sonic relations like '*pfffsscchheiiuu*'. But occasionally I will use theatrical transformations. So you can transform '*...hah! ...hah! ...hah! ...*' into laughter. These are sonically related, but they also have a theatrical impact.

Also when you're improvising there's a reaction from the audience. Sometimes the audience find things disturbing or funny or whatever, and you might react in some way to that. Or not. Or react against it. This is thinking multi-dimensionally. I had an interesting discussion about the piece *Anticredos*, which is a pure sound piece for six voices. I performed it in Germany recently, and someone said 'It's funny', and I said 'It's funny the first time you hear it, yes'. There was a big argument about it, and in the end, I said 'If you find it funny, because people are making sounds like that (*imitates*), that's a bonus, that's an extra for me, that's fine. When you've listened to the recording twelve times, you'll have forgotten, totally, about how the sound was produced, and then the sound is structured in an interesting way, musically interesting.' Humour is this kind of extra that I get from it. It's like the stories in *Encounters*: the stories are important, particularly in the place where I recorded them, but if I take it to France, or to Japan, the stories just fall out, altogether.

7. *VOX-Cycle*

Talking about voice irremediably take us to the *VOX-Cycle*, composed during the 1980s as Wishart had left the world of the mythological structure to enter the world of the voice experimentation itself. This cycle, for voice quartet and tape goes through almost every aspect of the voice, even having the performers disappear in the fifth piece, leaving their place to the Shiva representation – thus leading back to the metaphorical ideas – and the transformations of the voice. These pieces are a good way to study meaning, but also narrativity and dramaturgy in mixed works including the human voice. They explore it from theatrical representation to the most abstract numerical structures, always relating to the listener through the presence of the human element.

NM. Could you talk a bit about the *VOX-Cycle*?

TW. I composed it between 1980 and 1988. At least with the first four, I was looking at different aspects of humanity, and how to reflect it in different approaches to the voice.

The first piece, *VOX-1*, is the emergence of language out of chaos: it uses the sound transformations from *Anticredos*. Gradually, as the piece progresses, an imaginary language emerges. That's about evolution… like *Journey into Space*, I suppose.

VOX-2 is more a contemplative piece, which has to do with the inner details of things, and with the natural world. You have a very slowly changing harmonic field. But the ornaments, the articulations of the sound carry energy inside. It's an internal kind of articulateness. I guess it suggests this contemplativeness.

The third one is about intellectual excitement: a group of people is playing rhythmic games which become increasingly complex as it goes on. Again, you're not supposed to get a textbook about intellectual rhythms and how they work. You just hear those rhythms and you can't think of how they're doing them (because it's based on click tracks), so it gives the excitement of intellectual endeavor, but not by being intellectual (*laugh*).

The fourth one is about social relations …very much like Ligeti's *Aventures* (1963), which is about social relations and the way they develop, the way the social structure breaks down. (*pause*)

VOX-5 then becomes the voice of Shiva, which is like a voice of creation and destruction, the voice that contains everything within the world, using the transformation techniques, now with the computer. (*pause*)

And *VOX-6* is a very interesting, very controversial thing… because everybody hated it: serious musicians because you're not supposed to write rock music; rock musician because serious musicians don't know how to write rock music. In fact, it's a piece of serious music, but dance music.

It was in the 1980s when Margaret Thatcher came to power, and all the hopes and aspirations of those who wanted change were dashed. (*pause*) So, it's a slightly ambivalent thing, a joyous dance but also a dance of death. (*pause*) I had been asked to rewrite the *VOX-6* as something different. But again, it was already gone.

NM. Where did you compose those?

TW. At the time, the situation was that, outside IRCAM, people were working on mini-computers. The big, expensive things, you couldn't buy as an individual, as they cost tens of thousands of pounds.

I worked in the York University Studio, where the computers were infinitely slow, and ran things like Music-V, which is not really musically friendly. We were experimenting on the Sinclair machines.

VOX-1 and *VOX-2* use analogue tape, they were made in the early 1980s. We still had four-channel analogue tape recorders. *VOX-3*, with the click tracks, was also made in the York Studio; I used to work there early in the morning: from 4 to 10 am – no students would ever be there (*laugh*). (*pause*) There was a computer by then, and probably to make the click tracks I used that. (*pause*) *VOX-4* was also made there. I had a couple of analogue machines at home, but I never really used them, I used the York Studio. It's only when I started to really work with computers that I started working at home. *VOX-4*, I think, is still pre-computer. *VOX-5* was composed at IRCAM. (*pause*) *VOX-6* was made with MIDI-controlled instruments, with a MIDI keyboard, at home.

NM. So you did the composition alone.

TW. Oh, I was doing the work alone, yes.

NM. And the sounds used, were those sound-effects or…

TW. I had a huge collection of sources, from *Red Bird*, on vinyl. I bought every possible recording of wildlife that was available, transferred to analogue tape from vinyl, and catalogued them, with catalogue sheets, so I could find the material to work on. I recently got rid of those tapes, because I couldn't store them anymore.

NM. In the writing of the vocal parts of *VOX-2*, you said you were inspired from *bunraku* puppet theatre and the vocal music of Mali.

TW. I listened to lots and lots of music from around the world, and I was particularly interested in those two kinds of vocalization. I tried to imitate the *bunraku* type of articulation in the opening of the piece. In the score, the time-varying vibrato and the use of sub-harmonics, all those kinds of things are written out. It's not meant to be a kind of exact imitation. I'm trying the flavor of those detailed articulations. But I don't intend to make a conscious reference, I don't do that.

But in fact that's un-*bunraku* because the articulations are in counterpoint. What you have is a field of limited transpositions, with the octatonic scale, that moves a second, and then a minor second. The interesting thing about that is that if you stick a C in the base, you think 'Oh yes, that's in C'. If you put an A in the base, you think it's in A. Same thing

with F sharp and D sharp. You can actually use the same material and modulate, simply by shifting the base.

What happens in the piece is that it shifts down by a third, while the harmonic field doesn't change. Then it shifts down again by a third, and in the final section it shifts down by a tritone. That's the most dramatic change you can make in that field. I use only those very limited harmonic changes to make the thing quite static but to keep this possibility to modulate. The end of each section will modulate, without actually changing. (*laugh*) And I focus all the energy on the internal articulation, on the ornaments.

In the final section, when it becomes fast, the ornament turns into rhythm. That's suggested to a greater extent by the Mali music, but it's much less authentic. (*laugh*) Listening to Fanta Sacko it sounds like a very articulate classical Arabic singing, with a jazz feel, it's kind of loose. It is very elaborate, but the rhythm is much freer. It's not all over the place; it's just more fluid, like jazz. It has a very amazing quality to it. (*pause*) That's what inspired some of the material in the rhythmic sections.

NM. Still in *VOX-2,* there are interactions between the voices and the tape.

TW. There isn't, really. What happens in *VOX-2* is that the environment is used like perhaps you would use an orchestra: you've got the voice, and you've got the landscape provided by the orchestra. Here, we have a real landscape, we don't need to have the orchestra, we can create any illusion we want.

Two things: suggesting a natural landscape, you can imagine that most of the sounds you hear are from the natural landscape. But of course it isn't natural, because it has been constructed, tuned, so the voices sing in tune or out of tune with it. Or they synchronize with events that happen within it. It is treated like an orchestra, an accompaniment to the voice. It's a cross between the way we use an instrumental accompaniment to a vocal piece, and the way you would hear an environment around you. There's an ambiguity about that. Music is an artifact, so you're able to suggest both things at the same time. It's a natural world in which the existents you hear relate to each other harmonically and in terms of the events happening; so you feel some sort of empathy between the performers and the natural world. Well, it's not a natural world.

NM. I meant, at one point, we hear the wolf…

TW. Oh yes! Well, it's more pitch. The singer is asked to imitate the line of the wolf, which is not in a tempered scale. The singer has to get quite close to that. It's quite difficult to get close to things spectrally, because without computer manipulation this isn't something we

can do. But certainly there are some resonances, some correspondences between the things in the landscape and the things in the voices.

NM. Imitation.

TW. Imitation, yes.

NM. You say in the booklet that comes with the CD that the tape is an optional musical accompaniment to the performance.

TW. I can't imagine why I would have said that. (*pause* then *laugh*) Well, this idea is… completely crazy! (*laugh*) You cannot possibly perform any of them without the tape. *VOX-6* has instrumental backing tracks you couldn't perform without. *VOX-1*, *VOX-2* and *VOX-4* have environmental backing, *VOX-3* has click tracks that you can't perform without. I don't understand this at all…

NM. So was this cycle composed for performance only, or for it to be recorded?

TW. It's for performance. One of the things I was interested in was the transformation of the performance space. In using an electroacoustic environment as a way of transforming the performance space, a bit like at the theatre: you go to the theatre, but you don't think of yourself as sitting in a seat looking at people on a stage. You think they are people in their living room, or… whatever.

So the role of the electroacoustic material is to set a scene. In *VOX-1* you're surrounded by sounds from creation, it's sort of like this maelstrom thing. *VOX-2*, you're in what sounds like a natural landscape. It's not natural at all, but it has implications of a natural landscape. In *VOX-4*, you hear people hammering on the door, attempting to break in. Instead of just being at a live concert – where the guy comes into a jacket and everything – you're in a magic space, like at the theatre. You theatricalize the performance space.

NM. Do you see yourself as a surrealist composer?

TW. I guess not, really. (*long pause*) No, I'm more of a magic realist (*laugh then pause*). No, I'm principally a musician, but I have a sort of orientation towards progressive social ideas and notions of creativity and things. (*pause*) I'm a person of the left. Very much so. But… whether that is apparent in the music I have no idea, because I'm just a musician, and I'm making these things.

NM. Well, thank you very much for your time.

TW. Okay! (*laugh*)

8. Conclusion

From this essay-interview, the reader may keep in mind chiefly the subjective aspect of meaning, but also the inexistence of narrativity without the process of narrativization undergone by the listener. If recording sound erases the materiality of the sound-source, it doesn't erase the symbolic value it may have, once recognized (whether directly or via contextualizing cues). Once again, this symbolic value will or will not be taken as such by the listener, who, if he wants to listen in the most reduced (the most musical?) way possible, can make abstraction of all reference to sound-sources.

But going back to reality, we can say without a doubt that most listeners will when possible turn to the realistic aspects of sounds, considering as of primary importance their origin and their symbolism – what I called contextual identities. Even in cases where this is not possible, they will typically turn to the mode of sound production, giving it symbolism or narrativizing the musical scene whenever they can.

Trevor Wishart, as a composer and an improvisator, tries and uses those tendencies of human perception to produce associations and conceptual narrativity, without ever leaving the realm of the musical merely for the sake of meaning. Because of this, he *is* a magic realist, or even a musical realist, that can be related both to soundscape composers and to radio art (*hörspiel*) composers.

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