The Design and Marketing of QSound: A Case Study of the Relationship Between Technological Innovation and Musical Culture

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Abstract
The Design and Marketing of QSound:
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In the early 1990s, QSound Labs introduced a "three-dimensional" sound recording technology to the music industry, intended to revolutionize stereo and become the new audio standard for all media formats. However, its initial attempt to market its technology resulted in a series of controversies regarding both the company's business practices and the performance of its product, rather than the adoption of the QSystem as a standard production tool. QSound Labs has since redesigned its product and revised its management strategies, focusing instead on its adaptations for PC and video game applications; markets it had expected to be secondary.

Rather than viewing QSound as a "failed" technology, the thesis will focus on the shift that occurred in its product design and marketing strategies and ask what these modifications reveal about the dynamics of the innovation process and its interaction with musical culture, specifically in terms of the definition of QSound's technical function and aesthetic purpose.

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Introduction

This study originated from an interest in new media technologies and their interaction with existing cultural practices. The QSound case deals specifically with the popular music recording industry, and was chosen to illustrate the complex and often unpredictable relationship between technological innovation and musical culture.

While it has since redesigned its product and revised its management objectives and strategies, QSound Labs' first attempt to introduce its technology to the music industry in the early 1990s can best be described as disastrous. Its initial attempt to "revolutionize" the industry with what was intended to be a new recording standard -- three dimensional sound -- ended in controversy regarding both the company's business activities as well as its technology, rather than the adoption of a new practice in music recording.

Accordingly, the story of QSound tends to be overshadowed by technical and business issues, not to mention drama. It has even been described as "a business venture that sounds like a movie screenplay" (Greber 1989, 49). While this certainly makes it an intriguing story, this thesis will attempt to deliver a more cultural analysis of QSound's technological history.

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The technology in question is QSound Labs' three-dimensional sound-processing system as it was developed for use in the music industry.[1] The original QSystem consists of a portable hardware/software package that interfaces with conventional mixing consoles. Using digital signal processing technology, audio signals are manipulated during the final mixing stage of recording to produce an expanded sound image that can be heard on regular stereo playback systems. In principle, QSound and similar three-dimensional sound processes mimic the human auditory system such that sounds seemingly appear from sources other than the two stereo speakers and beyond the range normally covered by the somewhat similar effects of stereo imaging. More recently, it has taken the form of less flexible software "plug-ins" that work with other manufacturers' hardware platforms.

In contrast to both multi-channel surround sound systems that require peripherals such as extra speakers and decoders, and systems requiring special headphones, QSound's main distinguishing characteristic and selling point was the fact that its sound localization effects could be heard on conventional stereo playback systems, i.e., no additional consumer hardware is required. Its main drawback was the restrictive listening position required to perceive the full range of "three-dimensional" effects -- the listener must be

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[1] Unless otherwise specified, subsequent references to QSound will mean as it was originally designed for musical applications.

positioned in front of and in the middle of the speakers, which must also be placed at certain angles.

QSound thus saw its technology as going "beyond stereo" while avoiding the features that might discourage public acceptance and/or support from the music industry as experienced with the introduction of quadraphonic sound in the 1970s. One of QSound's primary intentions was to become the new standard process in music recording (as well as all other audio entertainment formats), however, although it made its introductory public appearance on recordings by major artists like Madonna and Sting, it did not become widely adopted by the music industry as a recording practice, and the QSound technology has instead found greater success in its adaptations for PC and video game applications, markets it had expected to be secondary.[2]

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Many accounts describe QSound's role in the music industry as controversial and dubious with regards to both technical performance and management objectives. To summarize quite briefly, attempts by the original inventors to get financial

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[2] On a technical level, because of the central and stationary position required to perceive its effects, the QSound technology is better suited for these "listening" circumstances. Economically speaking, the technology for these applications is in the much cheaper forms of sound cards and sound chips.

backing for their project resulted in what many consider to be a stock market scam. Larry Ryckman, an entrepreneur who agreed to finance the project, bought a "shell" company on the Vancouver Stock Exchange, Archer Communications, and sold shares to various members of the entertainment industry, the financial community, and the general public.

Management objectives were initially geared towards creating hype to attract investors and consequently, or perhaps intentionally, QSound Labs (still operating under the name of Archer) effectively functioned more as a PR engine for its stock than a company focused on developing a viable technology (Elliot 1994, personal interview). QSound recordings effectively functioned as advertising for the company, with its promoters ranging from record producers to stockbrokers. The QSound demos were often directed towards impressing people, who in some cases had little or nothing to do with the recording business, with "spectacular" sound effects and a correspondingly costly hardware/software system. It did manage to generate interest and sponsorship from several high profile music industry personalities and investment companies, and initially, QSound did succeed on the stock market. But when it came time to deliver its product to its consumers, it was not generally well-received.

It has been argued that QSound was not given a fair chance to prove itself since many of its investors pulled out after one or two marketing "disasters" which significantly

brought down the price of the stock and consequently halted developments in its musical applications. Furthermore, its attitude toward the music industry has been described as one of arrogance in that its technology was more or less "imposed" on the industry. The company approached recordists with rigid, pre-determined ideas regarding QSound's uses, as well as an inflated sense of its musical value which was reflected in its cost and the fact that it had to be licensed, a factor that only added to the extra time and energy required to use it. Discontentment with the company became synonymous with disenchantment with its product; controversy ensued, leaving QSound with a bad name and the QSystem was rejected by the majority of its potential consumers.

It is difficult to say if rejection was a reaction to the bad reputation acquired by the company, or a direct response to the technology itself. It is also somewhat debatable whether QSound's initial success on the stock market was the result of a legitimate business strategy or, as suggested by some critics, a personally-motivated financial scheme serving Ryckman's interests. In any case, despite the fact that initial marketing and promotion tactics nonetheless formed some important strategic alliances with the entertainment industry, rather than designing and marketing a technology in conjunction with musical practice, the QSound system developed into a prohibitively expensive, rather inaccessible technology whose altering of the sound experience did not justify such an

investment.

In addition to its rather restrictive listening requirements, technical criticisms ranged from its inability to cover a full "three-dimensional" range, to scepticism that its proclaimed effects could be heard at all. Under the best of circumstances, its technological status has been compared to that of reverb (Elliot 1994, personal interview) or one among many other sound "enhancement" techniques or sound effects, as opposed to universally revolutionizing both mixing practices and the sound listening experience. Furthermore, the pertinence of its effects in terms of its musical value is ambiguous and remains an unresolved question, especially given that musical culture has not established conventions for mixing or listening to music in "three-dimensions."

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On the one hand, as a short-term business venture, QSound could actually be considered a success: Ryckman's "hyperbolic promotion" (Greber 1989, 50) succeeded as far as acquiring "acceptance" as an investment is concerned. However, as a product innovation, in addition to the cost and logistical complications of licensing the QSystem, it became more renowned for its shortcomings, both technical and aesthetic. This was in part *because* of the promotional campaign that initially earned it support; not only were the stakes

extremely high from the start, but, as is the nature of "hype," claims were generated that its inventors never made and QSound lost credibility. This only contributed to its bad reputation which in large part came from disgruntled investors, many of whom were from the music business.

Furthermore, the presumptuousness with which it was accused of having introduced its product served to antagonise the recording industry every step of the way; from record companies who were initially expected to pay royalties, to recordists who were not always given the freedom to chose how to use the technology.

Under new management, objectives and strategies for musical applications have recently shifted away from generating publicity and projecting "revolutions" (Broomhead 1994, personal interview) to working more directly in conjunction with current developments in recording technology. More specifically, rather than solely designing and manufacturing the more expensive QSystem involving both hardware and software, the QSound technology is being marketed in software form as the QXpander Soundfield Expander and the QSYS/TDM Virtual Audio Localization Processor. These are currently available as third-party software for Digidesign's line of recording products, and became available for product introduction and marketing in late 1995 for use with Intel's Pentium processor for multimedia applications. The original QSound system is still being licensed for the pro audio market

and provides "the best of the QSound features," while the QXpander and QSYS/TDM are aimed at the semi-pro and pro market. In this way, the software plug-in form corresponds more closely to an existing technical and practical framework rather than creating a new one.

In one sense, this new approach is considered a more economically "realistic" one for a small company like QSound, but more importantly for the purposes of this study, this change reflects the influence of musical culture on the fate of technical inventions. The history of the QSound technology will thus be examined in the context of what Alan Durant terms "conditions of music."

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Rather than viewing QSound as a "failed" technology then, I want to focus on the shift that occurred in its product design and marketing strategies and ask what these modifications reveal about the dynamics of the innovation process and its interaction with musical culture, specifically in terms of the definition of QSound's technical functions and aesthetic purpose.

The thesis will demonstrate that essentially, QSound Labs' initial attempt to sell its "three-dimensional" sound technology to the music industry as a revolutionary recording standard replacing stereo, involved a packaging of specific

digital processes into a special function device whose technological complexity and scale, and its price, reflected this definition. As such, success would have required a meaningful correspondence with musical practice on both a technical/practical level and an aesthetic level; accordingly, its definition as recording standard would have to acquire congruent meaning and status through its musical applications.

I will argue that in practice, the application of "three dimensional" sound localization techniques did not constitute a new universal recording standard, but rather, an optional sound effect whose application and appeal varied dramatically among recordings, both between and within genres of music. The redirection of QSound's musical applications toward the designing of software will thus be viewed as constituting a resolution of the discrepancies between its initial marketing definition and that which it acquired through its insertion into musical culture.

QSound's institutional history will be mapped out using information gathered from company documents and articles in trade and business journals, reports from various financial institutions, and interviews and correspondence with actors in the company and other individuals involved with QSound Labs. Sound practitioners, including producers, recording engineers and musicians, who have used the QSound system and/or other three-dimensional sound recording systems have also been interviewed for their response to the technology, and their

involvement -- or lack thereof -- in its development.

The first chapter of the thesis then will outline the theoretical framework of the study. Drawing primarily upon Alan Durant's conception of "conditions of music," the cultural context of technological development will be discussed with an emphasis on the contextual elements most relevant to the QSound experience.

The second chapter will deal with the pertinent details of QSound's innovation process, more specifically, how the company defined, and correspondingly designed and marketed its technology, and subsequently formed its relationship with the music industry.

The aesthetic issues of QSound's three-dimensional sound techniques will be elaborated upon in chapter three. The role and meaning of "space" in recorded music will be discussed, both historically and in relation to selected QSound recordings. It will be argued that through its use by recordists and the "frameworks of interpretation" of musical culture, QSound ultimately acquired its meaning and definition as an optional sound effect rather than a universal recording standard.

The concluding chapter will summarize the significance of QSound's changes in product design as a reflection of its function and purpose as it was redefined in the actual circumstances of musical production, consumption and distribution. The thesis will end with speculative remarks

regarding future musical contexts for three-dimensional sound and directions of new music technologies in general.

While not completely ignoring the controversial phase of QSound's history, this study intends to look beyond the financial "drama" to an understanding that takes into consideration the musical culture with which its three-dimensional sound technology interacts.

Chapter 1

Theoretical Framework

Introduction

Many contemporary studies that examine the relationship between technology and popular music tend to focus on the changes occurring in musical form. This is especially true in the age of digital music given the surge of various electronic devices such as samplers and sequencers that have led to new modes of music-making and musical styles, many of which would otherwise be technically impossible. Whether a celebration or condemnation of technological involvement, such studies have been criticized for being based on a technological determinism that simplistically "equate[s] musical outcomes with technological means" (Harley 1993, 211); an approach based on the logic of "cause" and "effect," and resulting in either descriptive accounts of the music of "the digital revolution," or an exaggeration of its cultural significance. What claims to be overlooked in these studies are the more basic changes occurring in the overall context of musical existence; the modes of its production, forms of distribution, and patterns of circulation in society that together determine how, when, and where it is consumed. "Together these aspects of procedure and practice, rather than matters of form alone make up the basic parameters of what music is" (Durant 1989, 252).

An alternative approach then would address moments of technological change by looking at how, on the one hand, these circumstances of music-making as a whole are affected by certain developments, and on the other, comprise the context in which any technical invention is to be integrated, rejected, or modified -- technically and conceptually.

Using such an approach, I will examine the development of QSound's recording technology and the changes it experienced in terms of its interaction with musical culture and the significance it acquired through musical practice. From this perspective, an understanding of QSound's technological history will extend beyond both typical descriptions of the direct effects of technology on musical form and superficial institutional analyses of technological innovation that tend to present "a parade of personalities and organizational reshufflings" (Schudson 1991, 179). The thesis will instead take as its premise an analysis of conditions of music and thus the innovations that have influenced "musical perception and practice over the past hundred years [as] part of a protracted dialogue between music and science, technology and the sonic imagination" (Chanan 1994, 239).

Considering successful innovation as an invention that finds a use or a market,[3] the study will centre around questions of QSound's aesthetic purpose and the disjuncture between the intention of its manufacturers and how it was

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[3] See Théberge 1993, 57-98.

perceived and used by sound practitioners. Changes in both the technical and industrial organization and the economics of the recording process and its associated devices and techniques will be looked at in conjunction with their aesthetic value and function as they are defined through musical practice. More specifically, the conventional mixing techniques of the stereo field paradigm that QSound's "three-dimensional" technology sought to revolutionize will be examined as they relate to the production and reception of popular music.

As both a recording device and practice, theoretical issues will therefore concern the technical/practical infrastructures and aesthetic frameworks with which QSound intersected, and how these influenced the direction of its technological development. The theoretical framework for this analysis will be based primarily on Alan Durant's work on "conditions of music" in which he traces the parameters and dimensions of the musical experience and its organization around developments in sound reproduction technology. I will summarize the historical evolution of these technological changes into various "musical cultures," as Durant has outlined them and follow with a discussion of his notion of "frameworks of interpretation."

Alan Durant and Conditions of Music

Durant's work stems from an anti-technological determinist standpoint based largely in Raymond Williams'

ideas on technology and cultural form. Williams' model, which he applied to the study of television, considers developments in media technology as operating within and responding to deeper cultural movements (Schudson 1991, 186). Technology, it is emphasized, must be understood as social practice, where notions such as "cause" and "effect" are replaced with "selection" and "use"; the latter imply that the dynamics of technological innovation are not autonomous and thus marginalized or abstracted from society, but are embedded in social processes. As such they are subject to the "limits" and "pressures" of social, political, and economic forces (Théberge 1987, 31).

Applied to the study of music technologies, these can then be understood not only as technical devices, but as "a set of formalized techniques and aesthetic preferences," whose applications are a "response to different musical and social needs" (Théberge 1987, 63). Thus, while musical activity is organized around particular technical infrastructures that present or "enable,"[4] certain "opportunities" or technical possibilities, Durant emphasizes that

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[4] In "Technology and the (Trans)formation of Culture," Philip Hayward contrasts technological determinism with technological "enablement" (Hayward 1990, 4).

> technological developments take on their particular character only in specific instantiations within prevailing, but also changing, social relations and contexts. They lead to networks of reactions, responses and effects that cannot be predicted merely from the resources or design of the technology itself. (Durant 1992, 180)

This describes a rather complex process where indeed, "chains of causality...are not easily identifiable" nor generalizable (Durant 1992, 180).

For Durant then, the crucial issue is the context of musical production and consumption as the significant object of technological change. An analysis of new technologies then should result not only in the identification and description of musical sub-cultures specific to the production processes in question (e.g., rap music), but, as well, in an examination of their effects on, and interaction with, all areas of "musical culture": "an interlocking set of conditions and relations in which the sounds of music are produced, circulated and are understood." (Durant 1992, 175)

Although even the smallest innovation must be regarded as "social practice," not every new development in music technology will have such widespread or far-reaching implications. For Durant, it has been "most importantly in mechanical reproduction and broadcasting that present conditions of music have been and continue to be shaped." He has identified and isolated several moments of technological change that involve "initiatives of a scale of research, investment and development far larger than those of the more

specialized electric and electronic instrument manufacturing" and other new recording devices. In other words, while the latter have their effects on certain aspects of musical culture and must be understood within this larger context, they have not as significantly altered or created a new complex of industrial, technical, and creative relationships (Durant 1984, 102).

In *Conditions of Music*, which was written in the early 1980s, Durant has grouped these initiatives along three specific lines of development; the gramophone, broadcasting and tape recording. In a more recent article written in 1992, "A New Day for Music?" he has identified what I will consider another, yet "unresolved" trajectory: digital technology. I will begin by briefly describing each of these as they have been "isolated and catalogued" (Durant 1984, 103) by Durant with an emphasis on the particular contextual elements that will most concern my study.

The first line of development, gramophone technology, is especially significant because it marked the birth of the music recording industry itself. Having (inadvertently) become an object for mechanical and later electrical reproduction, music consequently became part of the electrical goods industry. Previously rooted in the "live" music business, the musical experience was deeply transformed through the industrialization process by becoming organized around mechanical and electrical reproduction where previously it was

organized around notation. In so doing, it entered into a whole new set of economic, technical and creative relationships that collectively formed the basis of a new musical culture in which all subsequent developments occurred.[5]

Most importantly, the foundations for music to become a technologically-based *recording* process were set. Music's relationship with technology was in itself at the time not new but because of sound reproduction technology, music recording became its own form of communication and the record, the new musical commodity. These two factors alone opened the way for new production processes and musical forms which in turn gave rise to new sorts of musical consumption and use.

Broadcasting followed the development of the gramophone and added to the complex of industrial relationships and technical infrastructures within which the music industry now functioned. Within this context, conventions of musical forms and styles were determined, with additional influences now coming from radio programming considerations as well as audience demand. (Durant 1984, 107) Together,

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[5] For a more detailed discussion on the technical foundations of the music industry, see "The Industrialization of Music," in Frith 1988.

> records and radio made possible new national (and international) musical tastes and set up new social divisions between "classical" and "pop" audiences. The 1920s and 1930s marked the appearance of new music professionals -- pop singers, session musicians, record company A&R people, record producers, disc jockeys, studio engineers, record critics, etc. (Frith 1988, 13).

The introduction of tape recording in the 1950s radically changed the mechanics of music-making "over a range of ... practical processes" (Durant 1984, 107). In particular, musical parts could be recorded separately and later multitrack recording's extended capacities for overdubbing and signal processing fundamentally reshaped the recording process (Durant 1984, 108). To the documentary role of recording and the technical, or "corrective," uses of its techniques were added the divergent possibilities for intervention and creativity; the music-making process became more fully integrated with the technology that produced and reproduced it (Théberge 1987) and consequently, music practitioners -- as the users of that technology -- became engaged in a dialogical relationship with its development, by either becoming directly involved in market testing for example, or by establishing aesthetic needs to which certain innovations responded.

Digital recording appeared in the late 1970s, initially overcoming technical problems such as noise and distortion degradation resulting from successive tape transfers. In addition to the long-term stability of the digital medium, the main processes of multitrack recording were at once simplified

due to greater flexibility, and complicated: "While in the digital domain, signals can be combined, limited, equalized, reverberated or processed in just about any way imaginable" (Eargle 1980, 332). Recording facilities were made mobile and included "racks" of special effects packages made possible by DSP (digital signal processing) technology, and by the mid-70s computerised mixing consoles were developed in order to simplify the coordination of complex operations in the final mixing process (Durant 1984, 108-109, Théberge 1993, 119).

The most recent changes in recording technology involve the introduction of MIDI (Musical Instrument Digital Interface). MIDI was largely a result of the "recognised musical aspiration" for inter-synthesizer communication, following the emergence of the computerized synthesizer industry in the late 1970s. Initially set up in 1981 and brought to market in 1983, the MIDI interface "specif[ies] digital music technology protocols" (Durant 1992, 182) using a standard system language that allows all digitally-based musical "instruments" and recording devices to communicate with one another.[6]

At the time of writing "A New Day for Music?" the MIDI interface had marked a new level of electronic integration in the recording process by connecting musical instruments and recording devices with computers and to each other, thereby

[6] For more details on the establishment of MIDI standard, see, Durant 1992, 181-182 and Théberge 1993, 115-122.

extending digital control "to all aspects of sound creation processing, sequencing, recording and mixing" (Théberge 1993, 115).

Durant also saw MIDI as forming "part of an increasingly interlocking network of digital technologies...[and] contribut[ing] to the development of further mixed-media and inter-communications possibilities." In other words, not only did MIDI permit new composition and editing possibilities for music, but through further digital code standards, music and video editing were linked[7] such that "MIDI developments fit in with far more general directions in longer-term research in digital technologies." (Durant 1992, 183)

Since the publication of "A New Day for Music," several hard-disk multitrack recording systems have entered the marketplace, with Digidesign's Pro Tools Digital Audio Production System having by far the largest share (75%) of the market (Garner 1995, 49-50). Final master tapes are still made on digital audio tape, however, working in conjunction with a Macintosh computer and massive hard drives, all recording, processing, editing and mixing functions are performed on-screen, on-disk. Such systems essentially replace the mixing console and the tape recorder, and can be used with separate samplers, sequencers and other existing digital recording

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[7] The SMPTE (Society of Motion Picture Technical Engineers) standardized digital timing/signal code links music tracks with video tracks, "harnessing together developments in music editing with video soundtrack editing" (Durant 1992, 183).

devices, or with Digidesign's associated peripherals in the form of add-on hardware and software plug-in features. The "open-architecture" of the Pro Tools system allows for third-party applications like QSound's QXpander and QSYS/TDM, options among the rest of the Digidesign DSP software plug-ins.

While not quite standard production tools within the industry, these "electronic workstations," mark yet another level of integration, although they are often still used in conjunction with existing mixing consoles as an intermediary process that exploits the increased flexibility in recording and overdubbing a greater number of individual tracks (Convery 1995, personal interview). Of greater significance is the change in technological form of the various DSP effects devices like the QSystem and the emergence of new products altogether that work within this emerging technical infrastructure.

In a way similar to that in which digital recording first spawned the development of special effects "packages," and MIDI "the design and production of a wide range of relatively cheap, digitally-based musical 'instruments'," (Durant 1992, 182), a series of related hardware and software products -- effects processors in the form of software plug-ins and add-on hardware cards, for example -- performing various DSP functions have followed the development of the digitally integrated studio.

Digidesign's set-up and the fact that its open system dominates the market has created a new technical infrastructure within which these related innovations are now developing while at the same time rendering other technologies redundant or obsolete. QSound is a case in point, where its original proprietary hardware system, the QSystem, has been redesigned in several software "forms" that work in conjunction with Digidesign's technology.

This situation has also altered the industrial structure of the recording industry, and as far as its musical applications are concerned, QSound Labs now operates as one of Digidesign's many Development Partners. Furthermore, Digidesign itself has recently been purchased by Avid, manufacturers of video editing technology, in view of fully integrating music and video technologies on an industrial as well as a technical level.[8]

At what point these developments in digital technology constitute the origins of a new "line of development," and thus a new musical culture, is difficult to say. In Durant's *Conditions of Music,* digital recording appears as an extension of multitrack recording processes, however, "A New Day for

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[8] Considering the existence of other, although much more expensive and therefore less popular recording systems that "combine all features of mixing consoles, sequencers, editors, digital recorders, samplers, effects units, and even synthesizers, in one machine," (Jones 1992, 152) the potential for completely integrating all processes of music recording and video technologies is already that much closer to realization that at the time of Durant's last article.

Music," basically states a case for a new "digital culture," by virtue of the degree to which these have become integrated and subsequently resulted in novel processes, techniques and new forms of music as well their related playback formats such as CDs and DAT. Together these involve an "overall restructuring of music production and distribution."

But what remains "unresolved" for Durant is how these changes in production and distribution "alter how people (including people not actively involved in making music) think about music's aims, styles and properties." Essentially, Durant is suggesting the possibility of a "new paradigm of musical sense":

> At face value, what MIDI technologies offer are extensions and enrichments of existing priorities in musical practice. They supplement rather than displace, current approaches to performing and composing, and permit complex and rapid manipulations of musical material in ways which build directly on existing ideas of instrument design, notational conventions, recording process and compositional techniques of allusion and musical reference. It is apparently only in the generic innovations implied by sampled musical collages that signs of major redirection for music are evident.
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> But such descriptions of "enrichment" and "extension" in the modes and relations of music-making nevertheless expose two important areas of unresolved issues. Firstly, there remain questions about the ways in which digitally-produced music is conceptualized and discussed, and how changes in practice are typically accompanied by the development of specialised kinds of musical knowledge and skill; a new musical literacy, in the sense of new ways of construing or "reading" music and of producing or "writing" it ... Predictably, along with changes in the kinds of machines used to make music, corresponding changes in ways of talking about the music being made have come into being...New ways of thinking about music which

remain entangled with the older conceptions can be seen..." (Durant 1992, 187-188).

(The second area of unresolved issues involves the role of a "public domain in musical culture ... available for reverential, ironic comic or critical reference" and its relationship to copyright issues, but does not directly concern the present study.)

It is the "reading" and "writing" of music that I now wish to address specifically in terms of listening and mixing practices as they relate to QSound's sound localization technology.

Interpretive Frameworks and the Aesthetic Purpose of Music Technologies

While QSound's actual technical processes come directly out of developments in digital technology, the aim of "fidelity" with which it associates itself stems from the very first experiments in sound recording and the "reproductive" philosophy of "concert-hall realism." But as will be discussed in more detail in chapter 3, the multitrack recording process changed the very role of recording and consequently brought into practice a new musical paradigm based on the philosophy of recording as artificial generation, or "construction";[9] the goals of "fidelity" thus became greatly confused in popular music as there was no single, composite, live sound event to reproduce as "faithfully" as technically possible,

[9] See Théberge 1989 and Wurtzler 1992.

and accordingly, no spatial configuration upon which to base the spectrum of the stereo field. In this way, "space" itself came to play a "constructive" role in the recording process and stereo location thus functioned additionally as a creative or structural element, not only as a technical measure or reference to a "live" configuration.

The concomitant development of stereo separation techniques therefore occurred in a problematic context where notions such as "naturalism," "realism," "fidelity," and "live," had become and are still rather ambiguous and contradictory.[10] While the role of spatial properties, including both environmental characteristics and stereo location has never been totally obvious, even in the more "technical" classical recording methods, it was especially in the popular music practices based in multitrack recording and its philosophy of "construction" that stereo practices became a matter of convention.

Consequently, certain attempts at extending "fidelity" were conflated with "unnatural" or "unconventional" results. The quadraphonic experience of the 1970s is a perfect example. Intended to increase "realism" by placing reflected sounds behind the listener in the quadraphonic speaker set-up, not only was its "extended naturalism, of a non-specular kind," but many of the popular music recordings placed primary sounds all around the listener -- dispersing "the field for

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[10] See Wurtzler 1992.

consumption and judgement." (Durant 1984, 105). These variations in both mixing and listening practices left many "unresolved aesthetic questions" (Eargle 1976, 83) in their disruption of established stereo conventions, which had thus far provided a particular context for meaning, or what Durant refers to as a "framework of interpretation." I have taken Durant's theoretical ideas regarding "frameworks of interpretation" from his study on improvisation (Durant 1989) and applied them to stereo and "three-dimensional" recording practices. My aim here is to outline how musical meaning, specifically in terms of spatial location of sound in recording, is created through musical practice and the establishment of conventions.

Basically, frameworks of interpretation refer to a "socially constituted ... 'language' of music which provides general reference points of intelligibility" (Durant 1989, 263); in other words, a set of conventions that make musical sense out of different musical processes -- in this case, stereo imaging and its various "extensions." Effectively, these frameworks, or conventions, "limit and define possibilities for creation and reception" (Durant 1989, 264), thereby giving meaning and legitimacy to the practices in question and effectively assigning an aesthetic purpose to their related devices.

Under these circumstances, the specification of aesthetic purpose of new technologies is a crucial factor in their

marketing and promotion. As outlined by Paul Théberge in *Consumers of Technology: Musical Instrument Innovations and the Musician's Market,* marketing has come to play a primary role in establishing the crucial connection between invention and use, thereby transforming an "engineering experiment" into an "innovation": "an 'invention' only becomes an 'innovation' once it has been put into the hands of users" (Théberge 1993, 70).

It is therefore also at this stage in the innovation process that, because of its direct creative relationship with technology, musical practice has the potential to "produce pressure against dominant directions stimulated by the technology and by the interests of those developing the technology" (Durant 1989, 253). It will be argued in the thesis that, in terms of artistic value, this was one primary point of tension around which QSound's transformation occurred.

While its two-speaker, "three-dimensional" process intended to solve the commercial problems experienced by quadraphonic sound, QSound nonetheless confronted similar aesthetic issues. However, these were and still are arguably more complicated (and "unresolved") given the more complex nature of contemporary musical culture and the "new musical literacy" as addressed by Durant: from new machines and techniques has arisen a new vocabulary (Durant 1992, 188) and thus new ways of conceptualizing musical processes. These stem

not only from innovations within musical practice alone but now result from its technical/practical integration with "multimedia" and "virtual reality" technologies, and on a more general level, its grounding in previously disparate computer technologies (Durant 1992, 188).

Emerging (and equally problematic) discourses and terminologies of the immersive "virtual" technologies are thus converging with those established in traditional musical practices, making precise descriptions and meanings elusive at best for both their manufacturers and users.[11] The very terms "three-dimensional" and "virtual" that form the basis of QSound's marketing rhetoric, co-exist with "realism" and "fidelity" -- sets of terminologies emerging from different areas of cultural practice and their "specific instantiations."

But this is precisely where the history of QSound is interesting in that it reveals the "changing" and "unresolved" nature of contemporary musical culture. The emergence of new musical texts like the interactive popular music CD-ROM for example, provide entirely new contexts -- technical and conceptual -- for musical production and consumption and only further confuse potential musical directions and thus "legitimate" practices.

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[11] The same could be said for consumers. Recent research on the internet found a posted message from someone looking for information on Pink Floyd's latest "holographic" recording, that which used the QSystem for its production.

However, in terms of a new musical literacy, the ambiguities surrounding QSound's aesthetic purpose -- as it was defined through the company's marketing strategies -- were in one way reconciled through actual practice where it was deemed an "optional" sound effect rather than a universal recording standard. In this way the change in QSound's design and marketing was equally an expression of the change in aesthetic purpose and value and thus a resolution of the prior discrepancy between the original QSound "invention" and its use.

Summary and Conclusion

In his analysis of new music technologies, Durant has identified conditions of music -- the circumstances in which music is produced, circulated and heard -- as the primary object of technological change rather than musical form alone. Such conditions are organized around historically-specific technical infrastructures and comprise the cultural context in which technological developments must be understood and examined. However, although musical cultures are in one sense defined by their technical foundations, they are not directly determined by them; rather, it is through the conventions of their interpretive frameworks that technologies acquire their significance and become -- or fail to become -- meaningful practices.

This is especially the case in a context where music-

making has fundamentally become a technologically-based process and recording practices creative in purpose. The process of innovation is thus closely linked to musical practice in terms of the aesthetic value of particular devices and therefore subject to rejection or redirection toward new or different uses than intended.

Therefore, within this analytical framework, it could be said that QSound did attempt to insert itself within an existing set of specific musical conditions by designing a technology that worked within the two-speaker stereo standard of the marketplace. In this way it avoided the obstacles confronted by quadraphonic sound as far as eliminating the need for additional consumer hardware was concerned. However, the problems of consumer requirements and industrial standards have tended to overshadow the unresolved matters concerning the aesthetics of mixing for the quadraphonic set up. Thus, while "seemingly a commercial miscalculation," (Durant 1984, 105) the problems experienced by quadraphonic sound were not limited to the realm of commercial or technical concerns, but also involved other aspects of musical culture which QSound still had to confront. Furthermore, as a recording technology, QSound came up against a different set of commercial problems involving technical and industrial changes resulting from the development of hard-disk-based recording.

What is significant here is that both sets of problems -- aesthetic and technical -- were specific to QSound's

particular musical context and thus differed in several ways from the quadraphonic experience it intended to transcend. On the one hand, the technical infrastructure of recording presented conditions for a completely new set of "commercial miscalculations." On the other, while the musical context for mixing and listening outside the traditional stereo field paradigm may in some ways appear to be more developed, given the recent emergence of both surround sound systems and the "3-D" culture of immersive technologies, it cannot be considered fully established or defined.[12] Nonetheless, the opportunity for some sort of definition of QSound's application did exist insofar as the technology was both redefined and redesigned to become an optional sound effect rather than a universally applied recording standard. Thus, the shift from QSystem to QSound software did not only constitute a change in technological form, but also corresponded to a change in aesthetic purpose.

[12] The very definition of "3-D" in relation to any media format is often ambiguous: "3-D isn't an interface paradigm. 3-D isn't a world model. 3-D isn't the missing ingredient. 3-D isn't an inherently better representation for every purpose. 3-D is an *attribute*, like the color blue (Farmer 1996, 117).

Chapter 2

The QSound Technology

Introduction

The QSound technology is part of a series of new audio systems that have "recently made the transition from laboratory to commercial marketplace" (Begault 1992, 79). As a technology that was oriented primarily toward musical applications in its initial marketing efforts, the history of QSound outlined in the following chapter will thus be viewed as an attempt to apply a technical idea to musical practice.

I will begin by briefly outlining the technological history of QSound, followed by a description of its technical principles and its position in the larger technical infrastructure of recording. Of particular importance will be how QSound formulated its ideas regarding the purpose and uses of its technology, upon which it based its marketing strategies and product design.

Once these basic ideas have been presented I will elaborate on the significant events in QSound's attempts to sell its technology to the music industry and the changes it went through in order to correspond to contemporary conditions of music.

Brief Technological History

The QSound technology was first conceptualized in 1975 by inventors Danny Lowe and John Lees. Lowe, a rock guitarist and record producer in Calgary, discovered the "3-D" effects that were to become QSound while experimenting with ways to "improve" stereo. After taking his ideas to Lohn Lees, an electronics technician in Calgary, Lees successfully reproduced the experiments electronically. QSound was thus "born" and the two partners officially began their research and development in 1981. Five years later, after shelving the project for lack of money, Lowe approached Larry Ryckman, a Calgary entrepreneur, who agreed to finance and market their project (Greber 1989, 48).

The three became partners and QSound Ltd. was formed in California in 1986. In 1988, it was bought by Archer Communications in Calgary, Alberta. For the next two years Archer continued to function as a "purely developmental company" (Archer Communications 1990, 1) and in 1990 began introducing the QSound technology to several markets. In December 1989, Coca-Cola signed a television commercial agreement for broadcast during the 1990 Superbowl, the first public presentation of the QSound technology. Madonna's *Immaculate Collection* was later released in November of that year, marking the first major QSound recording. In addition to deals signed with Nintendo and Capcom for QSound's video game applications, there was a five-year licence agreement signed

with Polygram Records in August 1990. Polygram agreed to release at least 20 recordings by major artists in QSound over the first 18 months of the agreement. However, after the release of Sting's *The Soul Cages* in February 1991, the agreement apparently dissolved following the various controversies surrounding the technology. QSound was also introduced to the film and television industry and in April 1991, the QSystem was installed at Todd-AO studios in Los Angeles. In 1992, the company underwent a major change in management and in June 1993, "in order to create greater brand name awareness" (QSound Labs 1994c), changed its name to QSound Labs, Inc., as it is presently known.

Its core technology has resulted in a variety of commercial products aimed at various high-tech markets including PC soundboards for multimedia; sound chips/algorithms for home and arcade video games, hearing aids, operator headsets and stereo-based consumer electronics; a hardware/software professional audio tool, the QSystem; and its recent software versions, the QXpander and the QSound Virtual Audio Localization Processor which work in conjunction with Digidesign's Pro Tools Digital Audio Production Platform. These are the first of a software product series designed to run on other companies' platforms (QSound Labs 1994b).[13]

QSound Labs initially focused its research on the

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[13] The QXpander and QSound software modules designed for use on Intel's pentium processor are now ready for product introduction and marketing (QSound 1995b).

development of the QSystem, intended primarily for use in the music and film industry, but after a series of "major marketing blunders" (Cowieson 1995, personal interview) and the change in management, it began targeting "a wider range of markets with a far greater growth potential" (QSound Labs 1994c). Thus, while the QSystem is still being manufactured and musical applications continue to develop, these are no longer at the centre of QSound Labs' activities.

The QSystem workstation has gone through two generations, the QSystem I and II. It is a proprietary processing unit that interfaces with conventional mixing consoles and consists of eight independent parallel-processing channels. Each channel provides sound placement outside of the physical stereo-speaker locations" (La Grou 1994, 108) in what is sometimes referred to as "QSpace," the perceived soundfield or sound stage which includes greater width and depth and, under ideal circumstances, seems to "wrap" around the listener.

The audio signal for an individual track is sent from the mixing console to the QSystem where it is processed and brought back to the console via the eight output channels. Each track is basically "processed" into eight subsequent "QSound" tracks. After all tracks are processed in QSound they are mixed down to stereo in the usual manner.

The QSystem has a variety of functions that produce different cues -- sounds far away in front, sounds close up on the left, etc. Recordists can choose the desired locations of

sound sources, the signals of which are then processed to simulate their location cues as closely as possible:

> In the final mixing process, the audio engineer can use the QSystem to place individual sounds from multiple audio tracks in a three dimensional listening environment. In this process, the QSound audio image is recorded in stereo onto the final master tape from which duplication for consumer product is generated... (Archer Communications 1989).

Any new or existing recording can be mixed in QSound and subsequently copied from one tape to another. It can be broadcast over stereo radio or television and used with audio and video cassettes, CDs, and video games. The perceptibility of QSound's effects however, depends entirely on the listener's position in relation to the stereo speakers. Because of the psychoacoustic nature of QSound, the listener must be positioned exactly in the "sweet spot" in order to hear the full effects of the QSound process. The stereo speakers require placement at certain angles and height, and the listener must be positioned directly in front of and in the middle. Even a slight move to the left or right can cause a significant change in perception.

The QSystem I was initially developed as an analog system and was redesigned to accommodate digital studios (Greber 1989, 50). "Most every function is hardware independent and QSound Labs has been continually upgrading software" (La Grou 1994, p. unknown). The QSystem II is a more

compact and more affordable version of the QSystem I: "Introduced in fall 1992, it incorporates such features as MIDI-compatible automated joystick panning to SMPTE/MTC (which links music editing to video editing), and autopanning with adjustable shape, rate and triggering. Stereo music (CDs and cassettes), stereo video soundtracks, television programming, television advertising, CD-ROM and CD-I are all formats which can store information preprocessed by the QSystem II" (Goldrich 1992, p. unknown). It has also been further adapted to be headphone and speaker compatible and works in real time. While QSound boasts that this "400-pound unit uses 15 DSP's executing 150 million instructions per second," to many critics, it remains a large, heavy, complicated, and relatively expensive system. According to Emery Kyneur, U.S. marketing manager, the rental of a system costs $300 a day, plus shipping charges and travel expenses for a QSound engineer if necessary (Goldrich 1992, 2).

The QXPander was the first software version of QSound's technology and works with Digidesign's Sound Designer software as a special effects file.[14] It does not work in real time and is much less flexible than the QSystem. It works more like a stereo "spreader" rather than "3-D" audio, where a sample of premixed stereo material is "filtered" through the QXpander window within the Sound Designer software, and manipulated;

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[14] Different effects files perform different functions like equalization, noise reduction, compression, reverb, etc.

"it pushes ambient sound to the outside and puts drums and stuff into the middle, spreading the stereo image" without destroying the centre of the mix (Van Cloute, personal interview 1995).

The QSYS/TDM Virtual Audio Localization Processor is the most recent software version of the QSound technology: "the essence of QSound's QSystem II multichannel localization processor in software form." (Digidesign 1995, 11). As a TDM (Time-Division Multiplexing) plug-in, it is thus much more powerful than the QXpander but has only four independent real-time processing channels rather than eight, as in the original QSystem II. Like its hardware counterpart, the channels "allow panning of mix elements (individual or grouped) in a dramatically expanded stereo soundfield extending far beyond the speakers" (Digidesign 1995, 11).

Technical Principles

The operating principle of the QSound technology is based upon psychoacoustics -- the brain's perception and interpretation of sound, as opposed to the actual physical state of sound. In its physical state, sound always emanates from a single source, or a combination of single sources, and is processed by the brain through the ears, binaurally. Unless originating directly in front of the listener, sound waves reach each ear differently, resulting in timing and loudness differences, or *interaural time differences* and *interaural*

amplitude differences.[15] These are caused by factors related to physical properties of both the sound source(s) and the subject's own body ("shadowing" by the head and shoulders), and are calculated by the brain such that these cues are translated into spatial information pertaining to distance and direction. The final interpretation of this information is based on the physical properties of the information itself and the listener's experience and knowledge of sound: psychoacoustics can thus be described as "the interdisciplinary study which relates physical acoustical stimulus to psychological judgment" (Eargle 1980, 36) and forms the basis of any listening experience.

Reproducing or simulating the spatial cues pertaining to the sound source and its environmental characteristics has been one of the primary challenges of re-creating "natural" or "live" sound since the early twentieth century. While certain environmental characteristics of the performance space were communicated through mono recording techniques, early experiments with stereo provided the first commercial means of conveying a sense of the spatial configuration/arrangement of individual instruments and vocals, and was initially an attempt to "preserve" or "reproduce" the spatial aspects of a live performance. Initially using microphone techniques to

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[15] These differentials vary according to frequency. Higher frequencies are easier to process, or "localize," making the manipulations of higher pitched sounds of a QSound recording easier to detect.

accomplish these goals, multitrack recording made possible the positioning of individual sounds through signal processing techniques with the use of the panoramic potentiometer, or stereo panpot (Eargle 1980, 64).

Since the development of stereo recording, the techniques and roles of spatial location have greatly expanded to include more creative uses, as will be discussed in the next chapter. These vary greatly and often confuse the purpose of certain recording devices, a point I will return to later.

Through stereo imaging, localization cues are basically "faked." Based on the psychoacoustic principles of interaural time differences and interaural amplitude differences described above, sounds are positioned or localized by adjusting time delays and amplitude levels, thereby simulating sound sources and creating a stereo image.

The sound sources that are perceived to be coming from locations other than the speakers are called phantom images and are used to both broaden the stereo image as a whole and localize individual sounds, sometimes referred to as "pinpoint imaging" (Moran 1987, 96). The stereo image itself occupies a particular perceived space, called the stereo array, or the soundfield, and is generally described as a horizontal plane, or "curtain" of sound (Snyder 1953, 177).[16]

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[16] The "horizontal plane" is the result of a series of compromises from the theoretically ideal situation involving a large number of microphones situated in a performance space, each transmitting sound to a set of loudspeakers whose positioning reproduce identically the microphone arrangement.

Further enhancing the stereo image has been pursued, to varying ends, using several different methods applied at various points in recording and/or playback, each possessing its own inherent "boundaries of the limits of perception" (Moylan 1992, 27).

In all cases the playback context -- speakers in particular -- are the limiting factor as the final link to the human auditory system. Accordingly, the one obvious objective would be to increase the number of *physical* sound sources or channels (as opposed to psychoacoustic manipulation), as was the case with quadraphonic sound and subsequent developments in surround sound systems. These multichannel systems have in the past posed, and still do pose, technical and economic problems for both recordists and consumers. In addition to requiring extra recording and consumer equipment, problems involving the availability of recordings, or "software," and incompatible formats, as was the case with quadraphonic sound, cause commercial problems for manufacturers. As far as surround sound is concerned, music is not currently being produced for these systems which are currently limited to film

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Listening to sound transmitted through the loudspeakers would be the same as listening to the live source. This constituted true "three-dimensional" sound. Reducing the number of microphones and using only two channels (two loudspeakers) reduces this three-dimension soundfield to a limited two-dimensional plane (Snyder 153, 177).

and video consumption.[17]

Binaural recording is another system whereby two microphones positioned at each ear on an artificial dummy head (or simply spaced the same distance apart as human ears), record sound as it would be heard by human ears. Two separate recording channels are used and the two signals are fed into a set of headphones worn by the listener such that each ear hears what its corresponding microphone recorded (Eargle 1980, 51). Headphones are necessary to prevent interaural crosstalk -- sounds from the left speaker reaching the right ear and vice versa.[18]

Binaural recordings have played an even smaller role in the music industry,[19] and in addition to the limitations of headphone listening, are subject to the same problems as

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[17] If stereo recordings are played on a surround sound system, the integrity of the stereo mix may be damaged, resulting in a "strange" sound.

[18] Stereo recording actually followed from experiments in binaural reproduction techniques dating back to 1881, which used telephone receivers and transmitters. Limited by headphone use, the first stereo experiments attempted to duplicate these effects over loudspeakers. For a concise description of the history and development of stereo recording, see Snyder (1953).

[19] A couple of examples include the Dimensions sound effect library, created in the mid-1980s in what is termed "holophonics," using binaural, headphone technology. Also, Lou Reed was the first rock musician to release a commercial recording (Lou Reed: *The Bells* (Arista Records)) using binaural recording methods. The album was recorded in 1979 in West Germany (Jacobson 1992, 78).

multichannel systems in that there is a lack of music recorded using these processes. At least for the moment, such systems are not a commercially viable choice for manufacturers.[20]

Add-on "3-D" stereo processors are currently available but these are consumer technologies and not recording devices to be used in the production of music.[21]

Stereo recording for two-speaker systems has thus remained the standard in recording and playback technology, and until recently, has been "limited to reproducing localization cues on the horizontal plane, and then only slightly beyond the loudspeaker array" (Moylan 1992, 27). Working within these industrial standards then, (i.e., two-speaker technology), the alternative is to focus on developing recording techniques that expand the horizontal plane. QSound's research and development is part of that which attempts to widen the stereo image and increase depth by

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[20] In a recent article on three-dimensional sound technologies it was stated that "for many applications, headphone-based systems will become increasingly important in professional and applied audio. Such applications include virtual reality systems, entertainment and emerging media, acoustic modelling, interactive engineering" (La Grou 1994, 1).

[21] These include, for example, the Roland RSP550 ($1,200); Yamaha's DSP-3000 Digital Sound Field Processor which has built-in programs that simulate certain acoustic spaces ranging from a small jazz club to a cathedral ($1,899); and Carver's Sonic Holography Generator which performs similar signal processes as the QSound technology -- complex phase processing, including interaural-crosstalk cancellation -- to widen the stereo image (Simon 1989, 107). These are all considered complex machines aimed at the audiophile market.

extending its range to the vertical plane by addressing the site of the final mediation of sound -- human perception.

Given that true 360-degree sound is physically impossible with two speakers, "three dimensional" audio really refers to the widening and deepening of the sound stage. It is sometimes more appropriately referred to as "spatially enhanced sound," "stereo enhancement," "superstereo," etc. and differs from regular stereo in the degree to which spatial cues are electronically processed. Several comparable technologies exist, for example, the Roland Sound Space Processor. While there exist differences in their user-interface and the number of available processing channels and hence flexibility, their operating principles are basically the same in that they combine binaural and transaural processing.

Binaural processing essentially means electronically re-creating the signals of binaural recording described above, and transaural processing cancels interaural crosstalk -- sounds from the left speaker reaching the right ear and vice versa -- so that the perception of the localization cues is not lost outside of the [illegible]hone set-up and can be heard over two speakers. Th[illegible]often referred to as the "head related transfer f[illegible]an 1992, 99) and is based on the results of empirica[illegible]ting where listeners' aural responses to sound are measured after being recorded binaurally (Burke-Gaffney 1995, personal interview). The localization cues provided by listeners' bodies and the interaural time

delays and filtering effects are electronically re-created in real time based on these measurements (Jacobson 1992, 78).

The actual physics behind this process is beyond the scope of this paper, but for the purposes of my study, it will suffice to describe it as "a frequency dependent phase and amplitude differential" -- a process whereby the differences in amplitude levels and the relative positions of sound waves -- phase -- are electronically displaced to simulate their shifts as measured in the empirical tests. Transaural processing basically involves more complex phase shifting.

Phase shifting -- or time processing -- is one of the many types of signal modifications made at various stages of the recording process more commonly known as signal processing. Generally speaking, by adjusting the electronic representation of the sound source (the signal), signal processors effectively alter the physical dimensions of recorded sound, and thus sound quality. While the effects on sound quality may be infinite, these changes are achieved in three principle ways: by altering frequency, amplitude, and time.

There are many types of signal processing devices, grouped according to their functions and applications. Some signal processors are available to the consumer as part of the playback apparatus, for example, basic treble and bass controls are signal processors. As mentioned earlier, more elaborate signal processing add-on components are becoming

increasingly available, although, as an extra financial and technical consideration, these are aimed mostly at the audiophile market.[22]

Eargle (1980) categorizes signal processors as follows:

> 1. Equalizers and Filters -- frequency processors
> 2. Compressors and Limiters -- amplitude processors
> 3. Noise Gates -- amplitude processors
> 4. Noise Reduction Systems -- amplitude processors
> 5. Electronic Time Delay -- time processors
> 6. Artificial Reverberation -- time processors
> 7. Special Effects: Phasing, voltage-controlled filters, envelope shaping, ring modulators, out-of-band signal generators, pitch and tempo regulations, chorus generators, and vocoders (Eargle 1980, 231-232).

The "special effects" category includes devices that are essentially hybrids of the principle types of processors (Moylan 1992, 124).

All of these processes can now be accomplished using digital signal processing (DSP) technology and very large-scale integrated circuit techniques (VLSI). As the name indicates, such techniques allow for the integration of greater quantities of electronic components, which today, fit onto a tiny computer chip. Thus, originally in the form of

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[22] See Simon (1989). In this sense, QSound was considered an audiophile technology by some recordists because of the degree of critical listening required to appreciate it in addition to its technical specifications regarding speaker set-up (Yale 1995, personal interview). Others saw it as an attempt to tap into the emerging home-theatre market, also considered an audiophile or "dentist's market" (Pennycook 1994, personal interview).

larger single-function hardware units as categorized by Eargle above, signal processors have become increasingly smaller and more portable, and their functions combined into "multi-effects" processors.

The amount of information that can be processed and the number of different functions that can be performed at any one time has thus increased tremendously. While nonetheless considered a huge, cumbersome device, QSound's basic technical processes described above are, in effect, the articulation of functions that were previously independent, and would have been impossible, or at least too expensive and time consuming to accomplish otherwise.

The QSound technology, therefore, allows for the simultaneous manipulation of multiple acoustic parameters, producing spatial cues that expand the traditional stereo field. As such, QSound is a "spatial processor," however, defining QSound's aesthetic purpose and likewise its technological status is not that straightforward. Before I proceed with a discussion on QSound's definition of its product, I want to briefly discuss digital signal processing in more detail.

Digital signal processing warrants further discussion because of the way it is changing recording practices, not only in allowing for new recording devices but in the way it has changed the overall technical organization of the recording process and consequently the design and marketing of

recording technologies.

With DSP, everything can potentially be accomplished in the digital domain such that virtually all multitrack processes can exist as digital signal processing functions. Thus, as discussed in chapter 1, DSP has enhanced the *integration* of discrete functions through the development of MIDI and subsequently Macintosh and PC-based recording systems like Digidesign's Pro Tools, that incorporate digital signal processing devices in software form.

These hard-disk based systems, -- Digidesign's in particular[23] -- are becoming increasingly popular, both for the home recording market and the pro and semi-pro market. Used in conjunction with conventional mixing consoles, they allow for more flexibility in recording and overdubbing multiple tracks. Alone, they provide an affordable means to record music:

> "Digidesign has dramatically changed the economics of recording and editing music," says Charles Finnie, a general partner and analyst with investment firm Volpe, Welty and Company in San Francisco. "Before Digidesign came along, it would require a six-figure investment to provide the kind of capability that Digidesign provides for 10,000 bucks." ... with Digidesign's products, a $10,000 to $25,000 investment buys a sophisticated audio workstation (including massive hard drives, Mac, and special effects gear) you might find at Elektra

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[23] Other companies such as Sonic Solutions in California are out there as "competitors," but Digidesign has reportedly "sold more than 25,000 units worldwide -- far and away the largest installed base of digital audio systems in the world" (Rochelle Garner 1995, 49-50).

> or Warner Bros ... But perhaps more important is the aspect of openness -- allowing customers to add products no matter who makes them. That's why in 1993 Digidesign announced the Digidesign Audio Engine software and Time-Division Multiplexing bus. The combination lets outside developers create products to add effects and control files (Garner 1995, 49-50).

In this way, the costs of recording and editing are greatly reduced, but for the manufacturers of recording devices, it is possible and much more cost-effective to produce software that works with these digitally-integrated systems rather than creating "outboard" hardware for each process (Cowieson 1995, personal interview). Therefore, whereas many effects processors like the QSystem were previously separate components in the form of hardware "modules," not only have they become smaller and more complex (multifunctional), they are now increasingly taking the form of DSP software special effects files or modules like the QXpander and QSYS/TDM that exist in the same digital domain as the workstation itself.

In addition to making signal processing less expensive and more flexible, another important aspect of the development of DSP concerns the multiplicity of sound treatment possibilities:

> Once an audio signal is converted to a stream of binary numbers, what you can do with it is limited only by your imagination and taste -- and by digital memory capacity and processor chip speed. A new generation of DSP chips will soon make the

> digital signal processing options available to us all but boundless (Simon 1989, 110).

What is important here is that this degree of flexibility and variety leaves these devices with a less "fixed character" than their analog predecessors, thereby increasing the need for definition of their functions particularly when introduced to the marketplace. In the same way that the sounds of newly emerging electrical instruments had to be "specified, in detail, boch in a conceptual and a technical format," (Théberge 1987, 113) and in a way that related to musical practice, complex signal processors -- like the QSystem -- and their effects require similar specification.

In terms of technical format, this overall architecture of the hardware system -- the technical infrastructure -- is becoming a standard organization (e.g., Digidesign's Pro Tools) and to a large extent determining the technical format of these devices. An analysis of the particular configuration of these broader infrastructures is beyond the scope of this paper[24] but definitions of the technical and "conceptual" dimensions of their related devices will now be discussed in terms of their design and marketing on the one hand, and their relationship with musical practice on the other.

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[24] See Theberge 1987, 112-114.

Aesthetic Purpose and the Design and Marketing of QSound

QSound's technology fits into the category of spatially oriented, "3-D" sound processors, now more commonly referred to simply as spatial processors. In its promotional literature, the effects are referred to as

> a form of "electronic ventriloquism," that allows a listener to hear sounds that appear to be emanating from positions outside of the traditional stereo environment. QSound generates "soundscapes" that exceed the physical bounds of stereo sound, creating an audio experience of previously unrivalled depth, clarity and realism (QSound Labs 1994c).

The notion of "electronic ventriloquism" is, in effect, the same basic principle underlying stereo imaging. This is therefore not a new concept by any means, however, the conscious focus on expanding stereo's traditional boundaries through the optimization of psychoacoustic principles using new digital technologies forms part of what is increasingly referred to as "sonic holography" (Chan 1992, 96). Although originally the term used specifically for binaural recording techniques, it is now usually associated with all "three-dimensional" sound technologies in trade magazines and books on new media.[25]

With the exception of the handful of QSound recordings and Michael Jackson's use of the Roland Sound Space Processor

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[25] For example, *Cyberarts: Exploring Art and Technology*, Linda Jacobson, ed., Miller Freeman, San Francisco, USA, 1992, and *On the Cutting Edge of Technology*, Sams Publishing, Carmel, IN, 1993.

on "Dangerous" in 1991, and more recently the Spatializer[26] technology on *HIStory*, as of yet, recording in "three dimensions" cannot be considered an established recording practice in the music industry. In any case, as mentioned above, these processes are generally not conceived of as true "three-dimensional" sound, but rather as "enhanced" stereo.

Nonetheless, they effectively describe a particular application of recording technology involving a different set of mixing practices as much as they refer to a specific technical process. Instead of just panning centre, left and right, mixers have to think about placing sound into eight different channels or, "like the numbers on a clock" (Goh Hotoda, co-mixer for Madonna's *The Immaculate Collection*," quoted in QSound 1990). In other words, these are practical categories whose techniques possess an aesthetic dimension. In this way, QSound's original product/technology was as much about a particular set of recording practices as it was about the psychoacoustic effects of the technology itself.

As such, QSound had to define the aesthetic purpose and function of its technology in a particular way. In other words, it had to assign a use and artistic value to its treatment of sound, which would form the basis of its marketing strategies and product design and determine to a

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[26] The Spatializer technology is similar to QSound but claims to be a "less complicated and cheaper method of passing sound through a filter to give the illusion of three-dimensionality."

large extent its position vis-à-vis the music industry. The details of its aesthetic dimensions will be discussed in the next chapter; here, I will continue with the role of aesthetic purpose in the design and marketing experience of QSound.

A recording standard

First and foremost, QSound tried, from the very beginning, to establish itself as a recording standard that would surpass and eventually replace stereo recording methods. As a process that was "to accurately and naturally reproduce spatial environments ... [and] create a virtual sound reality" (QSound 1994c), its sound placement techniques were thus viewed as contributing to a sense of "realism"; part of the "race to re-create natural sound." While these claims in themselves are not unreasonable given the history of attempts to improve "fidelity" or extend "naturalism" it has been argued that the status of "recording *standard*" and the overall exaggerated nature of its claims was necessary to justify its technological complexity and high cost, and served as the premise for the hype-machine that was to drive its PR campaign (Elliot 1994, personal interview).

The hype was particularly necessary because of the finance strategy adopted by the original company president, Larry Ryckman, reputedly a reckless business tycoon and certainly not renowned for successfully financing projects in

the music or the entertainment business.[27] Ryckman's strategy was to go public with the company almost immediately by buying what was then a mining development shell company, Archer International Developments Ltd., listed on the Vancouver Stock Exchange (VSE). The name was changed to Archer Communications and, in a reverse takeover, the assets of QSound were traded for enough shares to give the QSound partners majority control and equity in Archer (Greber 1989, 48). The stock acquired a listing on NASDAQ soon thereafter. (NASDAQ is the U.S. over-the-counter stock exchange.) Selling the stock directly to Wall Street was the next step and required the support and endorsement of the entertainment industry, who Ryckman approached in the hope of gaining legitimacy and generating more publicity.

According to Ryckman, QSound "needed someone who was widely respected in Hollywood ... whose phone calls people would return" (Greber 1989, 48). Their attempts at finding such a person were successful when in early 1987 the three partners took a boom box containing a QSound demo tape to Hollywood, and in a "historic meeting," played it for film producer George Folsey Jr., Buzz Knudson, sound studio chief

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[27] According to one anonymous source, not only was QSound a stock market scam, but also Ryckman's "stepping stone" to Hollywood. With the then recent "disastrous management" of a low-budget film, *Snowballs,* it is not clear why Lowe and Lees approached Ryckman in the first place. (It was reported that they were initially left in the dark as far as Ryckman's stock market scheme was concerned, and not pleased) (Greber, 50).

at Todd-AO Glen Studios, the world's largest audio postproduction company, and Chris Jenkins, his vice president. Folsey was impressed and seeing "an opportunity to revolutionize the audio industry," ended up buying a substantial share block of the Archer stock (Greber 1989, 48). Knudson and Jenkins of Todd-AO studios were also impressed and subsequently targeted by QSound as end-user consultants on the physical design of the technology.

Jimmy Iovine, a major record producer in the music industry, and his partner, Shelly Yakus, who were at the time part owners of A&M studios, were subsequently approached by QSound, played the demo tape on the now legendary boom box, and equally fascinated. They too ended up buying blocks of Archer stock and Yakus agreed to work for Archer introducing the QSound processor to sound engineers. Both felt that of the many sound systems they had been asked to promote, "QSound is the only 3-D sound system that really, truly works" (Greber 1989, 48-49).

Following these successes, Creative Artists Agency (CAA) took on Archer as a client and signed a 25-year exclusive worldwide marketing agent contract (and also bought shares of the QSound stock) in 1988. As a talent agent, it was unusual for CAA to represent a technology and had apparently refused many prior requests to do so (Greber 1989, 49).

CAA's involvement was interesting because they significantly revised QSound's original marketing plans. At

the time, QSound wanted to charge high first-time user fees "for the opportunity to be one of the first in the industry to use the QSystem" (Marshall and Stevens Inc. 1987, 11) -- a strategy they figured would be the best way to make themselves known. This introductory phase of first-use fees for the two prototype systems then in operation would be followed by a licensing effort as systems were produced on a regular basis. In this second phase, "it [was] hoped that providing licensing on such reasonable financial terms [would] allow the system to become a standard production tool within a reasonable amount of time." Licensing as a method of distribution was modelled on Dolby Labs' system of licensing its stereo mixing equipment, as a "means for controlling the use and protecting the technology of the ... mixing system" (Marshall and Stevens, 12-13).[28] However, CAA advised them to drop this idea and charge a royalty fee instead:

> Completely confident of the technology and with the credibility gap more than bridged by CAA's reputation, another course was plotted. Gear up for full-scale role out. Not one or two users, but a series of deals including all record labels. And they made another choice, unpleasant in the short-term to stock holders, but undoubtedly in the long-term interest of clients and shareholders.

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[28] It was also a more efficient way for Dolby to generate revenue since the initial equipment investment by studios was small, thereby making it an affordable choice. The cost of user fees could be passed on to their clients, in whose interests it was to record in Dolby given that the required decoder was concurrently marketed to stereo manufacturers, thereby generating consumer awareness and demand.

> They would not accept a contract, nor would they actively market the technology, until after the commercial version was in the studio, tested and open for business (Kerlin, 1989, 4).

Based on QSystem's potential status as a "standard production tool," and by co-ordinating a deal with record companies, CAA hoped to collect royalties by signing long-term master contracts with the major recorded music and motion picture firms (Dillon Read 1989, 4) -- a plan that would generate far more income than liscencing the processor to studios.

This arrangement, however, only made QSound's position that much more vulnerable since they were under even more pressure to come up with a product. Wall Street analysts were nonetheless impressed at this point, not only by the demo tape itself, but now by the list of major Hollywood players associated with the QSound technology. "An unusually positive, section-front story [appeared] in *The Wall Street Journal* about Archer and [reported] unconfirmed rumours that a major, unidentified New York-based mutual fund was buying a block of shares" (Greber 1989, 50), and that "several of Wall Street's most savvy institutional investment funds [had] also taken large positions in Archer" (Baxter 1989, p. unknown). Scotia McLeod Inc., Archer's sponsor, obtained a Toronto Stock Exchange listing, and by June of 1989, what had started off as 45-cent shares were now trading at $24.50, giving the company a market value of more than $200 million. Yet, at this point,

Archer was a company with no revenue or earnings (Greber 1989, 50). They had impressed everyone with a demo tape, but had still not come up with a working, viable technology.

With all the marketing relationships in place and an office set up in Los Angeles, the only thing left for QSound to do was actually deliver a product and make a sale; but with a technology that was still in its developmental stages and had yet to be tested in the market, its position was rather precarious and the stakes quite high. Pressure was enormous and with such a high profile in the entertainment industry and likewise under the microscope of the "finicky business media" (La Pointe 1989, p. unknown), every difficulty they encountered and miscalculation they made was now amplified.

Obstacles

The first series of technical problems they experienced involved changing the system from analog to digital circuitry; difficulty in achieving processing speeds required for real-time processing of the incoming audio signals; and shielding the parallel processors from one another as well as from surrounding technology in the recording studio. (Because of the prevalence of computer-related products in today's studios, technologies like QSound can affect software and other equipment in close proximity.) Trying to deal with the latter problem alone caused delays of over a month. One company reportedly agreed to fix the problem, but after thirty

days said they couldn't do it by themselves, at which point QSound had to ask five different companies to do the job collectively. This delay alone was apparently enough to cause a rather quick dip in the stock price (La Pointe 1989, p. unknown).

Another problem that tarnished its prominent reputation was the issue of mono compatibility. When a stereo signal is broadcast or received in mono it "collapses" into one channel. However, the integrity of signals and the sound image as a whole can sometimes be distorted and damaged in the process, thereby limiting the more extreme uses of even "regular" stereo. For example, centre-image sound signals may be raised when two stereo signals are combined, while other extreme left and right images are rendered inaudible. When using QSound, the potential for poor mono compatibility is increased even further, since it is in essence an "extreme" process involving a high degree of signal alteration.

It was reported that QSound had poor mono capability but later argued that the problem was not actually related to the QSound technology itself (La Grou 1994, 108). It is actually up to the recordist to determine mono compatibility of stereo programs (Moylan 1992, 112) and according to James Guthrie, who produced the Pink Floyd, Julian Lennon and Roger Waters QSound recordings, the problems were "due to mix oversight rather than to any inherent QSound problem" (James Guthrie, quoted in La Grou 1994, 109). Brian Cowieson, head of Pro-

Audio division at QSound Labs argues further:

> We have designed into our tools the ability to select how much mono compatibility or imaging the user chooses. Whether it collapses to a good mono or not is up to the user. The nature of this technology is that the more extreme use, the less mono compatibility. Some competitors claim complete compatibility with mono. This is, of course, impossible. The physics of what we all do to achieve sound localization doesn't allow for this (Cowieson 1995, personal interview).

Nonetheless, "word got around that something wasn't working properly," and that was enough to arouse suspicion (Broomhead 1994, personal interview).

The issue of mono compatibility is interesting because, as described by Cowieson, it is not only a technical "problem," but one related to industrial standards and listening circumstances:

> One of the biggest stumbling blocks turned out to be mono compatibility. It's hard to imagine but mono is still an issue in audio today. After thirty or forty years of stereo, mono for a lot of consumers is still their reality. Most radio receivers (clock radios) and some AM broadcasts are still in mono. There are still a lot of mono TV's in the marketplace and a lot of cable companies sending their signals in mono or synthesized stereo (mono source split with a comb filter to simulate stereo).
>
> Since we could not guarantee that the average consumer would ever hear QSound as it should be, or that QSound wouldn't adversely affect the signal they were presently receiving, there was no perceived advantage in processing with QSound.
>
> Even the multimedia marketplace, with all it's new technology, started off in mono. It is only in the last year or so that we have seen a significant

> move to stereo. Even in the gaming industry (Sega, Nintendo etc.) the change over has just begun. We believe we were a bit ahead of our time. The various audio industries were not ready to commit completely to true stereo and eliminate mono for good. A small company like ours was forced into the position of having to try to change the marketplace situation (mono to stereo) in order to accommodate our technology. This is still an ongoing battle, but a lot of other companies, some competitors, are assisting in the drive to make the marketplace more compatible to new 3-D (I hate that term) audio technologies (Cowieson 1995, personal interview).

The problem of mono broadcasting and reception became a public issue with the television broadcast of the QSound-recorded Coca Cola commercial during the 1990 Superbowl. As their first large-scale promotional campaign the enhanced effect was lost -- and presumably nonexistent -- to most viewers (and all live spectators) during QSound's "introduction" to the general public. While not an actual technical problem per se, the event was enough to cast more shadows of doubt over QSound (Lutsky 1994, personal interview). Similarly (although not brought to the attention of the financial or trade press), while initially appearing on Madonna's dance remixes may have been a good publicity strategy, the dance club venue is an inappropriate listening context for "sound localization." In fact, many club mixes are mixed separately for mono, so that the most amount of sound will be emitted from each speaker.

In addition to these more technically-oriented issues, problems around the CAA deal soon arose. "The British Columbia Securities Commission decision not to allow Archer to issue

special warrants[29] to the Creative Artists Agency in order to save some $2 million-$3 million in fees" (La Pointe 1989, p. unknown) made the deal appear shaky in the financial press, causing more dips in the stock price. Given that CAA would not market the QSystem until a fully-tested, commercial version was available, delays in product delivery and rumours that Archer was a fraud[30] indirectly jeopardized its position in the stock market, as the "credibility gap" intended to be "bridged by CAA's reputation" threatened to re-open.

Furthermore, in addition to CAA's relationship with QSound Labs, the proposed recording deals were not accepted by the record companies and only served to antagonize them. According to Cowieson:

> The assumption was that the product was so revolutionary that record companies and artists would be willing to give a percentage of sales to be able to use QSound. This approach has been tried unsuccessfully by other audio companies (e.g., Aphex) in the past and as a practice is generally frowned upon (Cowieson 1995, personal interview).

Indeed, with the recorded music market expected to represent the largest single market for QSound (Dillon Read 1989, 5) investment companies believed that "the technology

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[29] A warrant is essentially like a coupon. It gives the right to buy a stock at a certain price within a particular time period.

[30] It was reported that during the meeting with CAA executives in which the deal was to be closed, "an unsigned note arrived by fax full of innuendo and accusations that Archer was a fraud (Greber 1989, 50).

has the potential to create such interest among consumers (translating into record sales) that the companies will pay meaningful royalties to Archer under long-term agreements," -- despite the fact that record companies were recognized as being "tough negotiators regarding royalty payments" and that it was likely they would resist paying "meaningful royalties" (Dillon Read 1989, 5).[31]

All of these factors made Archer a risk for investors, who included major record producers and other influential people directly connected with the entertainment industry. By mid-1989, Archer was under even closer scrutiny in the financial press, and was considered a company with "all the trappings of a classic pump and dump scam -- a high-tech firm with an exciting story, trading on the fast and loose VSE with some unsavory promoters, a long litany of broken production promises and no revenues." In June of that year, VSE issued a press release warning that it was a risky investment. Nonetheless, a thread of legitimacy remained in the financial press: "if Archer fulfills its promises, it stands to revolutionize the world of sound the same way stereo did when it first appeared. In that case, the sky could be the limit" (Baxter 1989, p. unknown).

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[31] "A hypothetical example illustrates the earnings potential for the recorded music market alone. A $0.05 royalty on 40 percent of the recorded music units sold in 1987 would have translated into revenues of $48.8 million; a $0.50 royalty would have resulted in revenues ten times that level" (Dillon Read, 5).

This quote is both naive and telling. On the one hand, the financial community's version of success was measured in limited terms of sky-rocketing stock prices. While a reflection of a viable technology in the long term, on the other hand, the assumption was that delivery of product and hence the availability of working QSystems alone would "generate considerable excitement among consumers" and that QSound "could well be adopted widely" (Dillon Read 1989, 1). What this scenario didn't take into consideration is one of the most crucial factors of successful technological innovation -- that music potential is not realized through design and manufacture alone; it is through practice that technologies become musical instruments (Théberge 1993, 210) and through use that successful innovation is achieved (Théberge 1993, 70). And it was both use and users which had thus far been left out of the picture. Effectively, what Archer had sold to the financial community and the music industry at this point was a company stock and a demo tape, not a technology, and even less so, a recording practice.

Bringing the product to market

By the time Archer did start "delivering" it was basically presenting a technology that was still in development. It is quite common for manufacturers to send their products out for "beta-testing" before putting them on the market, however, Archer's first major QSound recordings,

Madonna's *The Immaculate Collection* released in November 1990, and Sting's *The Soul Cages* released shortly thereafter, were in fact, considered beta-testing by the company.

> There wasn't much time for any proper procedure because of the rush to get to market to follow up the hype. Sting's album "Soul Cages" and "The Immaculate Collection" were in my opinion beta-testing. Sting's album turned out well but Madonna's was done in too much of a hurry to be much of anything than a headache for us (Cowieson 1995, personal interview).

The issue of beta-testing can be a crucial factor in technological innovation since, by receiving feedback from users, manufacturers can get an idea of how the product will perform in the field and make necessary changes before it is put on the market. Beta-testing not only saves money that could be lost from equipment that fails to meet market demand but also allows the manufacturer to discover major design flaws (Jones 1992, 75-76).

QSound's main concern by this point however, appeared not to be the discovery of practical problems, but rather, simply getting their product out there in the studios and making further promotional announcements. "They tried to pander to the most famous people they could find and had them use the technology just to attach their name to it" (Yale 1995, personal interview). In addition to recruiting producer Shep Pettibone to record *The Immaculate Collection* in QSound, they also paid producer Bob Ezrin to use it; "they tried to parlay

his esteem into something they could use as PR" (Yale 1995, personal interview). Again, this in itself is not uncommon; "studios are offered equipment because they are often written about in consumer and trade publications like *Keyboard* and *Mix,*" (Jones 1992, 76) or they simply serve as a link to other studios.[32] But, instead of letting different recordists use the technology creatively and accept feedback, their approach was considered arrogant by some members of the music recording community who claim they were not given much liberty with the system (Yale 1995, personal interview).

Despite the fact that in its promotional material, QSound recognized that "the artists, engineers and producers are the silent partners in developing the technology," (Archer Communications 1990) they apparently had very specific ideas about what type of sound quality recordists should aim for. According to one producer whose studio, Digital Music, served as the Toronto "flagship," company, there were certain functions QSound didn't recommend or refused to let them use.

> They were very particular about how things sounded. One of the problems with it was that it was lacking in high end ... which meant that the further behind you placed sound, the "darker" it sounded. You got a muted, dark, sound

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[32] Ironically, although the first recordings may have given them some credibility and promotion from within the music industry, rather than receiving either royalities or first-time user fees as they had intended, QSound did not receive any money from the record companies (Burke-Gaffney 1995, personal interview).

> that became murky as it moved back, but actually it was a very interesting effect, and if used properly, didn't harm the sound at all. But they wanted it to be really clear. But not every sound is clear and pristine. Being unclear is part of the perspective ... They were more technically oriented in deciding how it should be used. There was one function they refused to let us use. It was called range and it made something sound like it was in front of you, but really far away, which was an effect we really liked and found useful for certain things. But they thought the sound quality was not good. They just didn't give much liberty to the users (Yale 1995, personal interview).

The issue of recording practice was completely bypassed and ignored, thereby not only wasting an opportunity to avoid future problems, but in doing so, contradicted the professional conception of the recordist and/or producer as artist underlying popular music.[33]

Furthermore, it offended many recordists that QSound had initially sought acceptance among stockbrokers who in a sense served to legitimize their recording technology. "You put a stockbroker in the same room with a recording person, it's like trying to mix oil and water" (Yale 1995, personal interview). Evidently, to stockbrokers, QSound was "the most important innovation in audio since stereo itself." They were given demonstrations using the "legendary" boom box, and were "completely devastated" by what they heard (Kerlin 1989, 3). Some brokers were even promoting the stock themselves by

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[33] See Kealey 1979, and Théberge 1987, 118-161.

playing the same demo tape to prospective buyers. And as much as listeners were impressed with 30-second segments of various recordings (only a couple of which were of popular music), to many recordists who eventually used QSound, its status was not much different than reverb, yet far more complex and time-consuming to use (Yale 1995, personal interview) or, nothing more than a fancy signal processor that couldn't live up to its reputation (Elliot 1994, personal interview).

Thus, with certain recordists feeling a bit used and abused, QSound's approach served to polarize the music industry against them (Yale 1995, personal interview). Which is not to say that recordists necessarily disliked or were uninterested in QSound; in some cases it was considered an interesting and relevant technology, but one whose marketing should have taken a more "grassroots approach" (Yale 1995, personal interview) and resulted in a product the company could manufacture at a more reasonable cost.

The problem then was as much, if not more, a question of marketing tactics as it was a concern with technical complexity. Although recordists may find complicated technical processes an attractive feature as well as a deterrent,[34] as mentioned above, many felt the complexity and expense of the technology was difficult to justify because of its restrictive

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[34] The actual procedure involves the creation of eight new tracks for every QSound-processed track, meaning eight times as many tracks to deal with in the final mix -- and re-process, if the recordist didn't like the sound.

perceptibility and rather limited potential audiophile market. This factor alone made it difficult for producers to sell QSound to their clients given the predominance of listening situations that did not involve sitting in the "sweet spot" or even stereo broadcasting and playback, as discussed earlier in the chapter. For example, many producers' clients lost interest when they realized you wouldn't be able to hear the effect when listening to music in a car or on most television sets (Yale 1995, personal interview). Now that they were actually dealing with the recording industry, this became a serious obstacle which QSound was finally forced to confront.

Apparently when new management took over in 1993, the new marketing strategy involved promoting QSound as a process that produced "enhanced, fuller bodied sound, with a sharper focus on individual instruments," (Archer Communications 1990) -- regardless of optimal listening circumstances. However, for producers, it proved to be a difficult task to sell it on those grounds:

> They [QSound] came up with this ridiculous idea that even if you're not in the sweet spot, there's something really neat about the way it sounds. "It's a mystery, but it's great and makes your music sound better anyway" -- *that's* how we were supposed to sell it to our clients (Yale 1995, personal interview).

To further hinder the process, given that the royalty deals did not materialize, the original licensing arrangement acted as an additional deterrent because of the extra cost (to

be incurred by clients), as well as the complicated administration and general hassle involved in renting the equipment. Problems with distribution thus soon became evident and, overall, it was not considered a very accessible technology. In promotional material dated 1992, it stated that eventually, the QSystem could be available for sale (Goldrich 1992, p. unknown), however, QSound never made any formal attempts to manufacture QSystems. Some critics argue that licensing was an attempt to avoid the costs and complications of going into manufacturing while some analysts saw this particular business model as providing an opportunity to "lower its risks and allow it to concentrate on the intellectual value added, rather than on the production and marketing of boxes" (Willett 1994, p. unknown).

In any case, the licensing option was chosen on the assumption that everyone would want to use their system (Yale 1995, personal interview). Apparently, in QSound's original marketing plan, it was to act as a service company: "they thought the world would send their tapes to QSound to process them" (Yale 1995, personal interview). Likewise, the fact that they tried to negotiate a royalty deal with record companies was based on the same assumption.

All these factors combined left many of QSound's supporters discontented and the majority of stockholders withdrew their support, with some going as far as suing the company. The details of what happened at this point are

difficult to discern but the general feeling among recordists I spoke to and in most articles in the financial and trade press was that QSound had failed and disappeared from the scene.[35] The company's promotional material refers simply to financial, organizational, and managerial changes, as well as a major move toward market diversification and away from its almost exclusive concentration on the music industry (Archer Communications 1992).

New Directions

With new management taking over in 1992 there was significant a shift in strategy, both in terms of marketing and promotion and in overall product design. In terms of the former, the new president, David Gallagher (former vice-president), was considered by some members of the financial community to possess a more careful and conservative management approach than the reputedly "high-flying," "risk-taking" entrepreneur, Larry Ryckman (Broomhead 1995, personal interview). The more significant change, however, was in the shift toward producing first the QXpander and later the QSYS software plug-in modules.[36]

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[35] E.g., a recent article in the *Globe and Mail* Business Section refers to QSound as having taken "North America -- and the stock market -- by storm...but it was a front that moved through quickly...revenue was slow in coming and much of the interest quickly evaporated" (Ingram 1995, p. unknown).

[36] Overall, musical applications were at this point no longer a priority for QSound since it was having greater success in its sound chips used in video games and multimedia

As described at the beginning of this chapter, these plug-ins do not offer the same flexibility as the QSystem, but they do offer spatial processing options in a product that recordists can afford:

> We want QSound to be accessible to everyone who wants to use it regardless of their budget. If they want a machine specifically designed to provide the best of the QSound features they would buy our QSystem II. It is expensive but it is aimed at the pro audio market. If they have a platform, such as Digidesign's Pro Tools III that they are happy with, and want to have QSound on that platform we can accommodate them with our software plug-in. This is aimed at the pro to semi-pro market. It is less expensive but it also reaches a larger market...it would be expensive and extremely difficult to try to build a machine from scratch for every potential application. It's much better to design software that runs on everyone else's (Cowieson 1995, personal interview).

Designing the QXpander was an attempt to reduce cost based on the approach of "substituting intelligent software for hardware wherever possible" (John Senior, quoted in Jones 1992, 81). In this sense, it had no choice other than redirecting its design strategies toward working in conjunction with changes occurring in the overall technical infrastructure of the recording process as described above, but even the most recent software form of the original QSystem -- the QSYS/TDM --provides fewer localization channels (four instead of eight), and thus a more limited "QSpace."

But the QSystem has not disappeared completely. It is still being manufactured and in February 1995 it was reported

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applications.

that twenty-five systems were currently being built (Cowieson 1995, personal interview), replacing the older systems. At that time, producer James Guthrie was currently mixing Pink Floyd's live album using the QSystem and was considered one of the few die-hard supporters of the technology (Lutsky 1994, personal interview). It has been suggested that Pink Floyd's "ambient" music which is strongly characterized by its spatial properties, is the most appropriate genre of music for QSound's application and a primary reason for continuing support in the face of a more general "rejection" by the rest of the recording industry.

Of primary significance is that, in addition to simply being a more affordable process, QSound's technological status was transformed in the innovation process from a "standard production tool," as it was initially marketed, to one of many sound processors taking the form of a software plug-in. QSound could thus be more appropriately considered an optional and genre-specific "sound effect" rather than a universally applicable recording standard that extended fidelity. In this way, its optional software plug-in form, at least for now, more closely related to its practical status and reconciled the prior incongruity between invention and use.

Summary and Conclusions

As a complex and sophisticated signal processor, the QSystem technology was marketed as a standard production tool

intended to revolutionize stereo sound, where "3-D" sound was to become the new recording standard. Despite high production costs and its limitations of perception, by developing a technology that worked within the existing two-speaker stereo standard, it was thought that the QSystem would be widely adopted by the recording industry.

However, because of the finance strategy chosen by the original management of the company, QSound was left effectively marketing its product primarily to the financial community in the form of a stock and a demo tape rather than an actual music technology or practice. By the time QSound introduced the QSystem to the music industry it was primarily in response to shareholders' expectations and the pressure to bring its product to market. There was little to no market testing or experimentation carried out with potential users and the relationships the company did establish with recordists had served mostly promotional purposes. Thus, rather than developing a recording tool in conjunction with user needs, QSound's process of innovation could be characterized as more of a "clash" with musical practice.

While its marketing definition as a universal recording standard may have justified its costly and complex product design, it was based on a problematic notion of fidelity that did not relate to its practical status. The latter was more appropriately expressed in the software versions, the QXpander and QSYS. As far less complex and hence less flexible

technologies, these are more cost-efficient products in the form of third-party software that work with the Digidesign Pro Tools workstation as creative tools.

It could be said that it is still not commercially viable to manufacture 3-D sound technologies, whether stereo or multi-channel systems, however, even in the limited context of ideal listening circumstances, there were equally considerable aesthetic problems associated with the sound in terms of its general appeal. On the one hand, the fact that the producer and mixers of Pink Floyd's album were the last to hold QSound in high regard at the time it was losing popularity is arguably testimony to the fact that it doesn't lend itself to all kinds of music and thus could never be considered a recording standard per se. On the other hand, despite QSound's attempt to regulate its operation, recordists used it in different ways and produced a wide variety of results. This situation is not dissimilar from stereo's introduction to music recording, a practice which took several years to establish, and is still evolving. It is therefore impossible to clearly ascertain what its aesthetic potential as far as musical applications really is. The next chapter will attempt to shed some light on this issue.

Chapter 3

The Aesthetic Dimensions of QSound

Introduction

As music-making has increasingly become dependent on sound reproduction technology "there appears to have been an evolving, dialectical relationship between the concepts of musical sound and the various possibilities offered by the technology" (Théberge 1993, 277). As was discussed in the previous chapter, in the process of innovation, this relationship is largely negotiated through the marketing of new technologies. It was pointed out that the technical and conceptual specification of new devices like QSound was necessary to establish a link between an invention and its use. But it was also pointed out that in the QSound case, in addition to factors related to changes in the broader technical infrastructure of recording technology, there was a certain amount of ambiguity and conflict regarding its applications and aesthetic purpose, which was resolved through its change in form.

In this chapter I will examine in more detail the aesthetic dimensions of the QSound technology and its role in musical practice as well as the interpretive frameworks, or musical contexts, that address "sound localization" in particular and spatial properties in general.

Following a discussion on the historical context of

recording and the creative process I will take a closer look at "space" as a creative musical element and provide a critical analysis of certain QSound recordings.

The aim of this chapter will be to gain an understanding of the changing role of space as it relates to the creative nature of the recording process. In this way, the QSound case will also serve as an illustration of the interrelationship between musical concepts and sound recording technologies.

Recording philosophies and the "aural image"

With the advent of sound recording, it was an unquestioned assumption that its goal was to achieve maximum "faithfulness" to the source. The record was understood as a documentary registration of a live musical performance where vocalists and instrumentalists performed directly in front of an assemblage of horns connected to a cutting stylus via a vibrating diaphragm (Eargle 1980, 276). Recording was literally direct-to-disc; a "brute-force system capable of only a few subtleties" (Eargle 1980, 276).

Being a mechanical process using only the acoustical energy provided by the performers, volume was limited because of a lack of power supplied to the cutting stylus forming the grooves of the record (Read and Welch 1959, 373). With its greater bandwidth and higher amplitude, the Western Electric recording process solved this and other technical problems and

led to the first means of recording that involved the modification of the recorded waveform (Read and Welch 1959, 374). Introduced in the mid-twenties, electrical recording marked the beginning of new techniques that "entailed alterations in both recording practice and the listening experience" (Chanan 1995, 57-58). Most importantly, these changes involved the first in a series of "paradigm shifts," and for the first time, "recording engineers and record companies began to think in terms of creating an aural image" (Chanan 1995, 57-58).

This initial period of change was not without chaos (Read and Welch 1959, 374) as engineers and critics were unable to agree on recording standards or on whether the new methods were in fact superior to the old acoustical methods in their ability to "capture the spirit of the music" (Read and Welch 1959, 353).[37] Much of the early debates centred around technical and philosophical issues of "realism" and were further complicated by the fact that two sets of practitioners were now involved in establishing recording standards.

On the one hand, the philosophy of the existing acoustical engineers, who were already accustomed to working with musicians and had certain musical goals in mind, was based on the idea of re-creating the performance space by recording "the natural room resonance of the studio, or

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[37] For an excellent detailed account of these early debates, see Read and Welsh 1959, Chapters 24 and 25.

acoustical reflections of the auditorium" (Read and Welch 1959, 377). On the other hand, the newer radio-trained recordists were more concerned with exploiting the potential of the technology itself (Read and Welch 1959, 374) and adhered to a philosophy of the "close up" radio broadcast where vocalists and instruments were recorded at close range in a small, dead studio space. The intention was to create a sense of intimacy by transporting the orchestra and soloist into the listener's living room rather than transporting the listener into the auditorium (Read and Welch 1959, 377).

Both philosophies were nonetheless still understood as constituting the reproduction of a live event, regardless of the lack of a singular, agreed-upon aesthetic. While recordists were indeed aware of the range of aesthetic choices, the implications of the contrived nature of the "aural image" were not fully acknowledged and consciously explored until the early 1950s with the development of magnetic tape recording and later, multitrack and digital recording.

The removal of "the tyranny of the needle" allowed for a greater degree of manipulation through more precise and extensive selection and correction (Chanan 1995, 131). With magnetic tape recording this involved simple editing out of "flaws" and dubbing in of corrections through tape splicing, and in some cases, a crude form of overdubbing, through "re-recording from one deck to another while adding in another

live recording at the same time" (Chanan 1995, 144). Multitrack recording intensified this process even further such that sound became separated into individual tracks that could be edited or modified and eventually mixed into a single master version. With the arrival of digital recording in the late 1970s, the potential for altering the "recorded waveform" was virtually limitless.

In the same way that the adoption of electrical recording methods spawned competing recording philosophies and practices, the initial switch to tape recording, and eventually, digital recording, presented music practitioners (recordists, musicians, and producers) with an even greater degree of choices. The difference in these circumstances, however, was that it led to the practice of recording specifically for the medium: the "aural image," no longer considered solely an imperfect representation of a performed piece of music, became a constructed image with its own characteristics. In this way, the new practices accompanying tape recording methods involved another "paradigm shift" where "an initial period of representation conceived of as the documentary recording of a preexisting event" gave way to "representation as the construction of that event" (Wurtzler 1992, 88) Recordings ceased to represent a live performance and the relationship between the live and the recorded was broken: recording became its own means of communication and

the record, the sound event.[38]

This new philosophy of recording as "artificial generation" was not immediately accepted and debates regarding "authenticity" in music based on technological involvement continue to this day, both in terms of the generation and treatment of individual sounds (through electronic instrumentation and signal processing), and their overall arrangement, or mix.[39] The nature of these debates, often complex and full of contradictions, are beyond the scope of this paper, but what is significant to note here is that the different, at times, coexisting philosophies became the basis of two principle recording practices.

On the one hand, classical music recording methods are based in the philosophy of reproduction -- capturing the "sonic photograph" of a performance, regardless of the degree of electronic manipulation involved. The objective is to create a sense of "realism" and "liveness" by re-creating the original soundfield "without distortion" such that the recording medium is "transparent" or the recording technology invisible (Moylan 1994, 81). As one recordist describes it, it is like "taking dictation" (Jones 1992, 177).

On the other hand, popular music practices developed out of techniques that "exposed" the recording medium to "present

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[38] See Wurtzler (1992) and Théberge (1989).

[39] For more detailed discussion on the relationship between technology and authenticity in music, see Frith 1988, 1986, and Goodwin 1988.

musical ideas and sound qualities and relationships that are impossible to create in live performance" (Moylan 1994, 87). Here, recording is said to be limited only by the imagination (Jones 1992, 177).[40]

While on a purely technical level this may be true, there are two important points that must be emphasized here regarding musical practice. Firstly, following Durant's notion of "conditions of music" and viewing recording technology as cultural practice, the technical capacity of the devices of musical production can only be considered as one contextual element in the music-making process; while theoretically "limited only by the imagination," the cultural context within which musical practice occurs offers its own influences and parameters in terms of legitimacy.

For example, the early experimental practices that sought to exploit recording as a medium occurred within the margins of musical culture -- the musical avant-garde -- specifically in the *musique concrète* and *electronische musik* movements of

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[40] In popular music practice the dividing line between these two approaches is not clear-cut; "most recordists find themselves moving about the vast area that separates these two extremes, where they enhance the natural characteristics of sounds" depending on what is deemed appropriate for the project (Moylan 1994, 77). An article in *Stereo Review* describes how classical music has "long relied on tricks...classical musicians take advantage of technological opportunities...virtually every contemporary recording you own is guilty. Even a so-called live recording is probably a composite of several live performances edited together" (Pohlman 1991, 110). In other cases, certain forms of contemporary "avant garde" music like that of Philip Glass is described as consciously combining "the techniques of classical music with pop production..." (Bambarger 1995, 67).

the late 1940s and early 1950s. Both employed the recording technology of their day specifically for creative purposes; through tape manipulation techniques (e.g., cutting, splicing, and editing) they created a form of musical montage with *musique concrete* using natural, acoustic material (recorded sound), and *electronische musik* making use of electronically generated sounds (Théberge 1987, 103).[41]

But such techniques and musical forms did not enter into the mainstream until the 1960s with the appearance of the Beatles *Sgt. Pepper's Lonely Hearts Club Band,* nor were they immediately taken seriously or socially regarded as "legitimate" forms of music. Nonetheless, as "the boldest, most experimental use of the recording studio of its day" (Théberge 1987, 119), *Sgt. Pepper* marked the beginning of the integration of experimental techniques with popular music production. This eventually led to the emergence of "studio bands" and new genres of music (disco music in the 1970s, for example), that were now formally rooted in recording technology and studio production methods.[42] These practices

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[41] For a more detailed discussion on the aesthetic and theoretical foundations of these practices, see Théberge 1987, 77-117.

[42] The particular dynamics of this transfer of techniques from the avant-garde into the mainstream is more difficult to explain. Michael Chanan (1995) notes that the original *musique concrete* and *electronische musik* recordings, after being released "in small editions for aficionadoes of the avant garde...began to spread beyond their immediate market and exert their influence undetected, until the media began to report stories such as that of Paul McCartney,

were thus as "limited" by the conventions of musical culture that effectively deemed certain practices and musical forms "experimental" or "popular."

Furthermore, as Durant stresses, "music is never simply led by technological invention" (Durant 1992, 180). In other words, the "nature" of the technology in question is not, by itself, the motivating force behind certain practices. *Musique concrète* methods, for example, were in fact first developed by Pierre Schaeffer, a radio and sound technician in Paris, by "scratching" records:

> Taking sounds from different sources, from pianos to railway trains, he produced a series of short pieces by playing them at different speeds, forwards or in reverse, isolating fragments and superimposing them. This was *musique concrète* -- concrete music as opposed to music made by putting notes on paper -- and by the early 1950s Schaeffer had attracted around him a group of young musicians keen to know more, including Messiaen and his pupils Boulez and Stockhausen (Chanan 1995, 141).

The tape recorder and subsequent development of multitrack recording simply allowed for a greater degree of manipulation and more precise control of these techniques -- techniques that became the basis of *musique concrète* and *electronische musik* forms mentioned above (Théberge 1987, 121).

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between making *Revolver* and *Sgt. Pepper*, listening to Stockhausen." Steve Jones (1992) on the other hand asks, "Did pop absorb avant garde techniques, or did the avant garde move into the mainstream?" (Jones 1992, 183, fn. 2) He notes that the particularities of this process are less important than the fact that the studio techniques of the avant garde had now become the basis of pop recording (Jones 1992, 183, fn. 2).

Similarly, while *Sgt. Pepper,* for example, could not have been made without a multitrack tape recorder, the practice of creating within and specifically for the recording medium as opposed to performance, pre-dates the particular technology involved. In this way, "the technical devices themselves and the practices that evolved for their use were purposefully organized in order to meet the specific aesthetic needs that had been developed during the earlier period of modernism in music" (Théberge 1987, 77).

The second important point regarding the emergence of multitrack recording methods therefore concerns the creative nature of the relationship between the technical devices and musical practice. In effect, the technical devices of recording were both organized around aesthetic needs and became the basic creative tools of popular music. Described as "technological rationalization," this process is "at the heart of multitrack recording" (Théberge 1987, 120).

As a particular set of technological practices (Théberge 1987, 121), multitrack recording brought the physical dimensions of sound under direct control of the recordist. The parameters of sound, now embodied in the technology, were transformed into artistic elements at his or her disposal: technical choices became creative acts, not merely corrective measures.[43]

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[43] Even the most seemingly technical processes such as noise or distortion could gain "creative" status through experimentation: "you could begin to experiment at the very

The implications of this approach to recording are manifold. On one level, the studio came to be seen as "a huge musical instrument" (Chanan 1995, 144) or compositional tool, while on another level, the site of the creative process had begun to reside more significantly within the recording technology itself as "music-making came to be much more fully integrated with electronic technology as a means of production" (Théberge 1987, 3-4).

In this way, not only musical form but the overall circumstances of musical production had been altered, resulting in a set of creative relationships through which musical practice and technological innovation were now directly linked. As was demonstrated in chapter 2, the application of these devices in musical practice is a crucial determining factor in the "fate" of technological inventions, especially when directed by marketing definitions as opposed to responding directly to established practices.[44] However, the consequences of this mode of production most relevant to

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deepest levels, such as German engineer Connie Plank used to. He would question just about every aspect of recording and consider how else it might be done" (Brian Eno, quoted in Afsari 1993, 148).

[44] For example, certain pre-programmed effects like the flange are a response to a phasing technique whereby the recordist would slow down the feed reel on the tape recorder by placing his thumb on the flange. Derived from studio practices of the mid-sixties, this effect can now be achieved using digital effects units built directly into synthesizers (Eargle 1980, 262, Théberge 1993, 278).

this chapter concern the very "conceptualization of musical practice."

As the technologies of multitrack recording expanded the range of sonic resources, both in terms of individual sounds and their arrangement, musicians were "able to engage in the micro-phenomena of musical sound itself" (Théberge 1993, 247) such that the sound of a recording became its identifying characteristic (Jones 1992, 12). That "sound" comprised such an important element in popular music has been described as "the primary impact of recording technology" (Jones 1992, 12). It is within this practical context that QSound's development occurred and in which the spatial properties of sound developed as artistic/musical elements in recorded music.

A detailed discussion of sound as a conceptual category in music would take us outside the bounds of the study at hand, however, what I would like to focus on now are spatial properties as a particular aspect of musical "sound," and the role of "three-dimensional sound localization" in recorded music.

Space in recording

The role of space -- stereo location in particular -- in recorded music is curious because despite its consideration as a "technical" factor in the "preservation of spatial

orientations" (Snyder 1953, 176), as a parameter of sound,[45] it functions equally as a musical element unique to the electronic reproduction of music. Prior to the development of stereo techniques

> the spatial properties of sound [had] traditionally not been used in musical contexts. The only exceptions are the location effects of antiphonal ensembles of certain Renaissance and early twentieth-century musics, and the effect of the movement of the sound source found in certain drama-related works of the nineteenth century (Moylan 1992, 47).

Any recording thus always possesses its own unique spatial configuration, regardless of whether it is understood as a documentation of a live sound event, or a piece of music composed entirely for and within the recording medium. Even the early stereo recordings of live performances, where stereo location referred to the left-right configuration of an orchestral arrangement,[46] assumed their own particular character (Chanan 1995, 133). At first, these were perceived as "gimmicky," largely due to the fact that "few of them were

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[45] Moylan (1992) outlines five parameters of sound: pitch, loudness, duration, timbre, and space. Each of these are translated into artistic elements through the recording process and include various dimensions. E.g., melody and chords are two elements related to pitch; tempo and rhythm are related to duration; stereo location, imaging and environmental characteristics are related to space (Moylan 1992, 13-51).

[46] Stereo microphone techniques were aimed at reproducing the environmental characteristics of the live performance as well.

produced to display the less spectacular but far more important virtues of stereophony: a sense of realism, depth and spaciousness" (Schike 1974, 151). The result was what many referred to as "ping pong" records -- sound separated into the extreme left and right positions, leaving a "hole" in the space between the speakers.[47] In either case -- as "gimmick" or "naturalism" -- the perception of space in the audio recording remained distinct from the perception of space of the sound source in a physical environment (Moylan 1992, 26).

While the first stereo recordings were nonetheless conceived of as an attempt to produce a greater sense of realism,[48] the establishment of stereo as a recording standard in 1958 coincided with the emergence of multitrack recording. With the development of stereo panpots, stereo separation served to further stimulate the experimental trends in multitrack recording, resulting in the "craze for stereo separation" (Schike 1974, 156).

In effect, stereo location and spatial properties in

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[47] These qualities were largely the result of a conflict between the technical and sales departments of the equipment manufacturers who believed that the public wanted the gimmick of stereo on the one hand, and certain pioneering producers and musicians who were concerned with the less dramatic effects but those which resulted in a greater sense of realism (Chanan 1995, 133-134). This discrepancy in aesthetic values is not unlike the QSound experience described in chapter 2.

[48] Preserving the spatial orientation of a sound event was clearly understood as one of the requirements for "crossing the sharply defined line from high fidelity to facsimile" (Snyder 1953, 176).

general became a specific site of experimentation in popular music. But as mentioned above, these followed prior explorations, particularly in the *electronische musik* movements, which took spatial dimensions to extremes. For example, the veteran avant garde composer Edgar Varèse created a work to be played at the 1958 Brussels World Exhibition in a space designed by Le Corbusier and equipped with 350 loudspeakers (Chanan 1995, 142).[49] In popular music, the use of stereo location was less dramatic, with the exception of certain bands that were recognized as being more "experimental," e.g., the Steve Miller Band, Pink Floyd and Jimi Hendrix (Chanan 1995, 143).

What is important to note here is that stereo recording techniques themselves did not render space a creative or structural element in music, rather their development was part of the process of technological rationalization described above, where stereo location functioned equally in the service of the aesthetic needs of the earlier avant garde practices as it did an extension of fidelity. The early experiments carried out by Bell Labs using microphone techniques were theoretically linked to the reproduction of an entire sound environment, whereas stereo separation techniques were a direct outcome of the multitrack process which was, by nature,

[49] The piece was commissioned by the Dutch firm Philips, to be played in their pavilion at the Exhibition (Chanan 1995, 142).

constructive.[50]

In this sense, the development of the stereo panpot was a significant contributing factor in the "shift in recording aesthetics away from the 'realistic' documentation of a musical event to the creation of one" (Théberge 1987, 133). In terms of stereo location, with no live referent, this involved the establishment of mixing conventions for the spatial configuration of the band and the performance space (Theberge 1987, 121), which became the stereo field paradigm.[51]

Space has thus become one of the many parameters of sound that have become recognized as creative/structural elements in the production of various -- natural and unnatural -- environments (Moylan 1992, 129), or what has increasingly been termed "soundscapes." And despite the different conventional mixing practices that have developed, "the number and types of roles that spatial location may play in communicating a musical idea have yet to be exhausted or defined" (Moylan 1992, 47). Experiments with extending stereo's capacities has thus always been accompanied by aesthetic questions, whether

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[50] Stereo microphone techniques are in general regarded as more "natural" techniques (Pennycook 1994, personal interview).

[51] Brian Eno describes the "stereo field" as being set up "as if it were a picture to scan, with things on the left, over in the corner, in the middle, and so on. This was really for lack of any other paradigm to work from" (Eno, quoted in Afsari 1993, 149). For further details on the spatial configuration of the stereo field, see Théberge 1987, 121-135.

working within the traditional stereo field[52] and even more so when expanding the "sound canvas" as in the case of quadraphonic sound and "three-dimensional" audio like QSound.

Furthermore, it has been particularly in the case of the latter that listening practices are simultaneously challenged in terms of the listener's physical relationship to the soundfield. In the case of quadraphonic sound this involved "the listener's becoming accustomed to fixing himself in the centre of his 'quad' room..." (Schike 1974, 168). Where the musical ensemble was staged by dividing primary sound among the four speakers, this changed the listener's relationship to the music entirely by placing him or her literally in the middle of a band.

With QSound, the aim was to expand the stereo image and make sounds "jump from speakers and swirl about the room" (Jacobson 1992, 77). However, applied to the mixing conventions of popular music, its effects, while fascinating to listeners and recordists alike, were often perceived as unwanted "distortion," and in some cases undesirable "clarity." On a purely aesthetic level, QSound was considered "not something you'd necessarily enjoy for all kinds of music"

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[52] E.g., an article in *Mix* magazine on sound design describes methods for manipulating the stereo image "dynamically," by exploiting panning techniques on a note-by-note basis such that the resulting mix sounds more "alive." The article includes a warning by the author in which he recounts a mixing experiment where "every sound was dynamically panned. He could only listen to it after taking Dramamine" (Marans 1990, 110).

(Yale 1995, personal interview), and as a critic, I would have to agree. In the next section I will attempt to describe my impressions of several QSound recordings as a discussion on the role three-dimensional sound technology plays in *music*.

QSound Recordings

My personal impressions of QSound recordings varied from one recording to the next as well as from one set of listening circumstances to the next. My first experience involved listening to Madonna's *Immaculate Collection* CD on a ghetto blaster -- apparently one of the better listening venues for QSound and the one used for its now infamous demos. Without being able to compare the songs side by side with stereo recordings it was difficult to measure and assess the factors responsible for their quality.

Later, I listened to a cassette that contained both a QSound mix and stereo mix of Madonna's "Justify My Love," back to back. I did feel convinced of a deeper, richer sound but as far as width and height were concerned I felt I was stretching my own imagination to expand the sound. My stereo set-up did not perfectly match the ideal QSound listening conditions, but I felt satisfied that the stereo recording that followed sounded flatter and smaller, and somehow constituted a "lesser" sound experience.

Eventually I was able to listen to one of the later

QSound demo tapes in a professional recording studio under ideal circumstances. The tape contains an assortment of musical productions and advertising jingles as well as QSound's own promotional piece ("The Voice of God") that was created specifically to demonstrate its features. I was truly impressed, yet ambivalent with regards to the appeal of the individual recordings' sound. There is no doubt that it produces a sound image that extends beyond the bounds of stereo, but whereas in most cases the effect was definitely "spectacular," it was not always "better," and in some cases I found it downright annoying.

Madonna's "Like a Prayer" QSound recording stuck out like a sore thumb when played after the stereo version. It was the one case where I definitely did not like what the QSound mix did to the music. As promised by the hype, the higher pitched sounds seemed to zip out of some "imaginary" speakers off to the side and into my ears like irritating mosquitos which I felt compelled to swat away from my head. Madonna sounded like she was singing from inside a tunnel in the distance, and, as a whole, the sound image appeared shattered, somewhat "tinny," and invasive, with no sense of musical coherence. This was "sonic fragmentation" taken to the extreme.[53]

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[53] In Théberge (1987) stereo separation techniques are contrasted with the sonic blend characteristic of earlier high fidelity recording aesthetics. This sonic fragmentation which is "characteristic of multitrack recordings can be regarded as both a result, and a reflection of, the spatial separation and isolation of the musicians in the rationally planned, acoustically dead environment of the studio" (Theberge 1987,

There was on the other hand, a quality of "liveness" to the sound but this was one of the features I found unappealing. In terms of an "original event" (Wurtzler, 89), "Like A Prayer" is a recorded, not live, piece of music and is a perfect example of music produced for the recording medium as opposed to live performance. Furthermore, not only was I already familiar with "Like A Prayer"'s stereo sound but the song was not composed or originally mixed with QSound techniques in mind; two factors that contributed to my sense of "disturbance."

What made the assessment of "Like A Prayer" even more confusing was comparing the QSound demo tape version with the QSound version on *The Immaculate Collection* CD, which is a whole different mix. They were also mixed by two different recordists, Bob Clearmountain having mixed the demo tape version, and Shep Pettibone responsible for the entire *Immaculate Collection* CD. Most of the *Immaculate Collection* songs are re-mixes of previous versions found on other CDs, such that QSound is but one and not necessarily the crucial variable.

Similarly, the stereo and QSound mixes on the "Justify My Love" single cassette are also two totally different mixes. While overall sound quality may distinguish the two, as musical/creative works they were difficult to compare on the basis of their sound alone. In other words, it was difficult

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to discern the specific role of the changes in the spatial properties in the QSound recording in shaping and defining the character of the new sound.

"Cherish" was one track on the *Immaculate Collection* CD where there was a noticeable difference, but one I would consider more sophisticated; it sounded less gimmicky and more like an improvement in terms of overall sound quality. It did not change the nature of the music or disrupt its structure as a whole the way it did in "Like A Prayer," rather, it gave it an overall wider and richer -- bigger -- and clearer sound. I found it a good example of "enhanced stereo" but would certainly not consider it "three-dimensional."

In a similar way, the Julian Lennon recordings on the demo tape were, in my opinion, not drastically different from each other, however, in this case, it was due to the stereo mix appearing to be relatively wide to begin with. Therefore, what QSound added in the way of "spread" appeared less than in other recordings. Interestingly, while discussing this particular track with a professional recording engineer, he claimed this was one of the more spectacular recordings and that during the opening sounds of a creaking ship on the water, "you were *in* the boat!"[54]

In these last two cases, it appears that the sound mixer

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[54] As an example of just how subjective listening can be, I listened to that particular recording at least ten times before I realized that the sounds were, in fact, that of a boat. Up until then, I thought I was standing in a battlefield listening to distant gunfire.

was altering the soundfield as a whole, rather than playing around with primary sound, or "pinpoint imaging." In the case of Madonna's re-mixes in particular, it would seem appropriate to *not* attempt to reconceptualize the music to the point of disrupting listener's expectations, but rather to employ more subtle, less theatrical techniques.

In complete contrast, the advertising jingles on the demo tape employed the more extreme techniques of QSound, but in a way that contributed to the meaning of the sound in a positive way.

The QSound mixes were strikingly different from the stereo recordings but, at the same time, less unsettling. The IMAX piece in particular created a very wide image and was the one case were I found myself instinctively looking around for extra speakers. I noticed similar effects as in "Like A Prayer" but the associations I made with the overall sound did not feel contradictory or disturbing in relation to what I thought I should be hearing, rather they were appropriately impressive. On a conceptual level, the sound corresponded to the spaciousness of a large theatre environment and, more importantly, the piece was specifically about spectacularity and it stood out.

As an advertising jingle, gaining the listener's attention through a dramatic effect or a sense of disturbance is more appropriate. In reference to the Aphex Aural Exciter, a signal processing device which added a "'gloss' or 'sparkle'

to an individual sound or mix," one recordist commented, "particularly in the world of advertising, anything you can do to make your sound track 'jump out of the clutter', is a good thing. We felt a liberal amount of this effect helped achieve that goal" (Convery 1995, personal interview).

But this approach of manipulating the spatial properties of music (as opposed to sound tracks for film or television) to such degrees is still controversial. Among certain adherents to classical music recording methods in particular, this was a heartfelt philosophical issue, where QSound was considered a cheap gimmick that produced an "unnatural sound" (Pennycook 1994, personal interview). On the other hand, within popular music practices, it is generally accepted that the sound stage, or the perceived environment can be "otherwordly" or "surreal" (Moylan 1992, 93), but how these particular qualities shape or contribute to the quality of the music and what kind of meanings they produce is highly subjective.

With one or two exceptions, most musicians and recordists I spoke to agreed that it depends largely on the particular piece of music. The most common opinion remained that it "just depends on what you want to do," and that QSound did not lend itself to all kinds of music:

> My impression of these 3-D devices like QSound is that you're screwing around with the sound in extreme ways just because there's some button or switch that let's you do it. But it doesn't necessarily mean it makes the music better. I heard

> someone in a studio once playing around with 3-D sound and I just thought it sounded weird. I can see why Pink Floyd may like it, they're music is kind of weird that way, so it makes sense. But for me, a good mix is usually not that dramatic, like, it doesn't mean making sounds come from weird places (Gangi 1994, personal interview).

In another case, producer Richard James Burgess who worked on the debut album by Praise in 1992 felt that

> the music was perfect for it: ethereal, filmic and spacious, with lots of unusual sounds and long reverbs. I consciously used the system in subtle ways because I didn't want the effect to be gimmicky, but you can still really hear the difference in A-B tests... (Burgess, quoted in Allison 1992).

Thus, even under ideal circumstances (listening from the sweet spot), QSound's "three-dimensional" process was not considered a universally appealing aspect of musical sound. And because it was capable of adding musical ideas and changing the quality of the music altogether rather than simply making it sound more "live," it was considered more as a genre-specific "sound effect" (Van Clute 1995) used in music where the exploitation of spatial location and spatial properties in general would be relevant.

Consequently, as a particular genre, "ambient" music[55]

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[55] Initially "invented" in the 1970s by Brian Eno, what he refers to as "immersive music" was the result of an exploration into "the possibilities of unobtrusive music which could interact with its environment." The "unobtrusive" element has reportedly been replaced by "out-and-out weirdness" (Q Magazine 1995, 97).

has thus far been deemed a more appropriate context for its application because of the primary role played by space (*Q* Magazine 1995, 97) and the conscious effort to attain "unnatural" spatial relationships. Ambient music is described as

> consist[ing] of layered found sounds, simple snatches of melody, sparing, plangent chord arrangements, train noises and so on, deployed to create a sense of space first and a memorable tune last...In short, all the long bits of [Pink Floyd's] *Dark Side of the Moon* only with more advanced effects" (*Q* Magazine 1995, 97).

What is interesting about ambient music is that as a "sub-genre" of club music, although it is characterized by its spatial qualities, it is nonetheless compared to other types of club music on the basis of its beats-per-minute, (where it is measured as having "no discernable beat" (*Q* Magazine 1995, 100)). In this sense, the acoustic parameters that characterize any genre of music are somewhat interchangeable[56] in terms of their musical value; that is, spatial properties are more or less important than other parameters, like duration, or "beats-per-minute" for example, depending on the type of music and its defining compositional elements.

What is significant here is that in addition to

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[56] This was the situation in *electronische musik* where the various parameters of sound are said to "lose their identity" and "become interchangeable as individual bits of objectified mathematical logic" (Théberge 1987, 111).

illustrating "the link between 'sound' and musical genre"[57] this "fragmentation of the sound materials" (i.e., stereo location, melody, rhythm, etc.,) is now technically expressed in the overall technical infrastructure of the recording process (Théberge 1987, 112-113) as it is organized in the Digidesign Pro Tools system discussed in previous chapters. With such a system,

> music becomes elastic. Disk-based files offer random accessibility, allowing producers to move and add *musical elements* with much greater ease (Garner 1995, 50).

All musical elements are reduced to the "same set of technical procedures" (Théberge 1987, p. 94) and exist as "interchangeable" plug-in files: space in terms of sound location is therefore not universally of primary importance because it is no longer simply a measure of fidelity, nor is fidelity or realism a primary recording goal or even a meaningful concept under these conditions.

Summary and Conclusions

As recording has become an integral part of the creative process of music-making the role of space has changed from its original conception as a factor in achieving "fidelity" to a live sound source, to becoming a musical element unto itself.

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[57] A similar connection exists with rap music, for example (Théberge 1992, 259-262).

I have tried to suggest therefore, that for music, the idea of three-dimensional recording is not simply an extension of the "fidelity" continuum but rather the result of what has become the very expanded and complex realm of multitrack recording processes and the expanded range of philosophies of recording that include more than "documentation" as a goal.

The variety of signal processing and mixing techniques available have become so vast that three-dimensional imaging, even under ideal circumstances, is not necessarily a major or desired leap from stereo imaging, the techniques for which are arguably still being explored and developed. With the changes in the overall recording process, the catalogue of musical/artistic elements available in the recording process has become so vast that sound localization techniques, more commonly called spatial processing, may not be distinct enough to constitute a new or different enough experience to merit the status of "recording standard" that "replaces stereo." In other words, among such a vast array of techniques and effects, "three-dimensional sound" loses its margin of difference in terms of its identity or value as a musical element. In practice, it becomes another sound effect, now available to a recordist in the form of a software plug-in.

Thus what is often described as the "transition from mono to stereo" obscures the defining characteristics of the recording practices and musical forms that have evolved, which

are more rooted in multitrack processes than in stereo recording per se. Effectively, the continuum of "fidelity" or "concert hall realism" has been supplemented, if not surpassed, by a more complex, multifaceted network of recording goals and practices with which new recording technologies must interact.

Conclusion

The shift in QSound's focus on developing its pro-audio technology as a proprietary hardware/software unit toward designing software that works in conjunction with other manufacturer's hardware systems has been examined to reveal certain dynamics and key elements in the process of technological innovation in the recording industry. More specifically, the case study has intended to serve as an exemplary account of the intersection of developments in music technology with musical practice, based on the premise that successful innovation requires a correlation between an invention and its associated practice as it is defined in musical culture, or by "conditions of music."

Because of the market context of innovation, the relationship between these two spheres is in effect largely negotiated through the marketing process. But as was argued in the thesis, regardless of the aesthetic motivations driving its inventors, QSound's initial marketing strategy was based primarily on generating hype around its "spectacular" and "mysterious" sound effects, which were aimed more at gaining the support of the financial community and justifying its cost than establishing a meaningful relationship with musical practice.

Marketed specifically as a mixing device, when put in the hands of recordists, its market definition as a standard

production tool was not easily translated into recording practices. In addition to technical and economic concerns, a certain amount of confusion and conflict around its aesthetic purpose arose and it was generally considered more of an optional or "special" effect appropriate for only certain genres of music and listening contexts where a disruption or expansion of the traditional stereo field was perceptible and more importantly, considered meaningful. Its change in form to software module reflected its acquired aesthetic status as an "interchangeable" musical element in the digital studio.

The discrepancy between marketing definitions and actual use is interesting and not uncommon throughout the history of new music technologies. Certain attempts by manufacturers to demonstrate the potential of and draw attention to their equipment can in fact simultaneously be detrimental to their acceptance. From the first appearance of the phonograph[58] to more recent developments in signal processing devices, gaining the attention of their markets has involved the risk of confusing their value as a "novelty" or "gimmick" with that of a useful and appealing contribution to music since the latter may often entail more subtle and less radically noticeable

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[58] Schicke (1974) describes the early history of the phonograph where its function as a musical device had to be decided after it was initially perceived as a "toy" or "vaudeville diversion" (Schicke 1974, 18).

applications.[59]

For QSound, this was a particularly tough balancing act and one the company was very aware of. The cheaper video game technology -- a PC computer-card costing a few dollars -- was already available at the time QSound was introducing its pro audio system, but apparently the company wanted to introduce the technology through the QSystem "because of concern that if introduced on video games, it would become known as a gimmick associated with video games" (Kerlin 1989, 5). Interested in maintaining its status as a universal recording standard, this may also explain why the company held such tight control over its use by recordists.

The whole first phase of the QSound experience, under the direction of Larry Ryckman, is generally recognized as one huge marketing catastrophe both by current members of the company and the recording industry at large. But, as was mentioned in the introduction, if indeed a stock-market ploy, introducing the technology on major artists' recordings was most effective as far as fuelling the PR machine for the stock: the celebrity of the artists who used the QSystem, like

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[59] In his article, "The Architectonic Object: Stereo Sound, Cinema and *Colors*," Philip Brophy considers the film *Colors* as carrying the best use of the Spectral recording process in contrast to other films that "feature sound designs based on the creation of a dimensional cacophony into which the viewer/listener is fantastically projected. They do not demonstrate the same sophisticated 'psycho-diegetic' sensibility in their mixing..." His concern is with how the applications of technological processes contribute to the text in either a positive or negative way (Brophy 1992, 94).

Madonna, Sting, Paula Abdul, Julian Lennon and Paul McCartney, played an important part in its promotion. In one sense, as the first *technology* to be represented by the Creative Artists Agency in Hollywood, marketing QSound was not unlike promoting a pop star. The problem was however, that it focused more on "celebrityship" than on how it contributed to musical value.

Viewed in this way, the fact that management chose to initially market the technology as a recording tool as opposed to a consumer technology is quite significant. On the one hand it provided the best opportunity for publicity, but on the other, it made establishing the connection between the invention -- its high cost and complexity -- and its use, a much greater challenge.[60]

Thus while considered largely a result of unwise business decisions and major changes in recording technology overall, the aesthetic issues concerning three-dimensional sound and music are equally important in understanding the significance of the shifts in QSound's directions and most importantly in

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[60] This contrasts the approach taken by one of QSound's competitors, Spatializer Audio Laboratories, Inc. (currently being sued by QSound Inc. for patent infringement (Ingram, Globe & Mail, 29 August 1995, p. unknown)) Having made similar promotional announcements around Spatializer's use on Michael Jackson's latest album, *HIStory*, in *The Lion King* and *Crimson Tide*, they have marketed their three-dimensional technology to stereo and other consumer electronics manufacturers as an extra feature in their products. Rather than actually recording in "three-dimensions," music is "filtered" through the processor on the consumer end.

what they reveal about the parameters of contemporary musical culture.

Many speculations exist regarding the future of music and recording in general, but they remain, for the most part, speculation. It is difficult to assess what exactly would constitute a "major redirection for music" and in terms of new technologies, according to Durant, the only signs of such a situation has been in the "generic innovations implied by sampled musical collages" (Durant 1992, 187) -- a practice unrelated to the spatial parameters of sound.

In this sense, "three-dimensional" sound is only one aspect of the "revolutionary" possibilities for music and one that is not necessarily all that significant in established musical culture. More significant changes seem to involve the technical integration of music and video technologies and the emergence of entirely new contexts for musical production, consumption and distribution. New musical texts like the music video and interactive CD-ROM, for example, involve new "forms of delivery" -- the television and the personal computer -- from where three-dimensional sound is more likely to emerge as an audio standard than from within the musical practice per se. But even music's relationship with these media formats is still questionable in terms of how they "add value to the musical experience" (Meyer, 31). Overall, the technical infrastructures around which musical culture and all forms of communication are organized are in such flux it is difficult

to predict the next "paradigm of musical sense." Following Durant, we can only say that for the time being, the question remains "unresolved."

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