Consumers of Technology:
Musical Instrument Innovations and the Musicians' Market

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ABSTRACT

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Since the early 1980s, microprocessor-based technologies (e.g., digital synthesizers, samplers and sequencers) have had an enormous impact on the ways in which popular music is produced. This study is about the industries that supply these technologies, the media that promote them, and the meanings that they have for the musicians who use them; more broadly, the thesis is concerned with the relationships between technical innovation, musical production and consumption. The dissertation begins by developing a broad historical perspective on the musical instrument industry (especially the organization of the piano and electronic keyboard sectors) and the problems of technical innovation and marketing. It is argued that with the shift to digital technologies, not only has the technical basis of musical instrument design changed but the organizational structure and marketing strategies of the instrument industry have also been transformed. The rise of third-party sound developers and MIDI (Musical Instrument Digital Interface) are regarded as key elements within this transformation.

In the second part, the history of music periodical publishing is discussed and an emphasis is placed on the role of publishing in the construction of markets for musical products; the focus on the home as a particular site of music-making and consumption, constructed along lines of gender, is considered. The increasing specialization of magazine publishing, the role of magazines within the marketing apparatus of instrument manufac-

turers, and the more recent formation of so-called "user groups" and computer networks, with their rhetoric of "democratic" participation, are critiqued.

Finally, the role of musical instruments, notation and sound recording in the formation of the concepts and practices of music-making are analyzed. It is argued that the adoption of digital technologies (including a wide range of prefabricated sound materials) in popular music production has been accompanied by a fundamental change in the concept of musical sound and the relationship between performance and recording. Furthermore, a new kind of consumer practice now appears to lie at the very heart of musical production in the digital studio; the recognition of this phenomenon poses a challenge to conventional notions of production and consumption.

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Introduction

Chapter 1:

Technology, Consumption and Musical Practice

> The history of twentieth-century popular music is impossible to write without reference to the changing forces of production, electronics, the use of recording, amplification and synthesizers, just as consumer choices cannot be separated from the possession of transistor radios, stereo hi-fis, ghetto blasters and Walkmen. (Frith 1987: 135)

An acknowledgement of the determining role played by technology in popular music culture appears to have become part of the "sociological common sense of rock criticism" (Ibid.). But common sense, while it may acknowledge the existence of certain phenomena, often leaves much unexamined: how musicians and audiences make the choices they make, how the music comes to sound the way it sounds, and the ultimate significance of technology in such processes, are still not well understood.

The present dissertation is about the role of recent digital technologies in the production of popular music; but more than this, it is about the industries that supply these technologies, the media that promote them, and the meanings that they have for the musicians who use them. In this sense, the dissertation is not only about the impact of high technology[1] within a particular field but about technology as a specific type of consumer product and technology as part of the broader phenomenon of consumerism in the late twentieth century. A broad examination of the dynamic interplay that exists between technology and contemporary modes of production, distribution and consump-

[1] Throughout the thesis I use the term "technology" in its broadest sense: i.e., not simply to refer to machines, but more importantly, as in the case of the term "technique," to also comprise the training and discipline of labour and the organization of means.

tion, and how these factors have become an integral part of contemporary music-making, is thus a central concern of the thesis as a whole.

The key case material for this study is drawn from the 1970s and '80s when microprocessor technologies were first introduced into the design of electronic keyboard instruments. The period between 1983 and 1988 is of particular interest here because, with the advent of the MIDI (Musical Instrument Digital Interface) specification, both the marketplace and the very nature of electronic music production were completely reorganized. This particular moment marks not only a significant period of innovation in the design, marketing and use of electronic musical instruments but also, I will argue, a watershed moment in the history of popular music as regards the very relationship between production and consumption.

However, during the summer and fall of 1992, as I attempted to pull my research together and put it into its final form, it appeared that another wave of technical innovation was just beginning, the contours of which seemed strikingly familiar. Two events--the introduction of a new product by the Alesis Corporation and the demise of a company known as New England Digital--appeared to be important signs of such a development: the former seemed like an indication of things to come, and the latter, a sign of the end of an era. But more importantly, these events struck me as being symptomatic of the process of innovations in music technology that I had been studying and I would like to discuss them here, if only briefly, as a means of introducing a number of themes that will be important in the chapters that follow.

Both events were greeted in the trade and consumer press with a certain surprise, even dismay:

> I'm not sure whether this is a review of a product or a phenomenon, as no device in the recent history of professional audio has created such controversy, speculation and conjecture as the Alesis ADAT...the long-awaited

> system uses a modular approach to digital multitrack recording, at a price that's comparable to the least expensive pro analog decks available.
> The repercussions are far-reaching indeed.
> (George Peterson in *Mix* 16 (10), October 1992, p. 180)

> New England Digital is out of business. The New Hampshire-based company, whose Synclavier systems defined current trends in digital hard-disk recording, ceased to exist on July 1, 1992....
> ...'The 300 people who use the Synclavier every day, and the other 700 people who own one, are basically fucked and far from home.'
> (Robert L. Doerschuk & Shelton Leigh Palmer in *Keyboard* 18 (10), October 1992, p. 40-41)

In certain respects, it could be argued that these two events were precipitated by the development of MIDI during the 1980s. On the one hand, the Alesis Corporation owes its very existence to MIDI and microprocessors: founded in 1985, it established itself as a bold, market-driven company that rode the crest of the MIDI wave with a series of innovative, low-cost products--drum machines, MIDI sequencers and digital reverbs--aimed at the broadest possible market of professional and amateur musicians; by 1989, Alesis had become one of the top-20 musical instrument suppliers in the U.S.[2] Their decision to develop the ADAT was a move that was both consistent with their previous successes in the marketplace (I will discuss this further below) but also a gamble insofar as it brought them into a new area of technology (multitrack digital audio) and, equally important, into potential conflict with a group of already well-established competitors.

New England Digital (NED), on the other hand, was founded during the early 1970s by composer Jon Appleton and engineers Sydney Alonso and Cameron Jones; in this regard, the company was initially an outgrowth of the kind of collaboration between

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[2] For a discussion of Alesis' market philosophy and strategic planning, see "Newsmaker: Alesis' Russell Palmer," *Musical Merchandise Review* 149 (7), July 1990, 46-51.

academic composers and entrepreneurial engineers that was typical of the early years of electronic synthesizer development during the 1960s and '70s. NED produced the first fully digital synthesizer, the Synclavier, in 1976 and went on to become a leader in audio, film and video post-production systems. Unlike Alesis however, NED's product development strategy was aimed resolutely at the "high-end" user: early systems were priced at approximately $50,000., and by the late '80s, a fully-equipped post-production system could cost close to $500,000. Thus, NED represented the opposite pole of the music instrument and audio industry market, one populated exclusively by superstar recording artists (e.g., Sting, Frank Zappa and Stevie Wonder), professional studios, and Hollywood post-production facilities (in fact, because of the costs involved, the Synclavier was never even sold through music retailers at all; it was only available through a small network of company sales representatives and independent dealers).

But with the introduction of inexpensive digital synthesizers, samplers, and MIDI sequencers during the mid-1980s and, more recently, the advent of PC-based digital recording and editing systems, the capabilities (if not the sound quality and integration) of the Synclavier could be had at a fraction of the cost. Incapable of, or unwilling to produce product innovations for the mass market, it was perhaps inevitable that NED would eventually succumb to the market forces unleashed by MIDI and microprocessor technology, as did its early competitor in the high-end digital synthesizer market, the Fairlight company of Australia (which also later reformed in order to produce systems for audio post-production). Indeed, with the closure of NED in July of 1992, it could be argued that there no longer exists a "high-end" in digital synthesizer technology; MIDI technology (and the consumer market that it represents) is, for the moment at least, triumphant.

And it is precisely this kind of volatility in the electronic instrument and audio industries that makes the introduction of the Alesis ADAT appear to have such far-reaching implications: the ADAT is the first concrete realization of what many in the music instru-

ment industry have long been predicting as the coming "revolution" in consumer hardware for musicians in the 1990s; it appears poised to do for the world of digital audio what the introduction of low-cost microprocessor technology and MIDI did for the world of synthesizers during the 1980s.

Alesis is certainly not unaware of such predictions within the industry and it has helped to fuel those very sentiments by promoting the ADAT as more than just a product. Indeed, everything about the ADAT appears to have been planned in such a way that it had become something of a "phenomenon" in the minds of consumers and industry observers alike, even before it had achieved concrete form as a product. And to achieve this status of product-as-phenomenon, Alesis has drawn on all the market strategies and promotional rhetorics commonly utilized within the electronics industries throughout the 1980s.

Firstly, the ADAT was announced with great fanfare in January of 1991 at the National Association of Music Merchants (NAMM) winter trade show held in Anaheim, California, the largest industry gathering of its kind in North America. Although the device itself was not scheduled for release until December of 1991, advertisements and product brochures touting the capabilities of the new recorder began to appear almost immediately. When not only December had passed, but even the winter and spring months of 1992, and the ADAT was still not ready for commercial release, local retailers (in Montréal and elsewhere) began to speak of the ADAT as little more than "vaporware." While such talk had the potential for seriously damaging the reputation of Alesis in the marketplace, it was clear that the "controversy, speculation and conjecture" caused by both the pre-release publicity and the subsequent design and manufacturing delays had created an undeniable "buzz" within the industry.

When the ADAT was finally ready for release, advance units were sent to reviewers and testers in what must have been one of the most coordinated promotional efforts seen within the industry in recent years. In the fall of 1992, virtually every special-interest

magazine devoted to producers, recording engineers, and so-called "electronic musicians," carried detailed reviews of the ADAT: in the UK, *Music Technology* and *Recording Musician* (September issues) and, in North America, *Electronic Musician* and *Mix* (October issues), and *Keyboard* (November issue), all carried feature articles proclaiming the ADAT as an almost unqualified success. Alesis' strategy of advance promotion and the (only partially planned) long delays in releasing the device had paid off: the majority of the reviews were not merely generous in their praise of the ADAT, they were positively, and somewhat uncharacteristically, effusive (one magazine editor even felt it necessary to offer a mock apology for the unabashed enthusiasm of the review).

The design and pricing of the ADAT itself left no doubt in anyone's mind concerning the market for whom this product had been created: modular in concept, the basic system begins with an 8-track configuration and is expandable up to an unheard-of 128-track capability simply by adding additional units and external controllers; but it is clearly the basic 8-track system that positions this product for the semi-professional and amateur home recording market. At about the same time that professional studios were establishing 24-track recording as the norm in pop music production during the 1970s, consumer 4-track equipment also began to appear. But it was not until the 1980s that the idea of the "home studio" came to the fore with inexpensive 4- and 8-track recorders (often using inexpensive audio cassettes as a storage medium) coupled with MIDI drum machines and synthesizers to form powerful production facilities at reasonable costs. Alesis had played no small part in the construction of the idea of the home studio as a viable production environment with its own line of MIDI products during the late 1980s and it is significant that the ADAT is fully compatible with MIDI synchronization standards (a feature seldom found on professional multitracks). Even the tape format chosen for the ADAT seemed geared to the home rather than the professional recording studio: instead of the standard reel-to-reel tape format familiar to studio recording, Alesis chose the most

ubiquitous home entertainment technology of the '80s--the VHS cassette--as the vehicle for its entry into the arena of digital recording (furthermore, unlike other digital tape mediums already in use, VHS has the distinct advantage of being universally available thus supporting Alesis' worldwide marketing aspirations for the ADAT).

But the promise of the ADAT extends beyond the home as well: because of its modular design, ADAT-equipped home studios are potentially compatible with more elaborate professional studios (possessing multiple ADATs) to a degree never before attainable and it is this potential that has the music press proclaiming the ADAT as "a major recording revolution in the making" (*Mix* 16 (10), October 1992, 185). For its part, Alesis has begun coining new slogans in order to promote the ideal of total compatibility and expandability: "8 Tracks to Megatracks" has become a registered trademark of the corporation. And, in a move that has become almost a marketing cliché within the computer and electronic musical instrument industries during the past decade, Alesis has announced (in a new ad campaign lauched simultaneously with the appearance of ADAT reviews in major publications) the establishment of a company-sponsored "user group" known as the ADAT Worldwide Network™, ostensibly, in order to facilitate communication between ADAT owners (not to mention direct contact with Alesis' marketing department as well):

> Imagine a network of ADAT users from bands, composers and project studios to professional studios, video editing suites and broadcast production studios. All recording master quality tracks with full compatibility and no barriers between their creative disciplines.
> (Alesis product ad, *Mix* 16 (10), October 1992, 6-7)

The idea of "no barriers" between low- and high-end users reflects a utopian rhetoric--a rhetoric based on the assumption of a "democratization" of the marketplace--that has been a typical characteristic of consumer culture throughout the twentieth century. The particular conflation of simple technical compatibility with social equality and a unified artistic

aesthetic however, has been a peculiar articulation of this rhetoric within the computer and electronic musical instrument industries during the past decade.

Certainly no single product could hope to fulfill the promises that have been made on behalf of the ADAT since it was first launched. At first glance, the ADAT simply looks like one more incompatible format within a sector of the audio industry already fraught with incompatible formats, sampling frequencies, digital communications protocols, and the like. However, in a bid to recreate the enormous success of MIDI as a *de facto* standard within the synthesizer industry during the 1980s, Alesis has recently entered into an agreement with Fostex (a leading manufacturer of consumer and semi-professional multitrack equipment) to license ADAT technology to them in the hope of establishing the format as an industry standard. The trade-off is as clear now as it was in the case of MIDI a decade earlier: risk greater competition in the hope of stabilizing the marketplace and stimulating consumer confidence.

And what of the musician in this grandiose scenario? The reality for most popular musicians in the 1990s is that a successful career in the music business is as elusive as ever (if not more so): advances in technology have not made access to recording industry executives any easier; indeed, it has made the former luxury of producing a competitive, professional-sounding demo tape a necessity. For many, the home has been transformed into a production environment: new technologies have expanded the range of activities associated with making contemporary music, placed greater demands on musicians as regards the types of knowledge required of them, and altered the very concept of "sound" itself for many popular musicians. Ironically, with everyone having at their disposal (for a price) the same powerful technologies of production, there has arisen the subtle yet persistent feeling that everyone is beginning to sound the same.

The advent of the "home studio" also highlights the degree to which sound recording, and electronic technology more generally, have become the central vehicle of

musical communication in twentieth-century culture. Since the introduction of magnetic recording during the late 1940s, it has become increasingly clear that sound recording is no longer a medium for the simple reproduction of "music;" but rather, sound recording is a mode of production which is fully integrated with the creation of music at its most fundamental level.

But what concerns me most in the present dissertation is the manner in which popular musicians have become what I will refer to as "consumers of technology." And by this expression I do not simply mean that musicians have become consumers of electronic musical instruments and recording devices as consumer objects; but rather, they have, in various ways, aligned their musical practices with a kind of behaviour which is akin to a type of consumer practice--a type of practice that is altogether different from earlier relationships between musicians and their instruments as a means of production.

The problem posed by such a thesis however begs the question of how one might conceptualize, study and interpret the relationships that exist between musical practice, technology and culture. Traditional musicology offers little assistance in this regard: the analytic study of musical technologies, sometimes referred to as "organology," is usually restricted to the simple classification of musical instruments, histories of instrument building, and accounts of the development of playing techniques; the relationship of musical instruments to musical style and genre, let alone the broader cultural significance of any given instrument or family of instruments, generally lies outside the scope of this discipline. Perhaps only in ethnomusicology has there been any systematic attempt to integrate the study of musical instruments within the overall study of music and culture but, insofar as the domain of ethnomusicology has, for the most part, been restricted to the study of the so-called "traditional" musics of non-Western cultures, little of this work can be applied in any direct way to the complex workings of contemporary industrial culture.

But the possibility of adopting musicological approaches to the study of recent technology and culture is problematic in other ways: in conventional musicology the analysis of musical style, as revealed through the detailed study of musical scores and the canonization of individual genius, have long taken precedence over the study of social processes and material culture (for a critique of the ideology of musicology, see Kerman 1985: 31-59). Most accounts of electronic music written from the perspective of the academy (e.g., Appleton & Perera 1975, Russcol 1972, Schrader 1982, Schwartz 1975) have adopted the positivistic orientation of musicology and placed an emphasis on the detailed history of relatively obscure musical inventions and the (often equally obscure) compositions of composers of the classical avant-garde that have been created with those inventions. Such accounts remain firmly within a tradition of histories of "great men" and their accomplishments in technology and art. Indeed, there is a kind of symmetry in these accounts where inventors and their machines share a certain (though subsidiary) glory with avant-garde composers and their music. In most cases, even the rigors of conventional musical analysis are eschewed in favor of discussions of technical and compositional strategy, thus placing an almost one-dimensional focus on the twin elements of technology and technique.

Furthermore, with few exceptions (most notably, the more pop-oriented histories of Holmes 1985 and Mackay 1981), the technologies and techniques of popular music have been ignored or denigrated in these histories. For example, in Schrader's *Introduction to Electro-Acoustic Music* (1982) only a single paragraph is devoted to the Hammond Organ and its inventor Laurens Hammond although, by Schrader's own admission, the instrument "has been one of the most commercially successful electro-acoustic instruments" (p. 68). The only reason for giving such brief attention to what might otherwise appear to be an important innovation in the history of electronic musical instruments is the following statement: "Although it has been widely used in popular music, the Hammond

Organ has been all but ignored by composers of art music" (Ibid.). Similarly, the adoption of synthesizer technology by popular musicians during the 1970s--a phenomenon that completely reoriented the technical design of synthesizers towards real-time performance capability--is dealt with by Schrader in three short paragraphs and a few instrument photos (indeed, the photos take up more page space than the text itself; Ibid.: 139-141). In these ways, the history of electronic instruments and music has come to be overly biased by narrow stylistic allegiances rather than openly addressed as a musical phenomenon of the broadest cultural significance.

But outside of musicology, and in popular music scholarship in particular, the technologies of sound reproduction have been regarded as playing a central role in the production and consumption of popular music, especially popular music of the post-War period. And, because of the predominantly sociological perspective of many pop music commentators, the attention given to industrial organization and structure, at least with regards to the recording and broadcast industries, has been more fully developed (see for example, Chapple & Garofalo 1977, Denisoff 1975, Frith 1981, Hirsch 1969, Peterson & Berger 1971, Wallis & Malm 1984, 1988). Strangely however, while electronics corporations such as RCA, Philips/Polygram and, more recently, Sony/CBS--companies which have a direct stake in the recording industry--have received a large amount of critical scrutiny, considerably less attention has been given to the broader spectrum of industries that produce musical instruments, sound recording technology, hi-fi equipment, and amplifiers.

Most popular music scholars have chosen, instead, to focus on either specific <u>uses</u> of technology in production and consumption (e.g., Chambers' 1985 and Hebdige's 1987 accounts of the uses of sound recording technology in Reggae and Hip-hop music) or the aesthetic and ideological conflicts arising around the introduction of new musical instruments (e.g., Frith's 1986 arguments concerning rock "authenticity" and Goodwin's 1988

account of sampling as a conflict between realist, modern and post-modern aesthetics in pop; Durant's 1990 comments on MIDI and digital technology embraces both approaches). To a certain extent, these discourses can be regarded as critical elaborations on, or critiques of, dominant concerns expressed not only in "common sense" rock sociology but also by fans and the popular music press, as well. In neither case however, has there been a sustained analysis of the social and industrial contexts in which technical innovations in music-making and instrument design take place.

But if electronic technologies do play an important role in the production and consumption of musical sounds, then a better understanding of the organization and dynamics of the musical instrument and electronics industries may offer new insights into the relationship between technology and musical practice, sound reproduction and musical style. As this statement implies however, such an understanding requires more than the study of a single industry: the musical instrument, electronics and recording industries are all more or less distinct but also linked in significant ways; differences in size, markets, pressures and competitive strategies must be taken into account without loosing sight of their complementary, and sometimes contradictory roles in the larger complex which might be referred to as the "music industries."

Theoretical Orientation & Plan of the Dissertation

The problem remains however, of how to adequately conceptualize the nature of the technical, social, economic, cultural and musical phenomena at hand. For an examination of the music instrument and electronics industries themselves, no matter how complex or richly detailed, cannot ultimately reveal the relationship of recent technical developments in musical instrument design to general social and historical conditions, on the one hand, or illuminate the specific shifts in musical practice that have been both a contribution and a

response to these developments, on the other. To this end, the present study has been conducted in a manner that is consistent, I think, both in its general orientation and with regard to a number of specific insights and theoretical approaches, with the discipline of "cultural studies" as it has emerged during the past few decades, first in Britain, and then in North America and elsewhere. The discipline itself, however, if a recently published anthology/conference proceedings is any indication, is extremely diverse in its objects of study and in its virtual "bricolage" of theories and methodologies (Grossberg, et al 1992: 2-3); it is perhaps necessary, therefore, to be more specific in identifying the manner in which I see the dissertation as falling within the general boundaries of a cultural studies approach.

In particular, I take as my point of departure some of the foundational work within the field of cultural studies as laid by Raymond Williams (1958, 1974, 1977, 1981). In his book, *Culture* (1981), Williams outlines his approach to what he calls a "sociology of culture" (see also, 1977: 136-141). For Williams, such a project is comprised of several areas of concern: these include, among others, the study of "institutions" (in the case of the present dissertation, the study of the musical instrument industry); "formations" (more or less conscious movements or associations of individuals, such as, in this instance, so-called "user groups"); the social relations of specific "means of production" (as in the case of the social relations in the multitrack recording studio); and "forms" (the analysis of musical works in terms of both their internal characteristics and in their broader social dimensions). While initially isolated for the purposes of study and analysis, Williams argues that these various areas of concern must ultimately be brought together and understood as elements in a "complex unity":

> Indeed the most basic task of the sociology of culture is analysis of the interrelationships within this complex unity: a task distinct from the reduced sociology of institutions, formations, and communicative relationships and yet, as a

> sociology, radically distinct also from the analysis of isolated forms. (Williams 1977: 139-140)

For Williams then, a sociology of culture must attempt to overcome the limitations of both conventional sociology and bourgeois aesthetics in order to understand cultural production as "a whole and connected social material process" (Ibid.: 140); as such, a sociology of culture is at once a sociological and an aesthetic enterprise.

While attempting to adopt Williams' general approach to the sociology of culture, I also want to extend one of his concepts mentioned above. Williams describes cultural "formations" as a diverse set of possible associations ranging from the medieval bardic orders and the highly organized craft guilds, to the much more loosely defined artistic "movements" or "schools" of modern art and literature. The latter may include formations represented by organizational structures based on "formal membership," less formal structures based around "collective public manifestations" (as in the case of specialized periodicals or exhibitions), or those represented by no formal, sustained relationships at all, but rather, by various temporary forms of "group identification" (Williams 1981: 57-69). Williams makes clear that the increasing number of cultural formations in the modern period is the result of shifts in market forces and, hence, the very conditions of artistic production. Furthermore, artistic or cultural formations can also be located within larger "social formations"--religious, political, or intellectual in nature--to which they may adopt, at different times, a supportive or an oppositional stance (Ibid.: 75-76). It is a variation on this more general notion of a "formation"--as a background or contextual element--that I wish to adopt here.[3]

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[3] The notion of a "formation" has actually come to be used in both a broader and a more diverse fashion, in the later writings of Williams himself (1989) and, more frequently, by other cultural theorists such as Stuart Hall and Lawrence Grossberg. For example, the term "social formation" has been used to describe a wide range of complexly structured relationships and practices--social, political, cultural and economic--within the social order at a given moment in history. In part, this expanded use of the term may be the result of

This is justified, I think, insofar as the present organization of the electronics industries (including the computer industry as well as the digital musical instrument industry) tends towards a more complete integration of cultural formations (such as "user groups" or, more loosely, so-called "electronic musicians") within their overall marketing apparatus. It is the integration of these formations with their ultimate status as a market for musical instrument manufacturers that prompts me to use the term itself in a broader, more integrative fashion to designate a wider set of relationships not only between individual musicians, but between individuals and manufacturers, especially as mediated through various means of communication, including user groups and their newsletters, computer networks, and the highly specialized sectors of the music press. While I certainly do not wish to reduce the concept of a "formation" to that of a mere "market," I do want to highlight the variable and sometimes ambiguous character of cultural formations within the present state of capitalist commodity relations.

And as noted above, this dissertation is, ultimately, a study of high technology as a commodity and the complex relationships that exist between consumption and production in contemporary (musical) culture. Indeed, Williams' focus on the "institutions," "formations," and "means" of cultural production tends to ignore the simultaneous aspects of the production-consumption process as a whole: in the thesis, I will argue that issues concerning consumption and the mass market permeate decisions made even at the design stages of instrument manufacture, underlie discourses found in magazines and user group activities, and characterize some of the most recent practices of individuals engaged in the making of contemporary popular music. The wider notion of a "formation" used here designates these three different areas of inquiry: the institutions devoted to the design,

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individuals working within the field of cultural studies during the 1970s and '80s and their attempts to integrate certain aspects of Marxist, structuralist, and post-structuralist thought into their work; see, for example, Stuart Hall (1980, 1985, 1992).

manufacture and distribution of digital musical instruments, the communications media that promote the use of new technologies and act as a source of knowledge, and the specific practices associated with the use of new technology in contemporary music-making. The task at hand then is, firstly, to understand the dynamics at play at each of these individual sites of production/consumption within the overall cultural formation and, secondly, to attempt to map out the various connections between them in order to understand the manner in which they constitute "a whole and connected material social process."

While the general approach to the present study has been influenced by the work of Raymond Williams, the three-part scheme of analysis and presentation adopted here has been derived from another proponent of cultural studies, Dick Hebdige; in particular, an extended essay entitled, "Object as Image: The Italian Scooter Cycle" (1981). In this essay, Hebdige focuses on the constantly shifting "cultural significance" of the motor scooter and its relationship to the post-war rise of consumerism. Hebdige considers the motor scooter not as a singular object but as several objects existing at distinct "moments": the "moments" of design/production, mediation (marketing and promotion), and consumption/use (Ibid.: 45). Each "moment" is independent, housed within specific structures, yet caught up in "networks of relationships" with the other two "moments" and within larger networks and contexts (in this, Hebdige's model bears much resemblance to the notion of a "formation" discussed above). Furthermore, no single "moment" can be considered as a completely "determining instance," dictating the meaning of the object at other "moments" or in other social contexts (Ibid.). For the researcher, the consideration of each individual "moment" demands its own set of theories and analytic tools while, at every point, the entire network of relationships needs to be kept firmly within view.

To a large degree, Hebdige's approach to the phenomenon of the motor scooter drew on a familiar set of tools--a combination of semiotics and subcultural analysis--that had characterized his own earlier work (1979) and that of a number of other individuals

involved in British cultural studies during the early '70s (e.g., see Hall & Jefferson 1976). But my interests here have less to do with "style" or "subcultures," *per se* (although the dissertation does touch on such issues), than with shifts in the technological basis of musical instrument design and in industrial organization; with patterns of association, apprenticeship, and the acquisition of musical knowledge; and in changes in musical practice that are both manifest in musical sounds and, others, that are not.

The breadth of study required to thoroughly investigate these various "moments" in the life of a commodity or, conversely, to trace the complex relationships of the cultural formation within which the commodity circulates, is formidable and suggests that a synchronic strategy, where only the most limited period of time is taken into consideration, be adopted. Indeed, when I first undertook my research, I fully intended to pursue such a strategy and initially set out to investigate the complex events surrounding the introduction of MIDI (Musical Instrument Digital Interface) and its impact on the digital synthesizer industry of the mid-1980s. The period between 1983 and 1988, for a variety of reasons--technical, economic, and musical--seemed to present itself as the most logical choice for such an investigation. It seemed to me, at the time, that only the most cursory account of the early synthesizer industry of the 1960s and '70s, and of recording studio production practices in popular music of the same period, would be required to make the kind of argument that I envisioned.

But while my overall thesis concerning musicians as "consumers of technology" has remained much the same since I began my research (although the scope and depth of analysis has increased considerably), the strategy and focus of the study soon began to change. In part, this was brought about by the research itself: as I studied the MIDI phenomenon more closely I began to understand it as the culmination of a certain technical development--the digitization of keyboard instruments--as well as the beginning of another--the advent of a fully computerized studio recording apparatus. To a certain extent, I had

understood this from the beginning but its full import did not strike me until my research took me into closer contact with the musical instrument industry itself, on the one hand, and until I began to consider, in greater detail, the various reactions to MIDI among musicians and the press (both positive and negative), on the other. In short, it became increasingly clear to me that the events of the 1970s and '80s, of which MIDI was only a part, took on an even greater significance when placed within the specific contexts of the history of the musical instrument and magazine trades and within the long-held traditions and conventions of musical practice.

Thus, a broad, diachronically-based program of research, in addition to the synchronic study of the more recent cultural formation, seemed to be called for. And here again, the importance of the work of Raymond Williams became evident, especially in what he has referred to as the method of "'epochal' analysis" and in his notion of the "dominant, residual and emergent" as dynamic elements within cultural processes (1977: 121-127). It is this line of reasoning that led me to perform additional historical research and to introduce each of the main sections of the dissertation with fairly lengthy and detailed accounts of the history of the musical instrument trade (and especially the development of keyboard instruments), the music press as an area of specialized periodical publishing (and, also, the rise of groups of enthusiasts in the area of communications technologies), and musical practice as a set of specific skills, techniques and knowledge in action.

The dangers inherent in such an approach are perhaps obvious enough: the plan of the dissertation is already quite large--including three distinct areas of investigation--and the addition of historical data could easily lead to the sacrificing of detail and coherence in exchange for sweeping generalizations, false comparisons, and the like. But the strengths of the approach, I hope, far outweigh any potential weakness by allowing for a more in-depth understanding of the unique character of the cultural formation in question. In this

regard, for example, it seemed absolutely necessary to try to understand the peculiar, fragmented nature of the musical instrument trades, the particular problems associated with musical instruments as commodities, the specialized nature of music periodical publishing, and the specificity of music as a form of artistic practice.

While many histories of individual instruments have been written (at least from the point of view of their technical design characteristics) few have attempted to understand the social and economic contexts of their development (Edward Tarr's 1988 history of the trumpet could be cited as a possible exception along with other specific titles used in Chapter 2 of the thesis). Similarly, while much has been written on the subject of periodical publishing, little scholarly attention has been paid to the music press. And when music periodicals are mentioned at all, the information presented is often misleading: for example, Sutherland (1989) mentions the *Canadian Composer* in his history of Canadian periodical publishing as if it were a general interest, commercial music publication; in fact, as an internal publication of the performance rights organizations, its circulation is controlled and its content highly specialized. Finally, books on musical performance and composition are plentiful but most focus too narrowly on musical "technique," thought of in its most limited sense.

As already mentioned above, the dissertation is broken into three separate sections that follow, in a general fashion, Dick Hebdige's basic analytic scheme. Each of the sections begins with a chapter that is primarily historical or theoretical in nature, thus setting up some of the important background issues to be addressed in subsequent chapters. The history of the piano supplies a particular focus within each of these chapters.

While I found this model to be useful, particularly in the initial stages of organizing the research, it also posed some difficulties with regards to managing the material and the arguments that I later wished to make. For example, because I see these three areas as interrelated in a variety ways, it is inevitable that some material will overlap between

sections or is otherwise cross-referenced. Indeed, at times it seemed impossible to keep these three areas entirely distinct and, at other times, theoretical arguments and particular historical events had to be broken up between chapters in different sections of the thesis, thus creating certain discontinuities as well. I have tried to minimise this type of problem as much as possible.

Part I, titled, "Design/Production: The Musical Instrument Industry," is primarily concerned with the problems of technical innovations in musical instrument design. Chapter 2 attempts to provide a broad historical background on the nature of the musical instrument trades. Of particular importance in this discussion are two social histories of the piano by Loesser (1954) and Roell (1989). Roell's assessment of the piano industry at the turn of the century and its relationship to the rise of a consumer culture is of special relevance to the study as a whole. Chapter 3 addresses the issues of invention and innovation in the context of capitalist markets through a set of examples drawn from the history of electronic musical instrument design. André Piatier's notion of "transectorial innovation" (1987/88) is introduced as a key concept in understanding the dynamics of recent innovations in microprocessor-based musical instruments. And finally, in Chapter 4, the rise of a "cottage industry" devoted to the supply of prefabricated sounds for digital synthesizers and the commercial development of MIDI (Musical Instrument Digital Interface), during the 1980s are discussed. Issues related to the so-called "democratization" of the marketplace are initially introduced here but not followed up in greater detail until Chapter 6.

Part II, "Mediation: Musicians' Magazines, Networks and User Groups," looks at the music periodical publishing industry and other forms of communication and their role in the formation of markets and communities of interest. While they are seldom cited in a direct manner, much of the background theory and orientation for this section concerning the role of communications in consumer culture in the twentieth century is drawn from Ewen (1976), Leiss (1976) and Leiss et al (1990). Chapter 5, is primarily concerned with

the history of music periodicals and their relationship to the music industries and to musical consumption in the home. This is followed by a brief discussion of the early twentieth-century phenomenon of "ham radio" operators; my interest here is in the nature of technically-mediated communications networks. Both parts of this chapter draw on standard historical works concerning the media in question. Chapter 6 focusses firstly on the modern, highly specialized musicians' magazine industry and its role in the definition of markets and the promotion of a (largely male) technical culture around the new instruments of musical production. Secondly, it describes the rise of computer networks and "user groups" associated with the new technology and, in particular, gives an account of the early activities of the International MIDI Association (IMA). The theories of C.B. Macpherson (1973) are discussed in relation to the IMA's attempts to establish an open, "democratic" process to guide the technical innovation and diffusion of the MIDI specification.

Part III, "Consumption/Use: Technology and Musical Practice," focusses on musicians themselves and the relationship between musical instruments and the concepts and techniques of sound-making. Chapter 7 draws on the literature of ethnomusicology (primarily the work of Merriam 1964, Feld 1981, 1988, and others), sociology/anthropology (Bourdieu 1990 and Schutz 1964) and, most prominently, on the reflections of David Sudnow (1978) with regard to jazz piano playing. One of the main concerns here is to explore the nature of "practical" (in Bourdieu's terms) vs. formal acquisition of musical knowledge; issues concerning the role of notation in Western music are also addressed. Chapter 8 discusses changes in the concept of "sound" in music and their relationship to performance practices and to electronic means of reproduction. The language used by musicians to describe sounds becomes one of the focal points of this analysis. And in Chapter 9, the multitrack studio, MIDI sequencing, and the rise of the home studio are considered as part of an overall movement towards the rationalization (Weber 1958b) of

musical practice. The changing status of the term "live" in relation to music and technical means of reproduction is also discussed. Finally, some reflections on musical copyright that bring together notions of sound, performance and reproduction are presented; a number of opinions are drawn from popular and legal periodicals.

The Concluding chapter (number 10) attempts to pull together some of the main arguments concerning the nature of what I have described here as a "cultural formation" and, furthermore, argues that the phenomena discussed in the dissertation may be part of a much larger shift in the nature of production and consumption in the late twentieth century.

In addition to the central concept of musicians as "consumers of technology" and the subsequent examination of the relationship between production and consumption in recent popular music practice, a number of other sub-themes are pursued at various points within the dissertation. One concerns issues of technology and gender in the world of music and the other deals, in a rather argumentative manner, with the relationship between the classical "avant-garde" and popular uses of electronic instruments. While neither of these themes is dealt with in an entirely systematic or satisfactory manner, their prominence warrants mention here.

A Note on Methodology and Data Collected

As I have already mentioned earlier in this introduction, the standard academic histories of electronic music tend to be rather narrow, focussing on specific individuals, machines, and compositional techniques; and few place any emphasis on the economic and social contexts in which instrument technologies are developed and introduced. As a result, I have had to rely on a combination of information gleaned from a variety of standard histories, trade magazines, specialized commercial publications, indexes and statistical sources such as those published by the American Music Conference and the

Music Industries Association of Canada (both of which proved to be more precise and informative than government sources) in order to gain a basic idea of the framework of the music industries and specialized periodical publishing industry.

In addition, a number of personal interviews (largely unstructured and recorded on tape) were conducted in person or by telephone with key individuals in the musical instrument and publishing industries (a complete list of interviews can be found in the Appendix). In many cases, initial contacts were made when I attended the trade show of the National Association of Music Merchants, in Chicago, June 1990, and the MusiCanada Trade Show held in Toronto that same year. I was also fortunate enough to arrange on-site visits and interviews with individuals at the Ensoniq Corporation, Malvern PA, and at the studios and research facilities of the Yamaha Communication Center, in New York City (two days each in November 1990). Some initial recording studio observation and interviews with musicians and recording engineers were conducted in Glasgow, Scotland during the fall of 1989 and, later, in Montréal and Ottawa. I have also had the privilege of teaching Sound Production in the Department of Communication Studies at Concordia and through many casual conversations with graduate and undergraduate students I have acquired a sense of some of the musical and technical preoccupations of these young musicians (some of these individuals are also listed at the end of the Appendix). On a number of occasions I also attended manufacturer seminars and clinics and went on "reconnaissance" in several retail outlets--a frequent meeting place for young musicians--in different cities. In preparation for this interview and observation work I have relied on the practical advice and theoretical insights found in Burgess (1984) and McCall & Simmons (1969).

Much of this interview material was conceived as background information gathering and I have therefore quoted directly from the interviews only sparingly. In some cases, I have cited individuals by name when they spoke as representatives of particular organiz-

ations or as authorities on specific topics; I have done so with their permission. In most other cases however, I asked my interview subjects to speak freely about their interests and concerns and have allowed their comments to remain anonymous.

One final caveat may be in order here: the reader will no doubt note that I have quoted extensively from interviews conducted with well-known performers in various musicians' magazine, especially in Part III of the dissertation. Because I view the content of many of the magazines to be highly skewed towards the promotion of technology in musical practice (indeed, this forms part of my general argument in Part II of the thesis), I have had to exercise a certain caution when extracting quotes in this manner. I have, I think, chosen them judiciously and not overemphasized the use of technology in these instances.

Portions of the thesis have been presented in public in the form of conference papers and journal articles. As a result, I have benefitted greatly from the comments of various colleagues.

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I

Design/Production:

The Musical Instrument Industry

Chapter 2:

The Industrial Context of a 'Revolution' in Marketing and Design

> Electric instruments are a departure from nineteenth century tradition. Because they depend on physical discoveries of this century, they are often considered the most characteristic instruments of our time...
>
> ... We do not know the destiny of these engineers' inventions, nor can we tell how much they will mean to the future of music. For the time being, they surely owe their existence to the experimentations of electroengineers rather than to any musical need. (Sachs 1940: 447, 448-9)

Thus Curt Sachs, in his monumental comparative and historical work, *The History of Musical Instruments* (1940), summed up the early history of electric musical instruments: nearly half a century of technical experimentation had seen little, if any, production of lasting musical significance; certainly the future of electric instruments seemed, at best, marginal. Indeed, Barry Schrader has observed that between 1930 and 1950 alone, over a hundred electro-acoustic instruments were invented; yet few of these experimental musical instruments achieved any kind of success during this twenty year period and none are in use today (1982: 68).

However, the situation could not have changed more during the second half of the twentieth century: during the past forty years changes in musical styles and tastes, on the one hand, and advances in technical design and marketing, on the other, have transformed electro-acoustic instruments--electric guitars and amplifiers, electronic organs, digital pianos, synthesizers and signal processors--from idle engineering experiments into what must truly be regarded as the "most characteristic instruments of our time." Following on

Sachs' observations, an analysis of the forces that have contributed to such a transformation would need to include both an understanding of what might today constitute a genuine "musical need" and, at the same time, an understanding of the role of technical experimentation as a partly independent driving force behind the development of new technologies. But in this regard, neither "musical needs" nor the experiments of electroengineers can be entirely separated from market forces--from the industrial requirement for new products and the influence of contemporary advertising and promotion on the formation of consumer needs. Thus, an examination of the dynamics of the musical instrument trade--its specific character, economic problems and marketing strategies--and the role of technical innovation within this industry, must be considered as an important contextual element in the development and adoption of new musical technologies.

In Sachs account, the initial impulses that have historically directed human ingenuity towards the development of musical instruments are elemental and universal in character: they include motor impulses--the desire to express emotion through physical movement; ritual functions--the desire to invest sound with symbolic meaning or magical powers; and, later, melodic impulses--the use of instruments to imitate repetitive patterns in speech and song (1940: 25-59). Certainly, aspects of these "primitive" impulses continue to play a role in the design of musical instruments: for example, even in electronically-produced music--where there exists a clear separation between physical movement and actual sound production, where keyboards of the organ type amount to little more than a switching device turning predetermined electronic events on and off--there remains an interest in supplying the musician with greater levels of touch sensitivity and in creating so-called "alternate controllers"--devices designed to bring into play a wider range of physical gestures as a means of initiating and shaping electronic sounds.

But added to these basic impulses Sachs cites a variety of motivations related to musical developments unique to the West: among them, an increased desire for the

expansion of musical resources to include greater timbral variety and expressive range and, above all during the late eighteenth century and throughout the nineteenth, a desire for greater power (i.e., volume). The piano was the instrument most representative of both these tendencies (Ibid.: 388-390) and, as Arthur Loesser has pointed out, such musical requirements were the impetous behind innovations in piano design--the introduction of cast iron framing, heavier strings and hammer actions, etc.--during the early nineteenth century (Loesser 1954: 301-304). Furthermore, in Sachs view, experiments with electronics in the early twentieth century exhibited a basic continuity with these same desires: "Most eulogies of electric instruments emphasize their unlimited capacity for dynamic power and varied timbre. This is in line with the trend of the later nineteenth century" (Sachs 1940: 449). And indeed, the appeal to unlimited capacity for varied timbre continues to be a major component in promotional hype for digital synthesizers some fifty years later.

Sachs relates the early formation of these desires to historical, social, and cultural factors: such as the gradual shift from aristocratic to democratic social structures from the eighteenth century onward that precipitated the building of large public concert halls requiring greater volume of sound (similarly, with mass culture in the twentieth century, concert promoters in popular music have increasingly turned to sports stadiums and other large venues thus stimulating the need for powerful amplification systems); and the rise of a romantic, passionate spirit in art-making following the French Revolution (Ibid.: 388-390).

As regards the latter, Sachs' speculations come close to identifying what Raymond Williams might refer to as the "structure of feeling" (1977: 128-135) of the period as manifest in its instrumental forms and expressive styles. An exploration of similar concerns in relation to musical and aesthetic "needs" will be undertaken in greater detail in Part III of the thesis. But for the moment, it is important to point out that while Sachs recognized such social and cultural forces at play in the design of musical instruments and understood

the importance of a number of technical innovations in the development of complex instruments such as the nineteenth-century piano, his appreciation of the economic context of these developments is much less acute. Arthur Loesser (1954) and Craig H. Roell (1989), on the other hand, have attempted to view the development of the piano as a complex interplay between commerce and culture: technical innovations, efficiencies in manufacturing and distribution, corporate finance, market control, merchandising, concert promotion and advertising, are all part of their stories of how the piano industry became a central part of musical life in Europe and North America. In particular, Roell's observations of the piano industry in the U.S. at the turn of the century, its response to, and contributions towards, the emergence of a consumer culture, will be important to much of what follows in the first part of the thesis.

In this chapter I would like to begin by outlining, in a rather broad fashion, a number of factors that relate to the particular nature, organization and historical evolution of the musical instrument industry. In the first section I will place an emphasis on the development of the piano industry during the eighteenth and nineteenth centuries; while this period may appear to have little direct relevance to the modern synthesizer industry, the nature of this development does reveal important issues regarding technical innovation and the evolving capitalist organization of the industry.

This will be followed by a brief discussion of the contemporary organization of the musical instrument trade, its status as a leisure industry, and its relationship to the electronics and sound reproduction industries in the twentieth century. The observations supplied in this section are intended primarily as background information concerning the overall commercial context within which musical instruments are currently produced and sold. Of particular interest to this discussion is the relative size and specialization of various sectors of the musical instrument industry and the resulting interlock of personal

relationships and corporate structures that seems to be so characteristic of the industry as a whole.

The manner in which the various pressures generated within this overall context influenced the development of digital musical instruments in the 1970s and '80s will be the main topic of the chapters that follow in Part I. And while a number of points will be made throughout this chapter concerning the character of technical innovation within the music industry, it seems appropriate that more detailed analysis be reserved for subsequent chapters of the thesis.

History & Organization of the Musical Instrument Industry

Music in the twentieth century is, to a large degree, a technologically-dependent, leisure commodity whose existence is guaranteed by the organized activities of a number of large corporate enterprises and media outlets. As in other areas of commodity culture, rapid changes in musical style, fashion and technology go hand in hand with contemporary modes of production and distribution. Of course, this has not always been the case: up until about the sixteenth century, most music for entertainment purposes was primarily the preserve of individuals: wandering minstrels, amateur musicians in the home, and the like. The only formal, institutional organization of musical activity in Western Europe prior to this time was that of the church and the municipal musicians' guilds: within these institutional frameworks music served relatively specific religious and social functions, musical styles changed only slowly, and the production, distribution and use of musical technologies (i.e., musical instruments and early notated scores) tended to be relatively controlled.

In the case of the church, most musical instruments had been outlawed from use in religious ceremonies at an early date and church leaders had even attempted, with relatively little success, to prescribe the use of instruments in secular music as well (Raynor 1972:

23-25). As one of the main institutional patrons of music, the church's early hostility towards instrumental music likely had a profound impact on the development of musical instruments in Europe throughout the middle ages. Indeed, Sachs states that, with the possible exception of the lyre, there were virtually no medieval musical instruments that could be considered as European in origin; nearly all instruments of the time were adapted from Asian models (1940: 260). As an institution, the church was indispensable in the development of keyboard instruments however: the early monasteries provided a stable environment for the development of organ technology; only after the thirteenth century did organ building become a secular profession (Weber 1958b: 114-115).

Even in secular music, where musical instruments were certainly widely played during this period, their role remained subservient to the voice in most music-making; perhaps as a result of this subservience, secular instrument production was limited and few standards developed either with regards to the their design or their use in instrumental ensembles. In Max Weber's account, it was the early professional organization of the medieval bards and that of the music guilds (at least from about the thirteenth century onward) that provided for the first, relatively fixed markets for musical instruments, thus encouraging their manufacture and early efforts towards standardization (Ibid.: 107). As a market however, the guild musicians tended to be relatively conservative: the nature of guild apprenticeship training encouraged musicians to maintain traditional musical forms and traditional instruments and discouraged experimentation with new musical styles and sounds even as public taste began to change during the early years of the renaissance (Raynor 1972: 61-62).

It was not until the sixteenth century that instrumental music began to evolve as a separate, distinct area of musical form in Western music. It was also during the sixteenth century that keyboard instruments began to become popular for vocal accompaniment and as instruments of home entertainment among the aristocracy (they had been preceeded in

this function by the lute). And it is not until even later, in the seventeenth century as instruments began to be specified in musical scores, that orchestration could begin to emerge as a distinct area of musical composition, thus providing the basis for the formation of the modern orchestra (see Grout 1960: 250-261; Sachs 1940: 297-304; Carse 1964: 22-85).

Because of the small size of the market however, instrument building remained, throughout this latter period, a specialized, craft-oriented activity supported by little in the way of formal industrial structures in either manufacture or distribution. Until quite recently instrument manufacture could hardly be described as an "industry" at all, at least not in the modern sense of the term, and was often no more than a secondary area of activity carried on by persons engaged in other craft. Even in the area of keyboard instruments, whose history is central to the development of Western music as a whole, the high cost of the instruments and the small size of the market effectively limited their production. In eighteenth-century Germany for example, keyboard instruments were still made by individual artisans and their assistants, often as a secondary line of production along with other manufacturing:

> Harpsichords and clavichords could not be bought at a "store" or at "warerooms": they were made to the order, and often to the specification, of individual customers...
> It is unlikely that, before the middle of the eighteenth century, there was enough demand...to occupy a craftsman exclusively with the making of them. Usually these instruments were a side line of organ builders or of cabinet makers. It was after 1740 that the demand grew to a point where building them could become an independent trade.
> (Loesser 1954: 16)

The personal, "made to the order" nature of the instrument trade was reflected in other areas of musical life as well and the gradual development of musical activity into a broad-based entertainment industry during the late eighteenth and early nineteenth centuries

continued to be influenced, and limited by, relatively specialized networks of distribution. According to musicologist William Weber, concert life and music publication were dependent on such networks of personal relationship. New compositions were

> sold copy-by-copy through a complex web of ties among composers, musicians, and interested amateurs. Each composer would ask colleagues in different cities to solicit subscriptions to a new composition (whether printed or not) for a small remuneration, usually advertising these agents in periodicals... ...trusting relationships were the key to success. (Weber 1977: 9)

Thus, musicians themselves, acting as "part-time merchants" (Hortschansky 1983), were central to the early commercial development of music publishing. But as Weber points out, such a personalized method of distribution was, by its very nature, a "self-limiting" system (Weber 1977: 9).

Similarly, in North America, where instruments and printed music were in short supply during this period of history, semi-commercial networks of professional musicians and amateurs were vital to the early development of musical life. For example, historian Helmut Kallmann has described how the development of secular concert music in Québec was dependent on the varied activities of musicians such as Friedrich Heinrich Glackemeyer (1751-1836): in addition to his musical performances and activities as a band director, Glackemeyer was a key figure in musical education and, equally important, the importing of printed music and instruments (Kallmann 1960: 50-55). Kallmann considers musicians' "auxilliary occupations" in education and trade to be central to the early development of music in Canada.

But the expansion of the market for music to be played by amateurs in the homes of the emerging middle classes in Europe contributed to the gradual transformation of such networks of musical, social and economic relationships. Weber claims that it was the publishing industry that was the main driving force behind this transformation during the

critical period between 1780 and 1850 and that its growth was aided by a number of factors: these factors included technical developments in lithography, movable type and engraving; the spread of retail outlets (in London there were only about twelve shops selling music in 1750 but by 1824 there were 150); and the development of promotional and merchandising techniques aimed directly at the emerging amateur market (Weber 1977: 6, 10-11). Thus, as Weber argues, technological innovations combined with changes in distribution and marketing were, from the outset, essential to the early formation of a consumer market for music.

However, what is particularly interesting in this transformation that Weber describes as a "quantum leap" from local personalized relationships to a professionalized international trade network, is the degree to which these two levels of activity continued to work together in the world of music:

> The personalized commerce and concert life of the eighteenth century never disappeared completely from European musical life. Amateur orchestras today still have an internal structure not very different from those back then... ...But around them have developed broadly based, impersonal social systems which have come to control these concerts in powerful ways. Indeed, one of the most fascinating aspects of modern mass culture is how it has interlocked with personalized institutions in this manner. (Ibid.: 9-10)

This interlocking of the personal and the impersonal is still, I would argue, an important factor in the music industry and this will be pursued further below and, from a somewhat different perspective, in Part II of the thesis.

The transformation of personal relationships into commercial ones is also indicative of broader changes in the social status of musicians in Western culture: faced with a much less secure employment than that of church, guild, or aristocratic patronage, those who needed to supplement their income from a permanent post or from free-lance work often turned to the music trades. Klaus Hortschansky has shown that among the various people

who chose to become involved in the music publishing and retail trades during the late 18th and early 19th centuries, professional and amateur musicians figure prominently; many maintained their musical activities as composers, conductors or musicians, while others used the trades as a means of becoming fully integrated with middle-class society (1983: 207-218). The pianist Muzio Clementi, well-known as a composer, performer, and teacher during the Classical period, was perhaps one of the most celebrated musicians to turn to the music trades (Clementi & Co. became an established piano manufacturing and music publishing firm in England during the early nineteenth century) in order to gain a more secure and respected position in middle-class society (Loesser 1954: 259-267). And here again, as revealed in many of the interviews conducted during the research for the present thesis, it would appear that a large number of musicians today continue to use the music trades as an escape from the insecurity of a musical career; indeed, the participation of amateur and former professional musicians at virtually every level of the industry would appear to be characteristic of the music trades.

With regards to musical instruments, the expansion of piano manufacturing, working in conjunction with the developments in publishing and concert management, was an especially critical factor contributing to the industrialization and commercialization of production in music during the late eighteenth and early nineteenth centuries. Initially, the early European piano makers had been dependent upon craft modes of production not unlike those of other instrument makers and the same personal networks of distribution as were characteristic of other areas of musical life. Loesser claims that an average keyboard workshop during the early and mid-eighteenth centuries--consisting of a single master craftsperson and a few assistants--could turn out no more than about 17 to 19 instruments a year (Ibid.: 133, 234). And in centres such as Vienna, where public advertising was looked down upon, piano makers regularly turned to piano teachers, offering them a large

commission on each instrument sold, in an attempt to market their instruments to prospective buyers (Ibid.: 134-35).

But the transformation of the craft of piano manufacture proved to be perhaps more profound than in any other area of musical life. As the eighteenth century drew to a close, the increasing demand for pianos required that production capacity be greatly expanded. Nanette Streicher, who had taken over her father's piano making business in Austria just prior to the turn of the century, appears to have introduced changes to the manufacturing process that enabled her operation to produce about fifty pianos a year:

> Clearly, this could be accomplished only by a considerable enlargement of plant facilities, an increase of working personnel, a fairly rigorous division of labor, and a steady purchase of ready treated materials. It could only be done by an organization approximating what we would call a factory. (Ibid.: 133)

In England, where industrial manufacturing methods had progressed much more quickly and the buying power of the domestic market was much greater than that of Austria, the piano manufacturer Broadwood was producing in excess of 400 instruments a year by the beginning of the nineteenth century (Ibid.: 234). Piano manufacture had thus distinguished itself from all other forms of musical instrument production:

> instruments of the fiddle or pipe species, by their relative simplicity and rarity, might never have tempted anyone to build them by factory methods. But the pianoforte, with its manifold, intricate structure--and especially with its abundance of serially repeated parts--seemed particularly suited to the new mechanical processes...The piano was the factory's natural prey; purely on the basis of its structure, it was the instrument of the time. (Ibid.: 233)

These passages illustrate the changes that factory methods of production had brought about in keyboard manufacture during the early nineteenth century: the piano was the first musical instrument to become the beneficiary of what would today be described as

a set of "process innovations"--innovations that allow for greater productivity in manufacture, economies of scale, or more efficient distribution. From its earliest incarnation, the piano had been designed to overcome the musical shortcomings of earlier keyboards such as the harpsichord--shortcomings as regards the ability to play loud and soft, deficiencies in overall sonic power, etc. Initially, it was a series of innovations in technical design (such as those in hammer design and cast iron framing mentioned above) that allowed the piano to gradually displace earlier keyboard instruments. For the most part it is these modifications in technical design--what I would refer to here as "product innovations"--that have been the primary concern of musicologists such as Curt Sachs (1940: 391-398). But I would argue that these innovations in technical design alone cannot account for the unparalleled rise of the piano in Western music history: only in conjunction with process innovations--innovations in manufacturing, distribution and marketing--could the piano have emerged as the quintessential instrument of musical entertainment in the homes of the middle class and as a dominant force in Western musical culture as a whole.

Such a perspective has been adopted in *The Piano in America 1890-1940*, a book in which Craig H. Roell (1989) documents the rise of the American piano industry and its relationship to the emergence of a modern consumer culture. By the middle of the nineteenth century, the United States had already begun to establish itself as one of the leading centres of piano production in the world. Indeed, piano manufacturing in the U.S. had become a big business: in 1851, some nine thousand instruments were produced (mostly for the domestic market) and, by 1853, the Chickering piano company of Boston had erected the largest single industrial building in the country (Loesser 1954: 495). But by the latter part of the century, Chickering, Baldwin and Steinway were only the most prestigious companies in an industry made up of literally dozens of small manufacturers--or rather "assemblers"--producing pianos from stock parts provided by a growing piano supply industry (Roell 1989: 72-76). The supply industry made it possible for small

companies with limited capital to produce pianos for a mass market at competitive prices (less than $200. for a low-grade upright at the turn of the century; Ibid.). In Canada too, the growth of domestic piano manufacturing during the late nineteenth century also depended on the ready availability of standardized piano parts, both domestically produced and imported (Kallmann 1960: 196-197).

Increased productivity however necessitated an increased attention to marketing and promotion. Many of the small manufacturers distributed their pianos without brand names and it was a common practice for local dealers to apply their own names or to fraudulently apply the name of a reputable manufacturer to the instruments. In an effort to combat the "stencil" piano trade, the larger manufacturers began to place an emphasis on the value of trademarks and to encourage brand name loyalty (a relatively unfamiliar concept in the nineteenth century); and in aid of this effort they turned increasingly to national advertising as a means of promotion (Roell 1989: 76). From the beginning of the nineteenth century, artist endorsements and manufacturer-subsidized concert tours had been a regular feature of piano promotion; in this way, art and commerce came together in mutual support of one another on the concert stage (it was customary for manufacturers to hang a sign on their instruments for the entire audience to see; Ibid.: 144-146, 150; Loesser 1954: 531-536). Not surprisingly, newspaper and magazine advertisements made prominent use of artist endorsements.

But to this was added a new feature in the latter part of the nineteenth century: international fairs had become a kind of mass medium for the communication of technological developments (Roell 1989: 147) and piano manufacturers began to compete for recognition at events such as the World Exhibition held in London in 1851, the Paris Exposition of 1867, and the Centennial Exposition in Philadelphia in 1876; awards and citations received at these numerous events could then be turned into important indicators of technical superiority in future ad campaigns (Ibid.: 147-149). Thus, artistic distinction and

the display of technical prowess became twin focal points of brand name promotional strategies in the piano inudstry.

In response to increased competition, the larger manufacturers began a process of integration and modernization through incorporation, increased capitalization and merger. Some also used franchised dealerships in an attempt to gain greater control over distribution. Thus, as factory methods led to greater productivity, lower prices and intense competition, the leaders of the American piano industry increasingly turned their attention to corporate and market control as a means of guaranteeing prosperity (Ibid.: 83-93); interestingly however, attempts to establish monopoly control through the creation of a piano trust failed. Perhaps as a reflection of the piano industry's craft origins, the piano trade remained relatively conservative and highly competitive: most piano companies during the late nineteenth century continued to be managed by their owners or by their major stock holders and were slow to adopt the modern managerial hierarchies that were quickly becoming typical in other spheres of American corporate life (Ibid.: 85).

Despite mass production practices and falling prices, pianos, at least high quality ones, still represented a sizable investment for both the average retail operation and the consumer. In addition to the measures mentioned above, piano manufacturers and dealers attempted to stimulate sales through credit programs and installment purchase plans (Ibid.: 96-97). Installment buying was still a rather novel merchandizing concept during the nineteenth century: the practice had been introduced by the Singer sewing machine company in 1856, adopted by the Baldwin piano company during the 1870s, and spread throughout the piano industry during the 1880s and '90s (Ibid: 100-102, 142-43; see also, Majeski 1990: 31).[1] Organized financing thus became an essential component of the trade

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[1] The connection between pianos and sewing machines was not simply one of analogous financing: both were major commodity purchases primarily intended for female use in the home; companies were formed to manufacture both devices; they were often sold in the same retail outlets; and they were advertised and written about in the same specialized

both in terms of retail floor-planning and consumer sales. It would eventually become a hallmark of the emerging consumer culture during the early twentieth century in promoting the sale of all "consumer durables": automobiles, electrical appliances, etc.

Given the mechanical character of piano design--a feature that had made it so well suited to modern factory manufacturing processes--it was perhaps only a matter of time before automation techniques would be applied to it as regards its ability to play music as well. The introduction of the automatic player piano around the turn of the century had a major impact on the piano industry and its relationship to the consumer market. A number of points should be made about this development that will be of some relevance to later discussions of digital musical instruments.

As early as 1825 attempts to design a self-playing piano had been made, most based on clockwork technologies derived from barrel organs, music boxes and other instruments already common in the eighteenth century (Loesser 1954: 577-579). The technical advance that would eventually make both barrel organs and player pianos more practical however was the introduction of the Jacquard automatic loom in the textile trade during the early nineteenth century: it was Joseph Jacquard's use of perforated cards on cylinders to control needle work that would become the basis of the perforated music roll on automatic pianos (Ibid.: 580; see also Ord-Hume 1984: 79-81, 83). It could be argued that virtually all aspects of musical instrument manufacture are dependent on the general level of industrial development attained in a given society, especially as regards craft techniques in metal and woodworking. It seems to me that the early development of automatic musical instruments based on such an unlikely invention as the Jacquard loom is among the more salient examples of what André Piatier (1987/88) refers to as "transectorial innovations"--innovations generated within a specific industrial sector that find subsequent application in

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magazines, such as the *Musical and Sewing Machine Gazette* (Loesser 1965: 560-564).

other, often unrelated sectors. In the electronic age, transectorial innovations have become increasingly significant and commonplace. But in the case of the early piano industry, the impact of such far flung technical innovations as the automatic loom could not have been greater: player pianos, would eventually account for fifty-six percent of the industry's production and sales (Roell 1989: 155).

In the same way that printed music suitable for home entertainment and designed for amateur players had been an important factor contributing to the sale of keyboard instruments during the late eighteenth and early nineteenth centuries (see Loesser 1954: 251-259), an adequate supply of piano rolls containing popular repertoire was essential to the success of the new automatic piano industry. In a sense, both sheet music and piano rolls could be considered as the "software" components of a primarily hardware-driven industry; similarly, in the early days of the recording industry, it was necessary to produce recordings in order to sell gramophones and phonographs. But unlike sheet music (and very much like records and record players) the technical nature of the automated instruments required a certain degree of compatibility in the format of the rolls and playing mechanisms if the same music rolls were to be playable on more than one brand of instrument. Clearly, cooperation and not competition was required of the fledgling industry and, in 1905, four manufacturers combined efforts in order to create a uniform standard for piano rolls; perhaps no other technical innovation contributed more to the overnight success of the player piano than the achievement of the standard roll (Majeski 1990: 52). As I will demonstrate in Chapter 4, the introduction of MIDI was the result of a similar set of circumstances in the digital musical instrument industry of the early 1980s; cooperation and standardization again proved to be essential components in a strategy to stabilize and stimulate the marketplace.

But the enormous success of the the player piano, or "pianola" as it came to be known, was not based on technical innovations alone. As both Loesser and Roell point

out, fundamental changes in cultural values and patterns of consumption had to preceed, or develop in tandem with, the new technical capabilities. The pianola was a new kind of musical instrument--an instrument that required no particular skill on the part of the operator; in this sense, the pianola had more in common with music boxes and the newly invented phonograph than with the traditional piano. Roell describes how promotion of the unique capabilities of the pianola resulted in a kind of "contradictory ideology" expressed in advertising campaigns of the period (ca. 1900-1925): the personal sense of individual achievement and creativity characteristically associated with the "producer ethic" of the nineteenth century and most clearly identified with the piano in middle class Victorian culture was suddenly juxtaposed with an opposing set of values characteristic of the new "mythology of consumerism"--effortless recreation, leisure, and immediate gratification (Roell 1989: 156-159).

Furthermore, the "easy to play" appeal of the instruments became linked to a notion of "musical democracy" (Ibid.)--a notion of universal accessibility to culture that would later become an essential component in the consumer mythology associated with the phonograph and radio. This mythology became especially powerful in the United States where there had long been a tendency towards the division of musical taste along class lines not unlike that found in the musical culture of Europe. According to musicologist Charles Seeger, the efforts of the mechanical music industries to promote the consumption of music in any and all styles--popular, folk and classical--had a profound leveling effect on American musical taste during the early part of the twentieth century. In Seeger's view, the music industries--what he sarcastically referred to as the "sell-America-music" group--were essentially a "democratizing" agent in American musical culture (1977: 229). In a sense then, the twin aims of the automatic piano industry--instrument sales and the universal accessibility of music--were the complementary halves of an economic and social ideology.

This relationship between the musical instrument industry and the emerging technologies of mechanical and electronic reproduction is particularly intriguing because it has changed so radically over the course of this century. Initially, instrument manufacturers and retailers did not regard the new technologies as a threat to traditional music-making: indeed, they saw reproductive technology as not only contributing to the democratization of music but also as a stimulus to sales. From the outset, music shops had been among the primary outlets for phonographs and, by the 1920s, some piano manufacturers were producing both phonographs and radios and selling them through their dealerships (Ibid.: 211-212; see also Majeski 1990: 50-54; 92-99). Music shops even served as outlets for television sets during the 1950s; retailers eventually got out of the business not because of ideological opposition but because TVs put them in direct competition with department stores and mass merchandising outlets forcing a substantial lowering of their usual profit margins (Majeski 1990: 149-150).

But musical instruments still remained the industry's main focus and, as a consumer product offering instant, repeatable pleasures, an instrument like the player piano soon found itself in competition with all other products of a similar nature (it was eventually outdone by radio during the 1920s). So while promotion of the contradictory ideologies of personal achievement and immediate gratification proved to be very profitable to the industry, such contradictions could not be maintained indefinitely and the more traditional piano manufacturers--Baldwin and Steinway--returned to the old Victorian values of technical and artistic accomplishment in their promotional activities (Roell 1989: 160-182). The piano industry began to realize that the promotion of music-making in private and public education was both ideologically and economically more appropriate and, in the long term, more effective than direct appeals to modern consumer values. Individually, piano manufacturers and their agents began to systematically exploit local networks of private music teachers and their pupils as sources of prospective sales (Roell

1989: 169-170); and collectively, the industry launched major campaigns to promote music programs in the public schools and in support of group instruction (Ibid. 190-91, 203).

Thus, while the piano industry initially participated in, and profited from, the promotion of the new consumer ethic, it soon found itself at odds with the entertainment values of the leisure age. By the time that the first commercially viable electronic musical instruments, such as the Hammond Organ, arrived on the scene during the 1930s, the industry was already becoming sensitive towards competition from leisure-oriented commodities such as radio and the automobile. Initially, the electric organ was marketed as the legitimate musical heir to the pipe organ and sold primarily to churches and auditoriums (Majeski 1990: 134) but, after the Second World War, Laurens Hammond began to look for ways to tap into the potentially lucrative home market (the piano industry's traditional turf). He began by developing a new electric organ incorporating a system of accordion-like chord buttons and then launched an "easy-play" ad campaign during the early 1950s to support its introduction into the marketplace: "Trade In Your Silent Piano For A New Hammond Chord Organ. Without lessons, you can play the Hammond chord organ in minutes, even if you can't read music. You'll never have to work on boring scales and exercises" (Ibid.: 140). In what must be regarded as an extreme form of collective amnesia concerning its own promotional appeals made during the heyday of the player piano, the piano industry reacted with outrage--not only, one suspects, because of the explicit call to "trade in" the parlour piano, but also because of the implication that musical accomplishment was no longer the result of diligent work: playing a musical instrument could be made effortless, or so it seemed, through the intervention of electronic technology.

The tension that exists between the belief that the acquisition of musical skills requires concentrated effort on the part of the individual (a work ethic) and the marketing requirement that all music-making be seen as a form of entertainment (a leisure ethic) has become one of the more enduring ideological and economic problems for the musical

instrument trade during the twentieth century both in terms of its internal and external market relations. And with the advent of electronic technologies designed for domestic entertainment, this conflict has become ever more acute: beginning with radio and followed by high fidelity stereo music systems, television, video cassette recorders and computer games, each successive wave of new technology has been seen by the more conservative elements of the musical instrument trade (especially the manufacturers) as a threat to both immediate sales and to the self-reliant, do-it-yourself philosophy of music-making regarded by many as essential to the long-term survival of the industry.

The Structure of the Contemporary Music Instrument Industry

Thus far I have discussed the music instrument industry primarily in terms of the development of piano manufacturing and marketing. I have done so for a number of reasons: musically and culturally, the piano has been unquestionably one of the dominant forces in Western music (theoretically, practically and symbolically) during the past two centuries; technically, its distinctively mechanical design characteristics made it amenable to modern manufacturing processes; and economically, the category of keyboard instruments, when taken as a whole (today, including not only pianos but also organs, synthesizers, digital pianos and portable keyboards), has consistently dominated the music instrument trade (the category presently constitutes between 40 and 50% of total dollar sales within the industry and has been even greater in the past). Together, these factors have exerted enormous pressure on the manufacturers of new musical instruments and, in large part, may account for the continued dominance of keyboards in digital instrument designs.

But certainly, the musical instrument industry cannot be reduced to a single set of characteristics, even when those characteristics are derived from one of its largest sectors. It could be argued, for example, that electric guitars have constituted a significant portion of

the musical instrument trade since the 1950s: in terms of units sold, if not in terms of total dollar sales (guitars are much less expensive than most keyboards), this has indeed been the case. With its employment of modern electronics and its focus on the youth market, the electric guitar has also been representative of post-War trends in instrument design and marketing strategies. And musically and symbolically, the electric guitar plays a role in contemporary popular music that is as central as that played by the piano in nineteenth-century Victorian culture. Similarly, band instruments, while their technical design has changed little during the past century, have nevertheless occupied a significant position in secondary school music education programs for many years. The relative stability of the educational market has made the band instrument sector a staple of the industry. As these examples perhaps demonstrate, the significance of developments in any one sector of the industry can only be truly appreciated when those developments are placed within the context of the industry as a whole.

According to a recent assessment of the size and diversity of the music instrument trade in the U.S., the industry is a "highly fragmented business," composed of a number of product categories which are "in themselves self-contained industries with their own set of customers, trade practices, and challenges" (*The Music Trades* 138 (10), November 1990: 52). There are, for example, few links between the manufacturers of band instruments, electric guitars or electronic organs: each relies on different materials--from wood and brass to electronic circuits; different manufacturing processes--from hand-crafting to assembly-line processes; and each focuses on different primary markets--schools, young rock enthusiasts, or mature amateur musicians in the home. Partly due to this fragmentation, the trade journal argues that there are "few, if any, truly dominant players" in the contemporary music instrument industry (Ibid).

Having stated this however, the data compiled by *The Music Trades* tells a somewhat different story. The Top 5 instrument suppliers--Yamaha Corporation of

America, Peavey Electronics, Baldwin Piano & Organ Company, Roland Corporation US, and Casio Inc.--accounted for over 25% of total retail sales of musical instruments in the U.S. during 1989. While the level of concentration demonstrated within the musical instrument trade is considerably less than that of the record industry--where the same number of companies control 80% or more of worldwide sales--such concentration is still, I would argue, quite significant. The well-known Japanese-owned company, Yamaha, with U.S. sales in excess of $370 million, alone accounts for over 10% of all instrument sales in the U.S. With its vast international holdings and its diverse line of products--including pianos, organs, wind instruments, digital keyboards, drums, guitars, and sound reinforcement equipment--Yamaha is one of the only companies capable of supplying instruments to virtually all industry sectors and, for this reason, must be considered as a "dominant player" within the industry as a whole.

Nevertheless, market fragmentation and manufacturing specialization is a significant factor in maintaining the dynamic balance between large and small companies that would appear to be characteristic of the music instrument industry: for example, Roland Corporation, although it has total U.S. sales of less than one-third that of Yamaha ($120 million), specializes in digital musical instruments and sound reinforcement equipment and is thus a major force within the electronics sector of the industry. Even much smaller companies such as the U.S.-based Ensoniq Corporation, with an even more limited range of digital products and estimated world-wide sales of only $24 million, is still considered to be a significant competitor in the highly specialized market for digital samplers and synthesizers.

Furthermore, market fragmentation may contribute to the relative "volatility" of individual market sectors: their response to fads, fashions, and changing musical styles, on the one hand, and their susceptibility to the influence of entrepreneurial capital, technical innovation, and unconventional marketing strategies, whether initiated from within or outside the industry, on the other. During the past century, ukuleles, accordions, and a

host of other instruments (including even the player piano) have all risen to prominence within the industry, generating huge short-term profits, only to disappear into obscurity a decade later. The guitar had always been a relatively insignificant part of overall sales within the industry but the popularity of jazz, folk, and especially rock and roll during the 1950s, catapulted the instrument to the forefront of the industry with sales in excess of 400,000 units in 1959 (Majeski 1990: 143-146). In an attempt to keep pace with demand, guitar manufacturers expanded production capacity during the early 1960s. But even their most optimistic sales forecasts could not predict the explosive impact of the arrival, in the U.S., of the Beatles: in 1964, following their appearance on the Ed Sullivan Show, over one million guitars were sold. Even market share among manufacturers within the guitar sector was affected by the popularity of the Beatles: George Harrison's use of Gretsch electric guitars gave them a market credibility that had formerly been reserved only for instruments made by Fender and Gibson (Ibid.: 152-154).

But the popularity of musical instruments is not only a response to changing musical syles or the simple result of market demand. The development of the home organ industry was predicated on a completely different set of criteria. Firstly, some of the technical expertise required for basic work in instrument design had to come from outside the traditional framework of the music instrument-building craft. In the case of Conn, formerly a band instrument manufacturer, experience with electronics was derived from work on military contracts during the Second World War (Ibid.: 142). Similar factors had contributed to the more general rise of consumer electronics, and especially high fidelity audio equipment, during the 1950s (Read & Welch 1976).

Secondly, no prior market existed for the electronic organ so it was essentially a matter of sophisticated marketing and promotion that led to the creation of one. The "easy-play" idea, already mentioned above, became an increasingly important part of ad campaigns for the industry during the 1960s. A host of technical innovations--rhythm

units, chord systems, automatic orchestras and the like--were introduced in order to complement this basic philosophy. Organ manufacturers also introduced the idea of "trading up" to the music instrument industry. Formerly, large-scale personal investments in instruments such as the piano were meant to last a lifetime. With the home organ each new year brought new models, features and accessories with which buyers could be enticed into returning to the music shops. By the end of the 1960s electronic organs were selling in the hundreds of thousands and had begun to rival even the piano for dominance in the home market (Majeski 1990: 159-160).

Interestingly, the same combination of technology and promotional appeal appears to have prevented the electronic organ from ever attaining status as a legitimate instrument within the more stable educational markets (Ibid.: 163). And these same factors were no doubt also critical in the ultimate demise of the home organ business as more sophisticated digital technologies were introduced during the early 1980s. Electronics giants, such as Casio Inc., shattered the technical competence and economic dominance of the organ manufacturers by introducing a series of low-cost, portable digital keyboards into the home market. A newcomer to the music industry, Casio rose to the position of the fifth largest instrument supplier in the U.S. in less than a decade based on little more than a single line of musical products. Meanwhile, the sale of home organs, which had constituted some 25% of total industry sales throughout the 1970s, fell to less than 2% of the instrument trade by the late 1980s (American Music Conference statistics).

Such enormous fluctuations in the fortunes of the organ manufacturers must be understood as characteristic of the music instrument industry as a whole. The initial popularity of the home organ and the subsequent success of portable electronic keyboards are testaments to the power of large-scale capital investment in technical innovation and aggressive marketing strategies when exerted within what amounts to a relatively small industry over all. According to statistical data and estimates compiled by the American

Music Conference (the AMC is a non-profit association funded in large part by the musical instrument industry) the entire retail value of musical instruments (not including used instruments), sheet music and musical accessories in the U.S. for the year 1989 was $3.6 billion (*Music USA 90*; the somewhat more conservative estimate of *The Music Trades* placed the figure at $3.4 billion). Reflecting the size of the Canadian market relative to that of the U.S., the Music Industry Association of Canada (MIAC) estimated Canadian sales for the same year at $284.3 million (*Canadian Music Trade* XII (4), July 1990, 20); this figure reflects the wholesale value of MIAC member sales only (approximately 80% of wholesale value of the total industry) and if adjusted to reflect retail sales levels, the per-capita Canadian market would appear to be only slightly greater than that of the U.S. But when such figures are put into perspective--there are literally dozens of Fortune 500 firms operating in the U.S. that have annual sales greater than that of the combined sales of the entire North American musical instrument industry--the industry must be regarded as exceedingly small. Indeed, a standard joke among synthesizer manufacturers in the U.S. is that sales for the entire sector are about the same as those for any reasonably large grocery store in California.

To a certain extent, because of the size and fragmentation of the industry and, perhaps equally important, because of the romantic ideologies of personal expression that have traditionally been associated with musical instruments, the handcraft aspect of the musical instrument industry has never completely disappeared; nor has the intimacy of the relationship between musicians and instrument builders. In Canada for example, some 85 firms are currently engaged in the manufacture of music related products (Allen 1990: 23): Québec luthier Paul Champagne, whose hand-crafted guitars are known throughout North America, manages to produce only about 14 instruments a year; and Sabian Ltd. of New Brunswick, reputed to be the second leading cymbal manufacturer in the world, produces some 200,000 instruments annually including a series of hand-hammered bronze instru-

ments (Ibid.: 31-32). Even instruments such as electric guitars and basses continue to be produced, on a limited, commission basis, under handcraft conditions. And synthesizer designer Don Buchla, a leading innovator in the field since the 1960s who has worked closely with a number of individual composers, has eschewed factory production methods in order to work within what most would consider to be a "garage-level" operation. There would appear to be a kind of enduring "fit" here that exists between modes of manufacturing and musical performance that is almost entirely aesthetic and ideological in character: the musical instrument passes from the hand of the maker, as it were, to the hand of the musician.

In contrast, the electronics sector of the industry tends to be among the most automated: for example, the Ontario-based company, Yorkville, a leading manufacturer and distributor of musical instruments and sound reinforcement equipment, uses a computer-assisted production system in order to cut labour costs and to compete in the global market (Ibid.: 29). The dialogue between musicians and builders however continues to be important, especially during the early period of development for any new instrument. In the digital musical instrument industry this process has become formalized and professional musicians and recording engineers are often used as consultants by manufacturers during the design stages of new musical technologies or as "beta testers" prior to the release of new products. However, as will be described later, the character of the innovation process in musical instrument design is extremely variable and can, in certain instances, transcend such simple marketing strategies and thus alter the basic relationship between manufacturers and musicians as sources of innovation.

The role of musicians as "part-time merchants" also continues to be an important characteristic of the retail sector of the industry. Trade magazines continually remark upon the unsophisticated, untrained nature of most retail management and sales staff; their pages are filled with the most basic "tips" on running a business. Often, manufacturers have had

to bear the cost of training dealers, not only with regards to effectively selling their own products, but in basic marketing and sales techniques as well. In the field of digital electronics, where specialized knowledge is often required to even operate the instruments, dealer training is an essential part of the suppliers' marketing operations.

But retailers and their knowledge of the needs of local musicians can also play a role in the process of technical innovation and in the fortunes of the industry as a whole. With most of the technical innovations discussed above, it has been implied that the source of the innovations has been the manufacturers themselves. But in his book, *The Sources of Innovation* (1988), Eric von Hippel argues that parts suppliers, distributors and users can, under certain conditions, become the functional source of new innovations. During the 1960s, when guitar amplifiers had not yet caught up with the demands of rock musicians, retailers were able to fill a void in the market place. Building initially on their experience in renting and repairing amplifiers, shop technicians like Peter Traynor, who worked for the Long & McQuade retail outlet in Toronto, began to design their own amplifiers and speaker cabinets. The Yorkville manufacturing operation (mentioned earlier) and the successful Traynor line of amplifiers grew out of these initial beginnings in a retail repair shop in 1963 (see Emmerson 1979, and Rowland 1987). The U.S. giant, Peavey Electronics, and its innovative line of sound reinforcement equipment appears to have had similar origins in the retail trade (Majeski 1990: 216-217).

The intimacy between retailers and the music scene may also be a factor in the success of many individual operations as well. For example, Toronto musician and synthesizer programmer, Jim Burgess, made a reputation for himself by working with popular performers such as Stevie Wonder during the early 1980s. His musical expertise in the emerging field of MIDI and digital keyboard instruments has allowed him to establish what has become a highly successful consulting and retail operation in Toronto called, "Saved By Technology."

Perhaps because of this intimate, almost insular, nature of the musical instrument trade (and despite the occasional successes of companies such as Casio), it has not been entirely easy for outside investors and business strategists to exercise influence and control within the music industry. During the boom years of the 1960s and '70s, large corporations viewed the industry as a potentially lucrative source of additional income. Corporations like Macmillan, CBS, and Norlin pursued an aggressive campaign of conglomeration and brought new, professional managers to the industry; CBS alone acquired the piano company Steinway & Sons, Fender Guitars, Gulbransen Organs and a number of other profitable operations (Majeski 1990: 176-177). Popular music scholars such as Wallis and Malm have made much of this trend and have tended to regard it as a sign of increasing vertical and horizontal integration within the recording and electronics industries (1984: 282-284). In fact, the influence of these companies was extremely short lived: within a decade, most of these corporations had left the industry because of their basic misunderstanding of the dynamics of the musical instrument trade and an inability to effectively produce meaningful product innovations (Majeski 1990: 188-189). But another hypothesis might also be put forward to explain this phenomenon: perhaps because of the basic conflicting nature of the producer and consumer ethic that separates the music instrument industry from the record industry, it was unlikely, from the outset, that companies like CBS would be able to effectively manage such a wide range of manufacturing and market sectors within the music instrument industry.

Conclusion

My purpose within this chapter has been to set out, in as broad a fashion as possible, some of the particularities (and, indeed, peculiarities) of the musical instrument trade; as a result, the history presented here is, at best, a sketchy one. But it seems to me

that it is only against this backdrop--the continuing value placed on handcrafted instruments within certain sectors of the industry, the interlocking of personal and impersonal networks, the striking changes wrought in manufacturing and marketing within the piano and organ industries, the unresolved problem of the producer ethic (i.e., the problem of acquiring requisite musical skills) versus modern modes of consumption (based on automation, reproducibility, and ease of use), and the fragmented character of the instrument industry overall--that the issues of technical innovation and marketing that will be discussed in the following chapters can be fully appreciated.

I have concentrated much of this discussion on the development of keyboard instruments (especially the piano) for a number of reasons, some of which were noted at the beginning of the previous section of this chapter. But beyond these, I would like to once again single out Roell's (1989) insightful analysis of the central economic opportunities and ideological conflicts within the piano industry at the turn of the century as being a response to a larger cultural shift in the nature of production and consumption within capitalism. In the following chapters, I want to argue that the application of microprocessor technology (and the attendant innovations in instrument design, organizational structure, and musical use) within the electronics sector of the music industry is perhaps also a sign of a similar shift during the late twentieth century. Roell's analysis of this earlier cultural "formation" is thus a key reference point for much of what follows in the thesis.

But there is also another reason for this concentration on the piano industry that is perhaps even more immediately pertinent to the topic of the dissertation: the use of microprocessor technologies in musical instrument design was first and most significantly developed for keyboard synthesizers during the 1970s and '80s and, to a certain degree, it would appear that one of the long-term effects of this development will ultimately be felt within the keyboard sector of the industry as a whole. Indeed, in a certain sense, the

legitimation of microprocessor technology in conventional keyboards appears to be taking place at a rate that is about equivalent to the pace at which it is currently usurping the traditional markets for pianos and organs: including the educational, church, and home markets.

In essence, microprocessors have entered what might be considered as a second stage of diffusion within the musical instrument industry. The economic theory of technological innovation described by Douglas Gomery (1976) posits that new technologies are introduced in three separate phases: invention, innovation, and diffusion. In Chapter Three I will discuss the dynamics of invention and innovation in electronic musical instrument design; and in Chapter Four I will take up Gomery's model in a more explicit manner in describing some of the recent events surrounding the development of MIDI. But for the moment, what I want to suggest is that the developments that will be described in both these chapters, which reached a peak in the synthesizer sector of the industry around 1987/88, were perhaps only the prelude to a more widespread diffusion of microprocessors that has only become apparent in recent years. Indeed, while the number of acoustic pianos sold in North America has been in a state of continuous decline since the late 1970s, the sale of electronic and digital pianos has become a significant growth area during this same period (according to AMC and MIAC statistics).

But perhaps the most pivotal sign of this second stage in the diffusion of digital technologies can be found in recent shifts at both the corporate and retail levels within the industry. On the one hand, piano manufacturers have recently made alliances with high-tech music firms in an attempt to diversify their product lines and maintain their share of piano markets: for example, the Korean piano maker, Young Chang, has acquired Kurzweil Music Systems, a leader in sampling/synthesizer keyboards; and the American piano company, Baldwin, has recently signed an agreement with the Ensoniq Corporation, for the joint development of digital piano products. The nature of these new corporate

relationships was made clear in a statement made by Harold Smith, President of Baldwin: "They [Ensoniq] have exceptional digital technology and we have the ability to package and market a finished product" (quoted in *The Music Trades* 140 (2), March 1992, p. 133). Piano companies, once the dominant economic force within the industry and leaders in technical and market innovations, have thus become dependent upon outside interests that can supply them with the technical innovations that they need but can no longer create on their own; meanwhile they will continue to concentrate on simple manufacturing, promotion and distribution.

Retailers, on the other hand, have also become involved in this phenomenon by diversifying their market base. Shops that had previously catered mainly to young rock 'n' roll musicians have used digital pianos as a means of entering the lucrative home keyboard market. And traditional piano retailers, whose ongoing relationship with their customers had always been based on servicing and tuning, have now looked to digital technology as a new form of potential income based not only on the initial sale of the keyboards themselves but on the subsequent sale of peripheral devices as well (*Canadian Music Trades* XII (4), June/July 1990, p. 30).

Thus, digital technologies have become the basis for an increasing integration within the keyboard industry at virtually every level. Because of the central role played by keyboard instruments in the history of Western music, a better understanding of the nature of the new technologies, and the dynamics of recent technical innovation more generally, is important because it may shed light on what may indeed be a key historical development within the music instrument industry and musical culture as a whole.

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Chapter 3:

Invention and Innovation

in Electronic Instrument Design

> In September 1978, a project was proposed: to design and build a high-quality all-digital keyboard synthesizer for the commercial market...The proposal was motivated by the successful prototyping of a digital circuit that simulated 32 oscillators...With a working example in hand...All that remained was to incorporate the device into a suitable package, program the desired features, and sell it. Initially, it was estimated that this process might take a few months. Two and one-half years and nearly one million dollars later, the resultant product...is available for sale. In retrospect, the tremendous number of technological, design, and production difficulties encountered make the original estimates seem appallingly naive. (Kaplan 1989: 611)

The passage from invention to innovation--the process by which "an idea or a group of ideas [is] transformed into something that is sold or used" (Piatier 1987/88: 208)--is a difficult transition in the development of any technology but it seems to have been especially so in the history of electronic musical instruments. As already noted at the beginning of Chapter 2, literally dozens of electronic instruments were invented during the first sixty years of this century yet precious few could claim the status of an "innovation": that is, few ever reached the marketplace and fewer still could be said to have achieved anything resembling widespread acceptance among musicians.

In some cases, the failure of these instruments may have been due to a simple lack of business acumen on the part of their inventors--inventors seldom seem to possess the business skills required to successfully manufacture and market a musical instrument, even one that appears to be, in itself, superbly designed. But the process of technical innovation

is also more complex than simply achieving a proper balance between brilliant design and shrewd marketing strategies: every step of the innovation process-- from conception, to financing, research and development, testing, marketing, production engineering, manufacture, promotion, distribution, and, finally, public acceptance--requires careful planning, coordination and execution (a more precise model of the innovation process derived primarily from Wasserman 1985, and Livesay, et al 1989, among others, will be discussed later).

In the following pages I would like to begin by briefly exploring a number of well known successes and failures in the history of electronic musical instruments. This brief survey is not intended to be a history of electronic music or synthesizer technology as such, but rather, a simple highlighting of specific examples that will serve to introduce and illustrate certain key components in the process of innovation in musical instrument design.[1] In the second section of the chapter, I will give an account of the early years of the synthesizer industry during the 1960s and '70s. The critical issue here, is to understand the nature of the early industry, the collaborations between musicians and entrepreneurs, the difficulties in gaining acceptance for the instruments, and the limitations of inventor/entrepreneurial forms of organization. Finally, I want to examine the momentous changes in the industry that have taken place since the introduction of microprocessor technology into musical instrument design. Using André Piatier's notion of "transectorial innovation" (1987/88), I will explore the dynamics of contemporary innovation and its relationship to broader issues of technology, economy and market strategy within capitalism during the late twentieth century.

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[1] Except where otherwise indicated, the details of the instruments and manufacturers discussed in this chapter are taken from a number of sources including Anderton 1988, Appleton & Perera 1975, Darter & Armbruster 1984, Davies 1984, Holmes 1985, Schrader 1982, and Majeski 1990, among others. The specific focus and interpretation of these events, however, are primarily my own.

Success and Failure in the History of Electronic Instruments

The standard histories of electronic music usually begin by telling the tale of a number of so-called "pioneers" in the field. The tale is a familiar one: the isolated genius exploring uncharted domains of science and engineering, inventing brilliant, unique designs for instruments with never-before imagined sounds and capabilities. If they are lucky, their devices come into some limited use among composers of the avant-garde (also cast as geniuses for their ability to realize and master the technical possibilities offered by the new instruments) but seldom gain any recognition from the public at large. Their failure, when acknowledged at all, is often explained away with the banal comment that the inventor was "ahead of his/her time"; this is, in a nutshell, for example, the story of Canadian inventor Hugh Le Caine as told by Gayle Young (1989; I will return to this story in more detail below). In most of these accounts the expression "innovative" has no precise meaning at all and is usually employed as a simple stand-in for notions of originality, novelty, or inventiveness.

But for my purposes here, these tales are far too coloured by a thinly disguised romanticism (e.g., in their overt admiration for extravagant individual effort) and by the hagiographic intentions of their authors. Furthermore, few of these stories take into account the context of invention: for example, the accumulation of scientific knowledge and engineering expertise in a particular field which often precedes the invention itself and the musical, social, economic and institutional forces that help or hinder its existence. When fully considered, such factors can often make the invention in question seem less the fruit of individual genius than the outcome of a particular interplay of social forces and local initiatives resulting in an almost predictable (if not always inevitable) sequence of events.

The truth is that the vast majority of these early devices were, from a practical point of view, probably poorly designed in the first place: idiosyncratic, incapable of functioning

in any musical context outside the laboratory, or impossible to manufacture in a cost-efficient manner. This was clear, from the outset, with the invention of Thaddeus Cahill's "Telharmonium" or, as it was sometimes called, the "Dynamophone"; introduced publicly in 1906, the instrument is often cited as one of the first electrical musical instruments ever built. Virtually an electric generation plant played from an organ-like set of manuals, the huge instrument required 30 boxcars for transport and cost over $200,000 to develop. But despite an initial, positive reception in the press, the Telharmonium was beset with technical difficulties and, furthermore, soon proved to be poorly suited to its main purpose: that of providing music to businesses and individuals over telephone wires from a single, centralized point of transmission.

The latter issue was critical, for even if Cahill had been able to overcome the technical problems of the instrument itself, its potential use in any other, more conventional musical setting would have been highly questionable (its size alone placed major constraints on its use). But the idea of using telephone wires as a system of distribution appears to have been technically ill-conceived from the beginning (the wires were hardly capable of transmitting the strength of the required signal) and was, in any case, soon made obsolete by the advent of radio; Cahill's enterprise failed within a few years. The Telharmonium failed then for two reasons: firstly, because of basic problems of cost and design, and secondly, because of Cahill's own limited perception of the role that such an instrument could play in musical culture.

Another well-known electronic instrument of the early twentieth century was the "etherophone," more commonly known as the "Theremin," invented in Russia by Leon Termen around 1919. The instrument was small, relatively simple in its design (making use of vacuum-tube oscillator technology), and possessed a unique sound and playing technique: a pure, sweeping electronic tone was produced whenever the player simply waved their hands in the vacinity of two radio-like antennae. The mysterious playing

method added an element of bizarre theatricality to performance and may have accounted, in large part, for the interest the instrument generated as a novelty device.

But this same characteristic that gave the Theremin such a unique appeal was also the main drawback which prevented its widespread use as a musical instrument: control over the pitch of the instrument was awkward and imprecise and the continuous glissando between pitches was equally difficult to regulate. And despite the fact that a handful of virtuoso performers (of whom former-violinist, Clara Rockmore, was perhaps the best known) dedicated themselves to promoting the instrument in public, the Theremin was never widely adopted by professional or amateur musicians, thus remaining essentially a novelty device (which is not to say that the instrument did not achieve a significant level of diffusion in this capacity). Ironically, the instrument's novelty status has been all the more reinforced by its occasionally evocative, though primarily anecdotal use in science fiction, suspense, and psycho-dramatic films (e.g., *The Day the Earth Stood Still*, or Miklos Rozsa's score to Hitchcock's *Spellbound*) and by its even more rare appearances in popular music (e.g., in the Beach Boys' 1966 hit, "Good Vibrations").

The failure of the Theremin to enter into musical practice in any meaningful way highlights the problem of designing musical instruments in such a way that they bear no resemblance to any existing musical technology, thus requiring musicians to not only adapt to unfamiliar sounds but also to learn an entirely foreign set of performance techniques (later, Termen did attempt to introduce several instruments based on more conventional designs). Given the investment in time and effort made by musicians in the normal acquisition of instrumental skills, it is not surprising that new technologies are not always readily accepted.[2] Composers of the musical avant-garde (especially electronic composers

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[2] A similar example of the problem of introducing innovations in an area dominated by skilled individuals can be found in the non-diffusion of the Dvorak typewriter keyboard--a keyboard whose configuration has been proven to be more efficient than the standard QWERTY layout--as described by Rogers (1983: 9-10). Rogers argues that not only the

of the 1950s) tended to champion such instruments however, precisely for their unique sonic characteristics and their implicit rejection of past musical technique; unfortunately, these modernist attitudes also tended to be dismissive of the need, felt especially among performers, for some form of common musical practice and a sense of continuity with their acquired skills, knowledge and experience.

This point can be further illustrated by taking into consideration the Ondes Martenot, an instrument which bears certain similarities to the Theremin both in terms of its sound generating apparatus and its sonic appeal. Developed in France in 1928, its inventor, Maurice Martenot, appears to have been more cognizant of the need to give performers some kind of tactile and visual contact with the instrument. Through a series of design modifications, Martenot eventually arrived at an instrument that used a combination of a conventional keyboard and a number of other, more specialized controlling mechan isms which, when taken together, gave the performer a wide-ranging expressive control over the sound produced by the instrument. Most important perhaps, the inclusion of the keyboard, without necessarily limiting the instrument to a fixed pitch scheme, nevertheless gave it a footing within the conventional experience of most performers and within established modes of composition and notation, thus allowing it to be integrated easily within both conventional and more adventurous forms of instrumental music.

The Ondes Martenot was never manufactured on a large scale; indeed, it continued to be made entirely by hand until the 1950s thus limiting the instrument's potential market. The instrument was nevertheless distinguished among virtually all other electronic musical instruments of the period by the fact that a distinct repertoire of music was created (mostly by French composers) expressly for it (it also later found some use in film and commercial

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vested interests of manufacturers but also those of typing teachers and typists themselves have prevented the superior keyboard from being adopted ever since it was invented in 1932.

music in North America); and furthermore, the instrument is still taught and played in a number of music conservatories, primarily in the French-speaking world, including Québec. In this sense, the Ondes Martenot was more than a mere "invention," a novelty device for the production of strange, electronic sounds: its fundamental musical characteristics, expressly designed for performance purposes, allowed it to become, if only within a limited sphere, an "innovation" of considerable musical import.

From the perspective of the present study however, the most important innovation in keyboard design during the first half of the twentieth century would undoubtably be the Hammond Organ. First introduced by Laurens Hammond in 1935 (the same year that Rickenbacker began producing the first commercially available electric guitar), the instrument became an instant commercial success (accumulating over 1,400 orders in only a few weeks) and was used extensively in jazz and popular music for close to four decades. The characteristic sound of the B-3 model remains one of the most sought after musical timbres among synthesizer sound designers.

Part of this success was no doubt due to the fact that Hammond's ambitions were relatively conservative: he did not set out to create a revolutionary new instrument but simply to design a more modern and cost-efficient organ, primarily for church use. Not a musician himself, Hammond worked closely with W.L. Lahey, a church organist, and a number of the more popular musical characteristics of the early instrument were likely the result of this collaboration between musician and inventor. They are equally, no doubt, responsible for the lack of attention paid to the instrument in most standard histories of electronic music. But while there is certainly some validity to the argument that simply playing an organ, even an electronic one, is not the same as making "electronic music" (at least not in the conventional sense of the term); I would argue that the practice of altering the timbre of the instrument through the use of its unique draw-bar mechanism (not to

mention the later addition of percussive effects, vibrato, chorus and reverb) is, in essense, not unlike programming an early analog synthesizer.

But popularity, commercial success, and problems of legitimation aside, the Hammond Organ is important in the present context for a number of other reasons: firstly the instrument is an example of what might be considered as a kind of "transectorial innovation" (Piatier 1987/88). The primary technical innovation of the Hammond Organ was the use of revolving tone wheels, powered by a synchronous motor, as the instrument's basic sound generating apparatus; the synchronous motor itself had been developed several years earlier by Hammond for the purpose of powering electric clocks. The synchronous motor stabilized the pitch produced by the tone wheels thus circumventing a problem that had plagued most earlier designs that had made use of vacuum-tube oscillators. The tone wheels themselves have been described as being not unlike those used by Cahill in his Telharmonium but, because of the availability of electronic amplification, Hammond's wheels could be miniaturized thus creating an instrument of reasonable proportions.

It is not simply the fact that Hammond derived his idea for the motor-driven tone generating apparatus from a previous, unrelated invention, however, that makes his organ an example of transectorial innovation. But rather, the motor/tone wheel mechanism reinforced by vacuum tube amplification, considered at a more general level, embodies a characteristic wedding of electronic, electro-magnetic and mechanical technologies that was common throughout the late nineteenth and early twentieth centuries; in a similar way, the shift from the purely acoustical and mechanical design of the early gramophone to the electro-mechanical gramophone of the 1920s and '30s was also an expression of the same broad-ranging set of technical innovations resulting from the application of electrical principals to the powering, amplification and/or regulation of mechanical devices. Understood in this way, the Hammond Organ is perhaps one of the most characteristic

musical instruments of this transitionary period in the history of technology: the transition from mechanical technologies to purely electronic devices.

Secondly, and more importantly, the simplicity of Hammond's electro-mechanical design made it both efficient, durable, and ideally suited to mass-production techniques, thus reducing production costs and facilitating the development of the instrument for a large market. The significance of these design characteristics however lie not only in their economic value. For what Hammond succeeded in doing was combining two (or perhaps more) separate stages in the process of innovation. The tasks of conceiving a new technical device, designing prototypes, and then adapting the design for production purposes are often separate stages in the development of a product that require different kinds of knowledge and engineering expertise. Hammond's approach to the development of a tone generating apparatus for his instrument succeeded in fusing design, manufacturing and product-oriented criteria; in a sense then, the tone-wheel mechanism combined the essense of a product innovation and a process innovation within a single device.

Thirdly, Hammond was as skillful in marketing and promoting his instruments as he was in designing them. Although the Hammond Organ was originally designed primarily for church use (and indeed, about 35% of initial sales were made to churches), it soon became clear that a more lucrative market existed for the instrument among professional musicians and, especially, amateur players in the home. Through a series of product and marketing innovations (already mentioned briefly in Chapter 2), such as the use of chord buttons, the invention of the small "spinet" organ, the concept of "easy-play" and group instruction, Hammond succeeded in tapping and expanding the home entertainment market. The importance of these innovations goes beyond their simple ability to generate sales: for if the concept of innovation is understood as a <u>process</u>, then marketing is one way in which the innovating firm establishes a dynamic relationship, not only between itself and its market, but also between invention and use. In an article outlining the develop-

ment of the Hammond line of organs, Mark Vail (1991) has discussed a number of relatively minor innovations and design modifications (such as addition of percussive effects, chorus and reverb to the basic organ tone) which were introduced by Hammond's engineers in response to the interests of musicians, outside competition, and changing market conditions.

This process of ongoing design modification is made critical by the competitive environment fostered by capitalism: every new innovation inevitably generates imitators and competitors, thus necessitating a program of sustained development and innovation if a firm is to remain profitable; a fact that appears to have been well understood by Hammond. In recent years, patterns of competition, collaboration and innovation have become increasingly complex and, as Yasunori Baba (1989) has argued, such patterns within the electronics, microprocessor, and other key industries has fostered the development of what he refers to as a process of "continuous innovation" (I will come back to this point later).

There are a number of other characteristics of market and technology-driven innovation that can perhaps be best illustrated by considering some of the problems of adapting, for the marketplace, electronic instruments designed within institutionally-based research environments. The experiences of Canadian inventor, Hugh Le Caine, are instructive in this regard because, despite the notoriety that his various inventions have received among composers of avant-garde electronic music (it has been claimed, for example, that his electronic "Sackbut" was the first modern synthesizer), none were ever successfully brought to market.

Perhaps the single most important factor contributing to the character of Le Caine's productive life was his association with the National Research Council (NRC) in Ottawa from 1940 to 1974. Arriving at the NRC during the war years, Le Caine's early work was instrumental in the development of radar and other NRC wartime projects; and with the security of working at the NRC, Le Caine was also able to devote himself to developing a

series of unique electronic musical instruments, at first in his spare time and, from about 1954 onward, with the support of the NRC.

But what I want to argue here is that Le Caine's association with the NRC was perhaps also one of the greatest drawbacks in the passage of his instruments from the status of "invention" to "innovation" (as understood in the context of this thesis). The contradictory aspects of this association were many: firstly, Le Caine had decided to stay with the NRC after the war because he felt that he could best pursue his creative objectives outside the context of commercial imperatives (Young 1989: 29). Ironically, while the decision to work independently in his spare time and, later, at the NRC laboratories may have afforded Le Caine the freedom to pursue problems of a musical and technical nature that were of interest to him and to produce novel designs for electronic instruments, it does not appear that this same strategy was equally beneficial in terms of a producing a coherent program of instrument development. Indeed, the evidence of Le Caine's output is telling: of the more than twenty musical instruments and devices built by Le Caine and described in the appendix to the biography written by Gayle Young (Ibid.: 167-223), more than half existed only in the form of a single, original prototype; no instrument was produced in quantities exceeding five units. Furthermore, only a few of these instruments were engineered on the basis of related principals, thus attesting to the eclecticism of Le Caine's approach and the lack of systematic, on-going development of any one instrument type (even the instruments produced in multiple units often incorporated significant design changes, thus imparting to them the character of a series of distinct prototypes).

Secondly, given the institutional matrix in Canada (and, to some extent, his own musical interests) it was perhaps inevitable that Le Caine's work would draw attention, initially at least, from the university-based music community; indeed, the first electronic music studios in Canada--those at the University of Toronto and at the Faculty of Music at McGill University--were established with the assistance of Le Caine and the NRC. To a

large degree, these institutional sites served as surrogate markets for Le Caine's research and, I would argue, this may have ultimately been as constraining on his output as the economic pressures of commercial design. For example, among the instruments designed by Le Caine, Young lists a ring modulator that he built at the request of composers at the University of Toronto Electronic Music Studio (UTEMS). Young admits the fact that the ring modulator had been a familiar component of radio technology for decades, that it posed no technical challenge to Le Caine (he built it himself without the aid of his assistants), and that there was nothing particularly innovative in his design (Ibid.: 210);[3] in fact, Le Caine appears to have found it to be a rather trivial device, useful for generating "odd sounds" at best (Ibid.: 135). So while there certainly may have been a number of genuine collaborations between Le Caine and the university community, it was clear that this was not always the case: problems of technical and financial support at the fledgling studios as well as the very structure of the relationship between the universities and the NRC appeared, at times, to reduce the latter (and by implication Le Caine himself) to the role of simple instrument supplier (Ibid: 136-138; 246).

But more important for my argument, Young describes how Le Caine was, from his earliest experiments, interested in developing musical instruments for live performance; the electronic Sackbut, among other instruments, was the product of this aspect of Le Caine's work. But, for the most part, composers of avant-garde electronic music during the 1950s and early '60s had little interest in live performance and, as clearly implied in Young's text, they appear to have ignored Le Caine's efforts to develop instruments like

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[3] Some of the other instruments built by Le Caine were also available commmercially in some form though Young does not always mention this fact, thus leading the reader to believe (perhaps falsely) that each of the devices built by Le Caine was unique in some way. This observation lends further support to Wright's criticism (1990: 166) that Young's biography does not adequately contextualize Le Caine's work in relation to commercially-developed instruments of the same period. Such omissions can only serve to reinforce the book's apparent hagiographic tendencies.

the Sackbut in favour of inventions designed for studio composition (Ibid.: 107-9). In this way, their role as a surrogate market had a substantial influence on the direction of Le Caine's research as a whole (a fact that he seems to have later realized; Ibid.: 146). Ironically, it was the popular music market that would eventually prove to be most receptive to performance-oriented keyboard synthesizers like the Sackbut.

Thirdly, designing one-of-a-kind instruments as a hobby in one's spare time or within a research environment for a very specific and limited group of clients does not tend to prepare one for the varied requirements of commercial production, thus making the transition from invention to innovation more difficult. For example, in his hobbyist days, Le Caine appears to have paid little attention to the problem of obtaining patents for his devices: his first patent application (made at the suggestion of a colleague at the NRC) was delayed for two years because of technical errors in the legal documents (Ibid.: 58). Such oversights could hardly be tolerated in a commercial context where monopoly control over new inventions can be critical to the profitability of a corporation.

An equally important but more subtle problem for commercial operations involves the amount of time and money that can be allotted for research and development before a product must be brought to market, either because of internal financial constraints or because of external competition. In working at the NRC for his university clients however, Le Caine often had the luxury of working on projects until he was completely satisfied with them and this immediately became a problem when some of his studio instruments began to attract the interest of commercial developers in Toronto around 1960. After waiting for three years for Le Caine to complete the work of redesigning his so-called, "Multi-track Tape Recorder" (a keyboard instrument for the playback and modification of pre-recorded tapes, more like a very sophisticated Mellotron than a tape recorder *per se*), the company gave up manufacturing plans assuming that the market for the device would evaporate before a workable prototype could be produced (Ibid.: 123-9).

Le Caine later regretted this failure to address a larger market with his invention:

> I was too much impressed by the undesirability of 'freezing' the position of the tenuous 'new music' at this stage, and I did not give enough weight to the benefits of making inexpensive equipment available to a large group of potential users with widely differing objectives. (Ibid.: 128)

Thus, Le Caine appears to have realized (though perhaps too late) that it was not through the design process alone that an instrument came to fully embody, limit, or exhaust its musical potential. Indeed, it could be argued that an instrument is never really completed at the stage of design and manufacture at all; it is only made "complete"--often in a variety of different ways and in different musical contexts--through its use. That is, an "invention" only becomes an "innovation" once it has been put into the hands of users.

Finally, developing instruments for a commercial market often requires that one consider production issues even at the initial stages of design: the characteristics and limitations of standard components, ease of assembly, planning for maintenance and servicing, and other factors, can pose serious problems for commercial designers that are seldom encountered within research environments (see Kaplan 1989: 620-21; and Rossum 1987: 21). This fact must have become especially salient for Le Caine when, during the late 1960s and early '70s, he began redesigning the Sackbut with the intention of introducing it to the commercial market.

By 1970, an arrangement had been made where a Montréal company, Dayrand Ltd., with technical support from the NRC, would produce and manufacture the instrument. But while the company appears to have had a strong background in the marketing and distribution of audio equipment, it had little or no manufacturing experience. As a result, delays in creating a production prototype were immediately encountered; furthermore, in an effort to make the Sackbut cheaper to manufacture, Dayrand began to propose design changes that, from the point of view of Le Caine and the NRC, would substantially

compromise the uniqueness of the instrument. The evidence supplied by Young suggests that much of the blame for the eventual failure to produce an instrument suitable for manufacturing rested with Dayrand: they neither had the finances nor the experience necessary for the project and it received low priority within the company (1989: 151-6).

While this may, in large part, be true, Young does not adequately question whether Le Caine's design itself may have also posed significant difficulties. Indeed, a number of the unique features of the Sackbut, such as its touch-sensitive keyboard, among others, were uncommon at the time and prevented the use of prefabricated components. Too many features of this kind would likely have made it virtually impossible to manufacture the instrument in a cost-effective manner. While the use of a high percentage of custom-designed parts may be acceptable in the research environment, efficient manufacturing usually requires that they be kept to a minimum; adopting design practices that are sensitive to production issues at the outset can sometimes allow one to avoid the inevitable compromises that result from the post-hoc application of cost/performance criteria.

But at a more general level, there was the problem of the lengthy, idiosyncratic development of the Sackbut as a whole. The instrument had been invented and redesigned during three separate periods of activity that spanned Le Caine's entire career at the NRC: 1945-48, 1954-60, and 1969-73. With each subsequent prototype (a total of four were produced by Le Caine and his assistants) not only were new features added, but new discoveries in the world of electronics required that the entire technical basis of the instrument be substantially modified (during this 28-year period electronic components changed from tubes, to transisitors, to integrated circuits). Such a protracted and disjointed process of development no doubt contributed to the complexity of adapting the design of the Sackbut for manufacture. Whatever the degree of responsibility of the various players in the demise of the Sackbut manufacturing project however, it is clear that everyone con-

cerned seriously underestimated the manifold difficulties involved in developing a production prototype of the instrument.

Ultimately then, the most critical factor affecting the commercial potential of both the Multi-track and the Sackbut was time: in the competitive and fast-changing world of electronic instruments, most industry experts agree that a period of no longer than two to three years can elapse before a product must be brought to market. Balancing the pit-falls of launching an instrument before it is technically ready against the potential for competitors to gain an upper hand in the marketplace is an extremely delicate part of commercial decision-making that has caused the demise of many otherwise successful and innovative firms. And in the case of Le Caine's Sackbut, the competition--early performance synthesizers by Moog and ARP--had already made their market debut.

Synthesizers of the 1970s: The Birth of an Industry

The development of analog and digital synthesizers[4] (and a commercial market for them) during the 1960s and '70s was largely the result of the activities of a handful of musicians, inventors and entrepreneurs, often working out of small make-shift laboratories and manufacturing facilities. The relationship between musicians and engineers was especially important during this period because it was through their various collaborations that not only individual devices were invented but the design and operational characteristics

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[4] An analog synthesizer creates sounds through the generation, modification and control of electrical voltages; sounds represented in electrical form are quantified on a continuous scale of voltages and the resulting audio waveforms can be sent directly to tape recorders or amplifiers. Digital synthesizers, on the other hand, represent sound phenomena through numbers only; quantification is done on a scale of discrete steps and the resulting calculations must be submitted to a process known as digital-to-analog conversion before being recorded or amplified via loudspeakers. Digital synthesizers offer greater precision in the generation and control of synthesized sounds and, once initial designs have been incorporated into hardware and software form, they can be mass produced at lower prices than analog equipment.

of an entire genre of musical instruments gradually evolved. In this regard, the early collaborations between composers such as Herbert Deutsch, Walter (now Wendy) Carlos, and Gustav Chiamaga (of the University of Toronto) and inventor Robert Moog (based in Trumansburg, NY), or that between Morton Subotnick and Donald Buchla (in San Francisco), or John Eaton and Paolo Ketoff (in Italy), have long been understood in the history of electronic music as critical relationships that helped define the very nature of the analog voltage-controlled synthesizer during the 1960s.

But with Moog another factor also became critical, for Moog was perhaps as vigorous an entrepreneur as he was talented as an engineer. During the ten years prior to 1964 when he first introduced his modular synthesizers, Moog had already managed to pay his way through graduate school and make a reasonably successful living out of building and selling Theremins on a part-time basis from his own home. This experience, and others like it (not all of them successful), gave Moog a sensitivity to the marketplace that he might otherwise have lacked had he remained only in the service of the university-based music community.

Partly as a result of this sensitivity and an interest in popular electronic organs, Moog, from the outset, had no reservations about creating an electronic instrument with a conventional organ keyboard as a controller (a step that Buchla, with his closer relationship to the avant-garde, was hesitant to make). As popular musicians became more interested in Moog's devices as recording studio and live performance instruments he turned his efforts away from the large, modular systems designed for laboratory use towards the problem of creating a synthesizer that would be portable, reliable and easy to use: the Minimoog, introduced in 1970, was the fruit of this labour and was eventually to become one of the most popular electronic keyboards of the 1970s (the instrument is well documented in both the serious and popular literature on electronic music so I will not describe it in detail here).

This popularity was not easily turned into substantial sales figures however for no real promotion, distribution or retail network existed for the instruments at the time. Both Moog and his most powerful rival of the period, ARP Instruments (founded by engineer Alan R. Pearlman in 1969), initially had difficulty convincing music retailers to even carry the new instruments and, in this regard, the early 1970s must be seen as an important period in which the infrastructure required to create and maintain a dealer base (and hence, a viable market) for electronic synthesizers was established. Some degree of legitimacy appears to have been achieved by about 1973 when the American Music Conference began to include synthesizers as a separate category in compiling annual statistics on music instrument sales (about 7,000 synthesizers were sold in the U.S. that year, valued at approximately $8 million, rising to approximately 24,000 units annually during the latter part of the decade; AMC).

The development of a small network of independent dealers, often times musicians and/or engineers themselves, has often been ignored as an important factor in the early development, promotion and distribution of synthesizer technology. In Montréal for example, musician and composer Otto Joachim had been an early enthusiast of electro-acoustic music and had set up his own studio during the mid-1950s. He later became an independent dealer of electronic instruments in his spare time and in this way helped to introduce synthesizers to the local Montréal market. Joachim and enthusiasts like him in cities throughout North America were the first links between the fledgling industry and its consumers.

But beyond simple distribution, the development of a network of independent dealers during this period had significant ramifications as regards design and technical innovation, especially during this initial period in which the new technologies were transformed into commercial products. Tom Oberheim, inventor of a number of poly-phonic synthesizers, expander modules, and other devices during the mid-'70s, began his

career in the late '60s building electronic devices for individual musicians that he had met while studying physics at UCLA. Later, in 1971, he became a dealer for ARP instruments in Los Angeles and, in this capacity, had direct contact with many popular recording artists (including Ian Underwood and Frank Zappa, among others) and session players in the area. It was, in part, through his experience as a dealer and his relationships with these performers that he developed an awareness of the possibilities of analog synthesizers and, equally important, the specific needs of musicians (Darter & Armbruster 1984: 96-97). In a similar way, though somewhat later, musician and electronics engineer Dave Simmons began his industry career as chief service engineer for ARP instruments in Britain during the late '70s; out of this and other experiences he developed his own line of drum synthesizers which became well known in popular music during the 1980s (Anderton 1988: 77-8). Both these examples bear testimony to von Hippel's theory that the functional source of technical innovations is variable and that any party that stands to benefit from an innovation--as user, manufacturer, supplier, distributor, insurer, etc.--can be regarded as a potential source of innovation (1988: 3-4).

As intriguing as some of these individual stories may be, the main focus of my inquiry here is the manner in which synthesizer manufacture reached industrial proportions during the 1970s and thus set the stage for the innovations in design and marketing that would not come to full fruition until the 1980s. As the decade of the '70s progressed, the informal networks of individual engineers producing custom-designed instruments, in make-shift manufacturing facilities, and distributed through independent dealers directly to musicians and enthusiasts, quickly gave way to more formal structures of research and development, manufacturing, distribution, promotion and artist endorsement (in the latter case, a very different kind of relationship than that of the early collaborations mentioned above). By the mid-'70s dozens of manufacturers from a number of different countries (including Japan) had entered the marketplace and synthesizers were quickly becoming an

important niche item carried by larger music shops in most major cities. A number of interrelated factors contributed to the character of this process of industrial maturation; some of these factors are no doubt similar to those occurring within any industry as it moves quickly towards mass production capability while others are, I think, more dependent upon the general nature of relations within the music instrument industry, on the one hand, and the more specific problems of technical innovation within the highly competitive electronics industry, on the other.

Undoubtably, the most important factor contributing to the expansion and maturation of the synthesizer industry was the decision on the part of a number of engineers and inventors, such as those already mentioned above, to move away from making unique devices to meet the specialized needs of avant-garde composers working primarily in institutionally-based electronic studios, towards the manufacture of affordable, keyboard-oriented musical instruments that could meet the demands of live performance.[5] Among the more immediate effects of such a decision were the requirements of greater planning in product development and large-scale financing of manufacturing facilities. The various engineer/entrepreneurs responded to these necessities with greater or lesser success during the 1970s but, ultimately, few of the engineer-owned companies established during this period survived into the 1980s. The failure and/or gradual absorption of these enterprises into larger industrial concerns, and the displacement of the individual inventors by

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[5] Not surprisingly, a certain residual resentment has coloured many of the conventional avant-garde histories of electronic music as a result of this shift in manufacturing priority: Schrader, for example, devotes only about three pages (half of them taken up with photos of various instruments) to the entire development of voltage-controlled keyboard synthesizers during the 1970s and ends his brief account with a lament for the lack of manufacturing support given to modular, studio systems (1982: 138-141). Ironically, as Schrader himself admits, only a handful of institutions had ever been able to afford electronic music studios during the 1950s and '60s; the vast majority of colleges and universities in North America established programs in electronic music during the decade of the '70s when voltage-controlled instruments had become cheaper and easier to use. In many cases, they equipped themselves with the same inexpensive keyboard instruments used in the popular field--a phenomenon that became even more prevalent during the 1980s.

engineering teams must be regarded as a key sign of the maturation of the synthesizer industry.

In the case of Bob Moog, the initial transition from inventor and entrepreneur to company president was relatively slow compared to the swift and far-reaching changes that overtook him and his company during the early 1970s. Moog had established the R.A. Moog Co. as early as 1954 as a part-time business to make and sell his Theremins but it only became a full-time operation in 1964 when he began producing voltage-controlled synthesizers and components. The company was not fully incorporated until 1968 and its name was changed to Moog Music, Inc., in 1971; the inclusion of the word "music" in the company name was significant insofar as it reflected Moog's decision to design and market the Minimoog as a musical instrument for performers as opposed to a studio production device (it was in that same year that Moog first displayed the Minimoog at a NAMM trade show; prior to that time Moog had presented his inventions at the Audio Engineering Society annual meetings).

Not long after entering the marketplace however, Moog Music was acquired, in 1973, by the Norlin Corporation. Norlin had been formed in 1970 out of a merger between one of the largest music concerns in the U.S., Chicago Musical Instrument Corporation (owner of Lowrey Organs and other successful instrument lines), and a foreign holding company, ECL Corp., who hoped to profit from the phenomenal growth that had occurred in the music instrument industry during the 1960s. In an attempt to internationalize the company's operations, ECL installed professional managers and consultants at the head of Norlin; few of these individuals appear to have had any understanding of the music instrument trade, however, and most of their investments and attempts to develop new products failed miserably (Majeski 1990: 176-78).

Initially, with the financial backing, distribution and marketing structures of such a large corporation, Moog was able to concentrate on manufacturing and instrument

development: soon he was producing Minimoogs faster than Norlin could sell them and, in 1974, introduced the Micromoog (an even more simplified synthesizer aimed at a lower-priced market). Ironically, though still nominally president of the subsidiary, Moog's position had become that of an employee within the larger corporate structure and, between 1974 and 1977 (when he left the company), he took a far less active role in the design of new products (Moog 1985: 36).[6]

By this time, product development at Moog Music, and elsewhere, was quickly becoming the province of design teams--a shift that was not simply the result of changing organizational structures but, also, one that was virtually necessitated by the increasing complexity of developing the next generation of synthesizer technology. The new instruments had been designed for keyboard players and, insofar as they had achieved a certain degree of popularity, it could be said that the innovating manufacturers had created a market for themselves; but their continued success would also be dependent upon the degree to which they could meet the escalating demands of that new market. The keyboard itself was perhaps a critical factor: traditionally, keyboard players had certain expectations of their instruments and this placed a burden on the manufacturers to come up with additional technical innovations. It was clear, for example, that the next generation of synthesizers would have to be polyphonic (the early synthesizers could play only one note at a time, a characteristic that frustrated many keyboard players who were used to playing polyphonic instruments like the piano and the organ); and, secondly, some way would have to be found to make synthesizer voice changes as quick and easy to execute as choosing a stop on an electronic organ (programming new voices on the earlier instruments was often

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[6] Moog later founded another company where he engaged in the custom design of electronic equipment and eventually joined Kurzweil Music Systems, during the 1980s, as vice president of new product research. Tracing the migrations of the various inventors and designers from the early period of synthesizer development to the present day would constitute a major study in its own right.

laborious and time consuming and therefore virtually impossible to execute in live performance contexts; devising a method of storing pre-programmed sounds for instant recall was clearly on the agenda).

The problem of achieving polyphonic keyboard designs with analog technology proved to be formidable: ARP Musical Instruments developed (and patented) a complex polyphonic key-switching design for their instruments that could play two or more notes at a time using a (not always musically useful) high note/low note system of priority logic. At Moog Music, the difficulty of devising a workable polyphonic design of their own using existing technology held up the introduction of the Polymoog for several years. Such difficulties allowed other entrepreneurial firms, starting from a very different technological base, to introduce innovations that neither ARP nor Moog could achieve.

The key breakthrough came in 1975 when Dave Rossum and Scott Wedge, founders of E-mu Systems, introduced a keyboard scheme making use of microprocessor control and using a time-based form of logic; the design was adopted not only by E-mu but also licensed to two other young entrepreneurial firms, Oberheim Electronics and Sequential Circuits, for use with their instruments. Similarly, Sequential Circuits had made its own entry into the marketplace during the early 1970s by introducing a digital device to edit and store synthesizer sound patches (thus taking a major step towards solving one of the other main problems associated with analog synthesizers) and a digital sequencer; its Prophet-5, introduced in 1978, was the first commercial synthesizer designed entirely for microprocessor control.

The introduction of microprocessor control by companies like E-mu Systems and Sequential Circuits was a critical step in synthesizer design: not unlike Hammond's use of the synchronous electric motor to regulate the speed of the mechanical sound producing mechanism of his organs during the 1930s, these companies used microprocessor technology to stabilize and control the analog components of the synthesizer and to introduce

fundamental product improvements that could not have been achieved using analog electronics alone. While synthesizers remained, for the time being, hybrid devices--a combination of digital and analog components--I would argue that the introduction of microprocessor-based technologies represented a type of "technological discontinuity" (Tushman & Anderson 1986: 440-441) in synthesizer design during the 1970s. Furthermore, this discontinuity should be understood as "competence-destroying" (Ibid.: 442): the new technology did not build on the type of technical competencies already present within the established companies; this allowed the new entrepreneurs to gain a foothold in the marketplace, thereby increasing the level of competition and uncertainty (or "turbulence") in a young and already volatile industry. In essence, the introduction of microprocessors shattered the "technical competence" of the earlier designers of analog synthesizer technology:

> I remember that the Moog engineering department was in up to its chin coping with the problems of getting the Polymoog into production. Work on that instrument had already proceeded for more than three years, and there was heavy pressure from headquarters (Norlin) to get it into the stores. To redesign the Polymoog for microprocessor control would have meant another two-year delay and many more hundreds of thousands of dollars--which, as they say in the business world, was 'an unworkable plan.' (Moog 1985: 38, 40)

The degree to which the loss of technical competence and increasing market competition affected the industry leaders was staggering: Moog Music managed to produce a microprocessor-controlled synthesizer in 1981 but it was already far too late for the company to regain its former market position; Norlin was forced to liquidate the company in 1985. And at ARP, which had become the industry leader in the mid-1970s, a combination of mismanagement, design error, and financial miscalculation, had led to the spectacular failure of the company in 1981 (for a detailed account of the events leading to the collapse of ARP, see Waters 1983). From the standpoint of technical innovation, the

entire approach to instrument design at ARP seemed to be at odds with the pace of change in the electronics industry. According to one observer,

> A major part of the company's design philosophy was explicitly to recycle circuit boards into new instruments, which left plenty of room for newcomers in the industry, unencumbered by outmoded components and concepts, to take advantage of developments such as microprocessors. (Jim Aitkin in Ibid.)

During its last years of operation, ARP attempted to design its own microprocessor-controlled synthesizer but the company went bankrupt before the instrument could be put into production (ARP's instrument--the Chroma--and its design team was eventually sold to CBS/Rhodes which did introduce the instrument some time later).

But the importance of the introduction of microprocessors in synthesizer design was not simply that it led to the downfall of a small number of industry leaders and to the rise of another, more enterprising group of entrepreneurial inventors. Microprocessor control was the first step in the development of commercially-produced, digital musical instruments--an event that would precipitate a far more important development, the phenomenon of "transectorial innovation" within the musical instrument industry as a whole.

Transectorial Innovation & the Music Instrument Industry

In an essay published in 1987/88, André Piatier has discussed the significance of a phenomenon in which innovations developed to meet the needs of a specific industrial sector come to play an important role in the creation of new innovations and commodities in formerly unrelated industries. He refers to this phenomenon as "transectorial innovation" and goes on to argue that it has become an increasingly important factor in the late twentieth century especially as regards innovations associated with electronics and biotechnologies

(Ibid.: 212). Transectorial innovation leads not only to the creation of new products but can also contribute to the diversification of innovating firms and to a transformation in the ways in which industries characteristically organize their operations (Ibid.: 223-28). And perhaps more important, the nature of recent transectorial innovation has resulted in a kind of technical interdependence where "each sector has become more and more dependent for its own development on all others" (Ibid.: 209).

I would like to adopt Piatier's concept of transectorical innovation here as a way of understanding developments that have occurred within the musical instrument and audio industries since the introduction of microprocessor technology. But whereas Piatier focusses his discussion on the transfer of technology from one industrial sector to another, I want to expand upon his observations by introducing a set of subsidiary concepts: I will refer to the movement, from one industry sector to another, of individuals with particular forms of technical knowledge and expertise as "transectorial migration"[7]; and I will use the term "transectorial marketing" to describe particular concepts or practices of marketing and promotion that clearly originate in one industrial sector and are subsequently taken up in other areas.

The evidence of transectorial innovation can be seen at a number of levels within the musical instrument industry and its effects have been as profound and contradictory as they are varied. At the level of technology, the inclusion of microprocessors in musical instruments of the 1970s and '80s placed the manufacturers of electronic keyboards and audio devices in a position, on the one hand, of dependency with regards to the overall advancement of general-purpose microprocessor technology and, on the other, of having to

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[7] Piatier also uses the term "transectorial migration" but does so to refer to the movement of technologies rather than individuals; in this sense, his use of the term is virtually synonymous with the notion of transectorial innovation itself. While my adoption of the idea of "migration" here may be different from Piatier's it is, I think, entirely in keeping with the general outlines of his argument.

develop the expertise necessary to create their own custom-designed integrated circuits for specific musical purposes. At an industrial level, these two complementary pressures have in turn resulted in, firstly, a reliance on the general economic success and innovative capacity of the computer industry as a whole and, secondly, a simultaneous tendency towards product and market diversification for the innovating musical instrument firms.

In the first instance, the capabilities of microprocessors--in terms of raw power, efficiency, complexity of device interconnections, cost and availability (see Kahrs 1989)--have played an important role in the development of each successive generation of electronic musical instruments since the mid-1970s.[8] Initially, a number of polyphonic keyboards and sequencers of the late-'70s were based around the characteristics of early 8-bit microprocessors such as Intel's 8080, Motorola's 6800, and Zilog's Z80: for example, the Zilog Z80 processor was incorporated into the design of E-mu Systems' polyphonic keyboards, Sequential Circuits' Prophet-5 synthesizer, and Roland's MC-4 digital sequencer (Anderton 1988: 44-45). During the 1980s, not only synthesizer control functions but their entire audio production pathways were designed as digital circuits and this created a need for ever more powerful processors. To a large degree, synthesizers and samplers can now be regarded as nothing less than personal computers whose operating systems and input/output circuitry have been optimized for musical purposes: Ensoniq's EPS-16 sampler, for example, contains a standard Motorola 68000 microprocessor, the same chip found in computers manufactured by Apple, Atari and Amiga during the mid-1980s.

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[8] The capabilities of other digital components can also have a similar impact on instrument design: for example, Will Eggleston of Lexicon has related how, when the PCM70 digital signal processor was being developed during the mid-1980s, the device had to be redesigned in order to take advantage of denser and cheaper RAM chips that were then coming available (Anderton 1988: 94-95). With the advent of digital sampling and drum machines and synthesizers based on sample playback designs, the cost/density ratio of memory chips (whether in the form of RAM or ROM) became an important factor in the overall capacity of an instrument to store and reproduce musical sounds.

In a similar manner, as digital audio production has become the norm throughout the sound recording industry, the advancement of audio editing and processing technology has become heavily dependent upon the availability of powerful digital signal processors (DSPs). As a result, many of the digital audio "workstations" currently available from a variety of manufacturers make use of the same signal processing chip, the Motorola DSP56001 (also used in the NeXT computer). But more importantly, plans for the next generation of workstations, which will integrate both digital audio and video, are entirely contingent upon the availability of even more powerful, parallel processing DSP chips emanating from the computer industry. Thus, it comes as no surprise that periodicals devoted to audio engineers now contain articles eagerly greeting the announcement of each new development in computer hardware and long descriptions of their more obscure characteristics, such as math capabilities, interrupt functions, and the like (for example, see Pohlmann's optimistic predictions concerning the arrival of Motorola's DSP96002 chip in *Mix* 15 (7), July 1991, 12-16).

As is perhaps clear from the above, the use of standard, general-purpose microprocessors and more sophisticated DSP chips represents a potential constraint on musical instrument and audio design insofar as the overall capability of the system will be dependent on the characteristics, power and speed of chips already in wide-spread use (and hence, cheap and readily available) in the computer industry. But such a dependency can also be understood as an enabling factor when one considers that the potential market for musical instruments and audio production devices is relatively small. The availability of off-the-shelf digital components is, in part, what allows technical innovations to occur in the music instrument industry in the first place, especially at the consumer end of the industry where the costs of design and production must be kept under tight control:

> This industry is far too small to innovate dramatically on its own...prices have come down I think mainly because we

> have been able to feed off the computer industry...we're going to live off what the computer industry is doing.
> (Synthesizer Engineer and Chip Designer, personal interview)

Consumer audio is another area on which electronic musical instrument designers have become dependent for basic components: "The whole CD revolution is what allowed the digital thing to happen and bring the cost down further because you could get D-to-A (digital-to-analog) converters at a good price" (personal interview, Ibid.). The same is true in the digital audio industry where, ironically, the trickle-down theory of technological progress has now, at least in part, been reversed:

> it is primarily the high volume of consumer sales which will justify the integration cost of circuitry, thus the professional's digital multitrack recorder will use chips primarily designed for CD players. That is the economics of digital design. (Pohlmann 1985: 22)

In both instances then, the phenomenon of transectorial innovation is not only a vital factor in the continued development of the digital musical instrument and professional audio industries, but rather, it must also be considered as a basic precondition for their very existence.

The music instrument industry is not, however, simply a parasite that lives off the back of the computer and consumer audio industries: from the outset, innovating music firms have had to commission or develop custom-designed components of their own to meet the specific needs of sound generation, control and processing. For example, from the late-1970s onward, two companies in particular--Solid State Music (SSM) and Curtis Electromusic Specialties (CEM)--made a substantial contribution to the development of analog (and later, digital) music technologies by designing and manufacturing integrated circuits (ICs) for musical purposes. While more expensive than most general purpose ICs, the application-specific character, degree of integration and reliability of SSM and CEM

chip sets led to their being used in literally dozens of products by a variety of organ, synthesizer, and audio equipment manufacturers (Anderton 1988: 46-52).

By the 1980s, increasing levels of integration and the importance of chip design overall in the development of the next generation of synthesizer technology made it inevitable that manufacturers would begin to develop their own expertise in the design and fabrication of integrated circuits. Large music companies such as Yamaha and Roland, and even many smaller firms such as E-mu, Ensoniq and Alesis, have developed the capacity to design and/or manufacture their own large scale, and very large scale integrated circuits (LSIs & VLSIs). Indeed, the market success of many of the smaller entrepreneurial firms during the 1980s has been based on their ability to innovate in the area of chip design and thereby create products with extensive features and capabilities at a lower cost than the competition.

This newly developed technical expertise within the music industry has allowed some manufacturers to expand and diversify their operations into new industrial sectors and markets. In this sense, the phenomenon of transectorial innovation has not simply been a one-way street:

> That's one of the nice things that music does offer: because it is a technically competitive field, there is technology that does happen. You bring in some technology, you mold it and shape it and it turns into something else. But in order to do that you develop chip technology, hardware technology, software technology, manufacturing...all those things, so that if you are now in a position to see another opportunity you can actually go after it.
> (Synthesizer Engineer and Chip Designer, personal interview)

And during the 1980s, music companies did "go after it" in a variety of ways. For example, Yamaha, which had established its own facilities for the manufacture of ICs used in its electronic organs as early as 1969, had developed its design capabilites in the area of LSI and ASIC (application specific IC) technology to the point where, in 1983, it began to

develop an entire line of ASICs for outside customers. In this way, Yamaha has not only been able to improve its own product line and keep costs down through in-house manufacturing but has also become part of the supply industry for basic digital components (Yamaha chips can be found in Atari computers and a variety of other digital products). Similarly, in 1981, Roland established a separate corporation, Roland DG (Digital Group), for the purpose of exploiting its expertise in electronics and digital technology; the company produces devices such as plotters, modeling machines and other computer peripherals. Even smaller firms have used their work in music and audio technology as a means of diversifying their products and entering new markets: in 1989, Ensoniq launched an innovative design for hearing aids which, if successful, could give the company a foothold in the large (and very lucrative) market for medical technology.

To a certain extent, this movement within the electronic musical instrument industry may go beyond simple diversification. Piatier argues that the multisectorial aspect of recent innovation within the electronics and biotechnology fields represents a new kind of "technological strategy": whereas firms might have once used technology as part of an overall "product strategy" within a single market, technology has now become the core of the firm, the means through which a variety of products can be developed for any number of markets (1987/88: 223-226). Support for Piatier's argument can be found throughout the electronic musical instrument industry: for example, during the late-1980s, Anatek Microcircuits Inc., a Vancouver-based company with close links to suppliers of integrated circuits for the hearing-aid industry and other specialty markets, entered the music market by introducing an innovative and highly successful set of peripheral devices for MIDI synthesizers and computer music systems under the brand name "Pocket Products"; similarly, Brother International, best known as a manufacturer of electronic typewriters, has used its expertise in electronics as the vehicle for a technological strategy that includes

the production of computer peripherals, home appliances and, more recently, digital sequencers for the amateur music market.

What is striking about this phenomenon is that unlike the early-1970s when large, diversified corporations such as Norlin entered the music market by simply buying up existing music firms, the electronics companies that pursue a program of transectorial innovation do so by making use of their formidable technical expertise in order to produce a limited range of products for a variety of specialized markets at lower than existing costs. What Piatier describes as a "technological strategy" has been linked by other theorists, such as David Harvey, to a broader transformation in the nature of capital and mass production in the late twentieth century:

> flexible production systems have permitted, and to some degree depended upon, an acceleration in the pace of product innovation together with the exploration of highly specialized and small-scale market niches. Under conditions of recession and heightened competition, the drive to explore such possibilities became fundamental to survival.
> (Harvey 1989: 156)

Harvey argues that the technological strategy of these highly mobile innovating firms is just one of a number of shifts in the organization of finance, labour, production and consumption that signals the arrival of a new system of "flexible accumulation" that has begun, in the so-called "postmodern" era, to displace the rational, bureaucratic modes of production and management associated with Fordism (Ibid: 141-172).

But it is also clear that transectorial innovation in the electronics industries and the technological strategies that it fosters could not occur without the existence of fairly large numbers of individuals who, possessing certain types of knowledge and skill, are constantly in search of new outlets for their talents. "Transectorial migration" then, has no doubt also been an important factor in the proliferation of digital technologies throughout many industrial sectors. This has certainly been the case in the field of electronic musical

instrument design, where the migration of individuals from the computer industries has been essential to the development of an entire generation of electronic instruments and recording devices.

Perhaps one of the most salient examples of transectorial migration can be found in the U.S.-based Ensoniq Corporation,[9] which made its debut in the music market in December of 1984 with an inexpensive digital sampler called the Mirage. The Mirage itself is noteworthy in that it has been widely recognised as marking the arrival of custom VLSI technology within the U.S. synthesizer industry; its "Q-Chip," a sound chip originally developed for the video game market and further developed for the Mirage, is an example of transectorial innovation *par excellance* Ensoniq's founders--Bruce Crockett, Albert Charpentier and Bob Yannes--had previously worked for Commodore International and were largely responsible for some of that company's most successful products: the VIC-20 and the Commodore 64 personal computers (the work of Yannes on the the C-64 included the design of a sound chip that provided the computer's sound capabilities). After leaving Commodore in 1982, the co-founders planned to start their own computer company but an overall slump in the computer industry made it difficult to find venture capital with which to establish operations (the fledgling company did begin one computer-related project that was sold to Atari). One of the founders, "a closet musician," suggested musical instruments as a possible alternative to computers and, after three months of market research, the company decided that its expertise in custom chip design could give it a leading edge in the production of electronic keyboards. The migration of individuals from Commodore to the music industry was thus a clear case of technical expertise looking for a market (interestingly, in

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[9] The information presented here and elsewhere in the dissertation concerning the Ensoniq Corporation was obtained from a variety of sources including interviews conducted on-site at Ensoniq's headquarters, company brochures and product literature, and articles found in various trade magazines and newspapers (of the latter, see Poe 1988 and McBride 1988).

some of its product literature, Ensoniq does not even describe itself as a music company, but rather, as a "technology company").

The company began working on a synthesizer but soon decided that the market for digital samplers would be a more appropriate place to make an entry: at the time, even the most inexpensive samplers cost over $8,000. and the people at Ensoniq were convinced that, with their custom chip designs, they could create a sampler at a much lower cost; in the end, Ensoniq's Mirage was introduced at a price of only $1,695. The product strategy employed in developing the Mirage was one that the co-founders had "brought with [them] from Commodore" and, in this regard, can perhaps be considered as a form of "tran-sectorial marketing": the team began with a "marketing definition" of the Mirage--a definition that had less to do with what the capabilities of the instrument would be than what it would cost. Once the appropriate "price point" had been determined, it then became a matter of deciding what features would be possible to include in the instrument and how they would be implemented in terms of technical design (the latter were certainly not trivial tasks given the economic constraints; the cost vs. performance tradeoff inherent in the design of a commercial digital instrument results in what has been called "an art of compromise" demanding the utmost creativity, sensitivity and good judgement on the part of designers; see Rossum 1987). At times, even Ensoniq's promotional strategies appeared to have been imported directly from the computer industry: when it launched its second-generation sampler in the late-1980s it did so with a promotional campaign entitled, "Test Drive an EPS," echoing Apple's "Test Drive a Macintosh" marketing pitch introduced in 1984.

Similarly, individuals in a number of music instrument companies have also stated that their concepts of product development and marketing ideas often come from their prior background in the computer industry. One reference that came up on several occasions in interviews and articles was Guy Kawasaki's *The Macintosh Way* (1990). Kawasaki's

book is a light, tongue-in-cheek history of Apple Corporation and a guide to the marketing of high-tech products. In addition, it can be regarded as an inside look at computer culture and some of its dominant concerns: the fascination with technology for its own sake, styles of management, the importance of user groups, and the like. But what the book is about is perhaps less important than its status as a common reference point among a number of individuals in different parts of the music industry; as such, it offers some insight into the diffusion of ideas and the workings of transectorial marketing.

The success of Ensoniq's marketing research and their imposition of a precise and relatively fixed "price point" at the outset of the innovation process suggests that marketing expertise may be one of the most essential complementary skills required of the innovating firm. Indeed, because of the complexities involved in developing products for multiple markets, marketing knowledge must be regarded as virtually equal in importance to technical knowledge as a requirement for transectorial innovation.

To a certain extent, this is nothing new: detailed studies of the innovation process have argued that the recognition of a need that can been satisfied through technological means is one of the first steps taken by any inventor or organization. In Wasserman's 12-stage outline of the innovation process, for example, the perception of a need is the second stage (preceded only by the establishment of a basic body of knowledge in the appropriate area of science) in the overall flow of events (1985: 9-13). But while Wasserman may give the perception of a commercial opportunity precedence within his overall scheme, it is clear that this initial stage of the innovation process is primarily a point of departure that does not, in any necessary way, determine the manner in which the innovation will be realized: later stages, such as the conception of the invention, theory of operation, and the development of prototypes, appear to be relatively autonomous. Furthermore, Wasserman's outline, which breaks the innovation process overall into two distinct areas of activity, "invention" and "implementation," does not recognise the degree to which problems

anticipated in production engineering (an important "implementation" stage where the product is prepared for the marketplace) may influence the initial design of prototypes or even earlier stages of "invention": even in his more elaborated model (presented at the end of his study) which explores the predominence of economic pressures on the process as a whole and various overlaps and feedback cycles between stages, this influence is not addressed (Ibid.: 119-123).[10]

Recent attempts to map the innovation process in more commercially competitive environments than that presented in Wasserman's study (e.g., Livesay, et al. 1989) have emphasized both the scope and depth of market analysis required to produce successful innovations. And Davidow's *Marketing High Technology* (1986) demonstrates that the evolution of needs in the marketplace and the outside influence of competition both have as much influence on the design of new technologies as the interests of engineering teams.

But what is most important for my argument here is the manner in which the speed of technical innovation and the increased pressure to bring new products to market as quickly as possible has had an overall effect on the innovation process, the nature of the devices produced, and the relationship with the consumer. Firstly, most industry people agree that a period of about 18 months to two years is the maximum lead time that a manufacturer can afford in terms of the development of a new instrument. This places a pressure on the innovating firm to compress and streamline the various stages of marketing, design and production, such that there now exists an overall fusion of these moments in the life of a new product.

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[10] To a certain extent, these issues are not addressed in Wasserman's model because they do not fit well within the particular case study--the development of loaded circuits in early long-distance telephone transmission--on which the model is based. However, Wasserman does mention, in passing, more recent work that takes into account the potential "loop" between production and design stages (Ibid.: 9-10, and footnote 12, p. 132).

Certainly, the design process is still divided, conceptually at least, into fairly distinct stages, from basic research, to product concept, chip design, the development and testing of prototypes, production models, etc. But as I have already argued, it is equally clear that, at a practical level, commercial innovation demands that production criteria be considered at the outset: however, this includes not only the use of foresight in the selection of appropriate components at the time of constructing prototypes (as noted in Kaplan 1989); but also, because software programming can be extremely dependent on the types of hardware in use, even the initial decisions concerning the operational characteristics of the instruments can be influenced by hardware and cost/performance constraints. For example, both Rossum (1987) and Mauchly and Charpentier (1987) describe how such criteria influenced their decisions regarding the basic approach taken towards the problems of designing digital oscillators in early sampling instruments introduced by E-mu and Ensoniq, respectively. In this way, marketing issues can have an impact on even the most basic levels at which scientific principals are turned into hardware designs.

The nature of mass production in the hi-tech industries also poses specific problems, and generates particular solutions, with regard to management, quality control and delivery systems not often encountered in conventional musical instrument manufacture. For example, the complexity of digital instrument design has led a number of companies in the synthesizer industry to adopt the management strategies advocated in the work of W. Edwards Deming (see Deming 1981, Deming & Grey 1981, and Walton 1990). More sober than the attitudes expressed in Kawasaki's book cited above, Deming's work provides a managerial framework for planned innovation and statistical techniques for quality control. Only recently adopted in North America, Deming's ideas have had a major influence in Japan since the Second World War, where he is regarded as "the 'patron saint' of Japanese quality control" (Morita 1986: 165)--the Deming Award is one of the highest distinctions in product quality that can be awarded to a Japanese company. In order to

reduce the risks of overproduction in the highly volatile market for high technology, smaller companies have also adopted "just-in-time" strategies of inventory flow and delivery; the "just-in-time" system cuts down on the amount of stock held by the company and has been cited by David Harvey as one of the many strategies contributing to the rise of more flexible modes of accumulation in the post-Fordist organization of production.

In terms of the products themselves, there has been a tendency to introduce "families" of instruments, with differing capabilities, rather than individual devices. For example, whereas high-end synthesizers like the Fairlight and the Synclavier came in only one basic model (with the possibility of adding various expansions); manufacturers like Roland have used successive product introductions--such as the D-50, D-20, D-110, MT-32, all based on its so-called "linear arithmetic" technology--as a means of distributing design costs over a range of instruments. The technical and financial investment in custom LSI and VLSI chip design often constitutes the largest part of the design effort: it takes a minimum of 10 to 12 months to design a single chip (a new instrument could contain several) at a cost of approximately $250,000 to $300,000; whereas it might only take about 6 to 8 months to design each new product incorporating the chip. In order to offset these costs, the manufacturer needs to anticipate instrument sales of at least 50,000 to 70,000 units (this reduces the cost of designing the chip to a mere $5/unit with fabrication costs adding approximately another $9-$10). To generate sufficient returns and to reduce the risks entailed in the market failure of any one product, it makes sense for the manufacturer to design chips that can be used in at least three instruments, and thus increase the potential life-span of the chip in the marketplace to two to three years. From a marketing point of view, this also requires that hi-tech companies engage in an almost obsessive program of product differentiation in order to separate not only their own products from those of their competitors (e.g., with "creative marketing" terms such as "linear arithmetic," "structured adaptive," and "advanced integrated" synthesis; Mauchley & Charpentier 1987: 29), but

also, in order to distinguish their own product lines from one another (Davidow 1986: 37-52).

Above all, the increased pace of technical innovation has resulted in a new phenomenon that has been described as a need for "continuous innovation" (Baba 1989) through out industry, creating various dependencies between small, creative firms and large, scale-intensive corporations. Again, evidence from the electronic musical instrument industry suggests that a number of the early innovators in the field have now become "innovation suppliers" (Ibid.) to the dominant manufacturers: for example, the creative team behind Sequential Circuits has been absorbed by Korg and become the centre of their U.S.-based R & D efforts; similarly, Kurzweil Music Systems was purchased by Young Chang (a Korean piano manufacturer) in order to provide them with the technology necessary to enter the electronic keyboard market; and both E-mu and Ensoniq have provided technology to larger companies such as Apple Computers, Matsushita Electric Industries, and Baldwin Pianos.

But what is often ignored in this scenario is the fact that an increase in the turnover of innovations also requires an increase in the consumption of goods. Thus, insofar as continuous innovation demands continuous consumption, the role of marketing and promotion has been both expanded and intensified in the music industry. And in this regard, the existence of "user groups," so characteristic of the world of computers and, now, electronic musical instruments, provides an essential vehicle for continuous, ongoing relations between manufacturers and a group of consumers that might be considered as the "opinion leaders" in the diffussion of new musical technology (Rogers 1983: 271-311, Kawasaki 1990: 87-96; a more detailed discussion of such groups will be taken up in Part II of the dissertation). Marketing and promotion pervades both production and consumption in high technology fields firstly, as a necessary component of successful transectorial

innovation and, secondly, as a precondition for sustaining the pattern of continuous cycles of innovation.

Conclusion

Electronic musical instrument design has undergone a series of enormous changes during the twentieth century: from a technical and marketing point of view, the idiosyncratic experiments of individual inventors have been superseded by a series of innovative designs that have attempted to combine electronic sound generation with the characteristics of conventional musical instruments (primarily piano and organ-like keyboards). In the early twentieth century, as I have argued in this chapter, the Hammond organ stands out as an unparalleled achievement: the simplicity of its design made it ideal in terms of efficient manufacturing and the conventional nature of its playing mechanism (to which was added a simple yet powerful means of sound modification--the drawbar system that gave the user direct access to the tone wheels) guaranteed its acceptance in the marketplace. Certainly other successful keyboard instruments followed--the Rhodes electric piano was notable--but none appear to have captured the market for musical entertainment in the home in the manner that the electronic organ did from the 1950s onward.

Similarly, the shift from modular synthesizer design, during the late 1960s and early '70s, to inexpensive, performance-oriented keyboards changed the nature of the synthesizer as a musical instrument and paved the way for the later development of polyphonic synthesizers, portable keyboards, digital pianos, and MIDI. Certainly, composers of avant-garde music have tended to regard these developments as retrograde, as impediments to true musical "progress"; but it seems to me that it is precisely because of such "compromises" that electronic means of production have become a broad-based cultural phenomenon during the latter part of the twentieth century. Indeed, by the late

1980s, inexpensive portable keyboards had all but entirely displaced the home organ sector of the industry and digital pianos were just beginning to threaten to take over the most prized sector of all within the industry--that of the parlour piano.

As described in this chapter however, the development of these more sophisticated keyboards could not have taken place without the advent of microprocessor control during the mid-1970s (and, later, digital sound generation and signal processing). The complexity of the technological and organizational change itself shattered the competence of the early synthesizer developers and brought about permanent changes within the synthesizer industry. The magnitude of this technical transformation (in purely quantitative terms) has been described recently by software engineer Alex Limberis (1991): whereas the Minimoog (introduced in 1970) contained about 300 transistors and took Moog about six months to design, an instrument such as Korg's Wavestation (introduced in 1990) contained the digital equivalent of close to 300 million transistors and occupied some twenty people for a period of over three years.

What Limberis fails to point out however, is that underlying these changes in technical design is an even more significant shift in the organizational structure of the industry. To a large degree, the days of the inventor/entrepreneur are over: the production of electronic musical instruments is today dominated by large corporate concerns where, in part because of the huge technical and capital investments required, product development is entrusted to teams of designers, engineers and marketing personnel. Indeed, as I have argued in this chapter, marketing criteria have come to play an increasingly important role at every stage of instrument development.

Furthermore, the incorporation of digital electronics in instrument design has resulted in an interdependence between various industrial sectors: including the micropro-

cessor, computer, digital audio, and musical instrument industries.[11] The impact of what I have referred to here as "transectorial innovation" on the musical instrument industry has been profound: the industry is now dependent upon developments in other, larger technology sectors for its basic components (and this has an enormous influence on the cost and capabilities of the instruments themselves); it has used its own developing expertise in chip design as a means of product diversification; and it has become a site of speculative investment and market development for innovating high-technology firms from outside the traditional confines of the music industries.

But what is most important to me here, is the manner in which these issues of technology, industrial organization and markets have contributed to the particular nature of the current generation of electronic musical instruments and to the simultaneous "production" of musicians as consumers of high technology. Indeed, the adoption of digital technology has had its own peculiar impact on the shape, sound capabilities and uses of musical instruments and audio products during the 1980s and, in the following chapter, I want to discuss two key developments that were both the result of, and major contributions towards, the digitization of music during this period.

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[11] For practical reasons related to the scope of the research and because of my own limited knowledge of the worlds of economics, international trade, and corporate investment, I have provided relatively little information on developments in Japan. However, it seems worth mentioning that the present dominance of Japanese firms, not only within the electronic musical instrument industry, but within the electronics and microprocessor industries more generally, is, in part, the result of large-scale investment and planning at the state level over a number of years (see Japanese sources in the Bibliography under **Directories, Statistics & Other Sources**). Such investment has placed Japan in a privileged position in terms of high technology development and may even be a factor contributing to the phenomenon of transectorial innovation.

For an informative look at the design philosophy of a number of Japanese synthesizer manufacturers, see Doerschuk 1985.

Chapter 4:

Consumption and 'Democratization':

Digital Synthesizers, Sounds, and MIDI

> ...the number of musicians who own these instruments has increased dramatically. Early last year I went to catch a Korg clinic which was put on by Chuck Leavell at a local music store in Asheville, North Carolina. As his final demo, Chuck played the Korg Poly 800 and blew the audience away. Here was a portable 8-voice keyboard with programmability and MIDI that cost less than a plane trip to the Coast!
>
> The fact that the event took place in North Carolina should not be overlooked ...Before then, you couldn't really buy a synthesizer in Asheville...But by 1984, the salesman knew his way around keyboard synthesizers, Chuck Leavell demoed to a hundred or so musicians, and suddenly synthesizers were a musical presence in Western North Carolina. That's what I mean by 'democratization.' (Moog 1985: 42,44)

There has long been a tendency to equate the simple technical improvement or the increased distribution of consumer goods in capitalist society with greater levels of freedom and democracy. This has been especially prominent in the blandishments of consumer advertising (it seems like every new ball point pen is hailed as a 'revolution,' in both the technical and social connotations of the term) and has been a fundamental tenet of marketing ideology: "giving the people what they want" is regarded as a statement of the most basic, democratic principal of the marketplace. At a somewhat different level, there has been, in recent decades, a similar popular ideology surrounding the introduction of new technologies: from the outset, microcomputers and computer networks have been the focus of a largely uncritical and utopian rhetoric of personal and political empowerment.

In a certain sense, these are the popular manifestations of a much deeper ideology and, in this regard, the historical link between the emergence of modern industrial capitalism and the rise of democratic institutions in the West is a complex economic and social phenomenon of the utmost importance. As an ideology, the assumption that one form of "progress" cannot take place without the other has guided Western development initiatives in the Third World ever since the collapse of colonialism and, more recently, economic policies towards the former Eastern Bloc countries: political reform, liberalization of the economy, and greater access to consumer goods, are understood to go hand in hand.

It is interesting to trace some of the material effects of such a pervasive ideology; the development of the synthesizer industry during the '980s offers a concrete example of how such ideas can contribute to both the formation of new services and industries and the definition of the operational characteristics of new technologies (the more contradictory, social aspects of this ideology will be taken up in Chapter 6). A one level, the "democratization" which Bob Moog refers to in the quotation above is related to little more than the breaking of the early price barriers that had kept the synthesizer from becoming a broad-based consumer item until the 1980s. During the late 1970s and early '80s, synthesizers were still quite expensive for the average musician/consumer: as much as $2,000. for a monophonic synthesizer, $5,000. for a polyphonic one, and even more for an early sampler; added to the problem of the cost of individual instruments was the fact that, given the limited capabilites of the technology, keyboard players often found that they required more than one instrument to be truly effective in live performance or recording.

From a distribution and retail point of view as well, the market potential of synthesizers was still limited by the relatively "high-end" nature of the instruments. Speaking in 1977, one Canadian distributor noted that

> No traditional price pyramid has yet developed in the synthesizer field...it is not yet possible to find a really wide

> price range on synthesizers, the way it is with, say, guitars. Starting with the most expensive custom-made guitar, one finds progressively more and more merchandise, the lower the price/quality level is reduced. Only the very top of the pyramid exists now in the synthesizer field. (Marty Golden, quoted in *Music Market Canada* 1 (9), October 1977, p. 12)

The expansion of the lower part of the "price pyramid" took place during the early 1980s, in part, because of marketing decisions made by synthesizer manufacturers themselves, but also because of falling prices in microprocessor technology, improved manufacturing, and the entry into the field of powerful new competitors such as Casio Musical Instruments. Korg appears to have led the way when it introduced a polyphonic synth, the Poly 6, at just under $2,000. in 1982; other manufacturers followed Korg and developed new products for the lower priced market and, by 1984, Casio was able to introduce the CZ 101, a 4-voice instrument at a cost of under $500. (Moog 1985: 42).

The magnitude of this change in the nature of the synthesizer market should not be underestimated: for example, during the entire decade of the 1970s, the Minimoog sold about 12,000 units; Yamaha's DX7, released in 1983, sold over 200,000 units in just over three years. Casio's successes were even more spectacular: as mentioned in Chapter 2, Casio was a relative newcomer to the music industry but with its huge financial resources and its proven expertise in the production of microprocessor technology, the Casio Electronics firm (manufacturer of calculators and other consumer products) was able to launch a musical instrument division in 1978 and introduce its first portable keyboards in 1980. While its success in the marketplace was initially slow in coming, by the end of the decade, Casio had sold some 15 million instruments--an accomplishment unprecedented in the history of the keyboard industry. Most of these instruments were sold through department stores, outside the mainstream music retail and distribution network; in part, because of this and because of its reputation as a supplier of consumer (i.e., hobbyist) musical instruments, only a handful of Casio products ever gained acceptance in the professional and

semi-professional musicians' market. However, the more broad-based cultural role of Casio is nevertheless important: in introducing low-cost synthesizer technology to the home market, it helped broaden the base of the "price pyramid" and has had an immeasurable impact on the attitudes of an entire generation of young amateurs.

But the lowering of price barriers is only one factor, among several, that contributed to the spread of digital musical instruments during the 1980s. In this chapter, I want to explore two less well understood factors that had a considerable impact on the growth of the synthesizer industry during this period. The first concerns the rise, during the mid-1980s, of a small cottage industry that supplies prefabricated sound programs for synthesizers and samplers. This industry is both an effect of the growing popularity of synthesizers and a contributing factor to it: by simplifying the operational characteristics of the technology and eliminating the need for musicians to become proficient programmers, the consumer appeal of the instruments was considerably enhanced. In many respects, the continued success of a number of recent digital instruments has been, in part, guaranteed by the widespread availability of prefabricated sounds. At an industrial level, the nature of the mutual dependency that results from this phenomenon needs to be fully understood.

Secondly, I want to focus on how the evolving context of the synthesizer marketplace during the 1980s guided the design and development of MIDI (Musical Instrument Digital Interface)--widely regarded as one of the most significant innovations in electronic musical instrument design since the invention of the synthesizer itself. Here again, the characteristics of MIDI can be understood as both a response to the nature of the synthesizer market and a contributing factor to its growth during this period: in the second half of the chapter I will demonstrate how the stabilization of the marketplace and the stimulation of consumption was the main *raison d'être* of MIDI and how cost/performance (i.e., marketing) factors became one of the main technical constraints of its implementation.

Selling Sounds: A Tale of Industries and Cottages

During the mid-1970s, instruments with the ability to store sound programs (or "patches") in computer memory slowly began to appear in the marketplace (since that time, in addition to internal ROM and RAM banks, a variety of external storage media such as cassette tape, cartridges, cards and computer diskettes have been used). While initially intended as a convenient way for users to store their own sound programs for instant recall during live performance and, for the manufacturers themselves, as a means for storing programs that could demonstrate the abilities of the instrument and thus act as a sales tool at the retail level, the very existence of the memory chips and various storage options opened up the possibility for third-party developers to create and market sound patches to synth owners. This market opportunity lay relatively dormant for several years however, for at least two reasons: firstly, the internal memories were quite limited, allowing for only a few sounds to be stored in the instruments at any one time; and secondly, and more importantly, because it was assumed that there was no real demand for prefabricated sounds--users were thought of as programmers as well as players and, following this, it was generally understood that they created their own, original sounds to meet their specific musical needs.

But by the late-'70s this perception of the synthesizer user had begun to change. The story, as it has been told to me in numerous interviews and as it has come to be popularly known through various magazine articles (see, for example, *Keyboard* 15 (1), January 1989, pp. 68-69, 79), is that several months after the introduction of the Prophet-5, in 1978, the service department at Sequential Circuits began to notice that most of the instruments returned to the factory for repairs still had the factory preset programs in their memory banks. As a result, it was assumed that the majority of users (80% or more) were not actually programming at all but were relying almost exclusively on the presets. As

instrument technology became increasingly complex during the early 1980s (Yamaha's popular DX7 is often cited as a case in point), and programming more difficult (the shift to abstract, numerically-based programming schemes will be taken up in some detail in Part III), the suspicion that most users simply did not program became even stronger; by the end of the decade, marketing departments claimed that their best estimates indicated that as few as 10% of users programmed their own sounds.

This story is taken as a justification for the necessity and popularity of prefabricated sound programs and the existence of the tiny industry that supplies them; indeed, the story has assumed the status of a legend, or myth, within the industry (support for such a contention lies, I think, in the fact that the specific instrument and manufacturer in question often differs from one account to another but the story always remains the same). But the particular interpretation of the events that have become this legend has been challenged by at least one prominent musician/programmer that I interviewed. During the late-1970s and early-'80s, there was no such thing as a copyright in individual sounds or synthesizer patches (the basis for the latter has only recently been established in the U.S.; *Keyboard* 15 (2) December 1989, 24-25) and, according to my informant, he and other programmers that he knew would quite deliberately purge the memory banks of their synthesizers before ever sending the instruments anywhere to be serviced. It is possible then, that many of the early Prophet-5 users were likewise using the only means at their disposal to protect their work.

But which interpretation is correct is perhaps less important than the changing perception of the user that began to take hold within the industry from this point onward: as far as the manufacturers were concerned, programmability was still important as a status symbol for any serious, professional synthesizer but ease of use and ready access to "libraries" of exciting, prefabricated sounds would increasingly become the basis upon which new instruments would be marketed and sold. For example, during the 1970s synthesizers were often promoted with the idea that they could "create any sound that you

can imagine"; both the imagining, and the creating, however, were understood to be the responsibility of the individual user. But by the early-1980s, in addition to the claims concerning the superior programming capacity of the new generation of digital synthesizers, one was just as likely to find them also being promoted in the following manner:

> **You Don't Have to Program to Play**
> The DX7 comes with 32 voices programmed into the 32 internal voice memory positions that are ready to play at the touch of their selector buttons...The DX7 also accepts plug-in cartridges that are loaded with even more preprogrammed sounds...you have 128 voices at your fingertips without programming a single one. (Yamaha DX Series product brochure, 1983; emphasis in the original)

In a certain sense then, even if there did not already exist a market for prefabricated sounds, the promotional activities of the manufacturers (and the rise of third-party interests) certainly would have contributed to the creation of one. Changing perceptions within the industry were thus the first step towards the *production* of a new kind of consumer for digital musical instruments.

Initially, the main source of sounds for new instruments was the manufacturer itself. Each synthesizer was supplied with a number of preset patches stored in ROM or RAM and alternates on cartridges or other storage systems (these increased in number from only a handful of sounds to 32, 64, and eventually hundreds of patches by the mid-1980s). In some cases, these sounds were created by programmers who were part of the design teams themselves or by musicians hired as full-time product specialists for the companies. For example, John Bowen, a product specialist, and Dave Smith, owner/president and head designer at Sequential Circuits, worked together on the first presets for the Prophet-5 during the late-1970s; and Marcus Ryle, who created a number of the factory presets for Oberheim instruments during the early-'80s was also a product design engineer with the company (*Keyboard* 11 (6), June 1985, pp. 28-32).

But while this practice appears to have been common, especially among the smaller, entrepreneurial companies where engineers often felt that they had the necessary technical skills and the most comprehensive knowledge of the instruments to perform such tasks, it soon became increasingly clear, even to the entrepreneurs, that designing sounds for the marketplace was better left to individuals who had a more intuitive sense of the sounds that were currently most popular among musicians (especially session musicians). By the late-'80s, most manufacturers of digital instruments recognized that the production of sounds had become essential to the success of their products--sounds helped to sell synthesizers--and, as a result, had shifted the responsibility for the production of sounds out of the hands of hardware designers and into the hands of their marketing departments or to outside specialists.

To a certain extent, this appears to have been realized first among the larger, Japanese firms where product specialists and outside consultants from different countries were often involved, from the outset, in creating sounds for their instruments. At first, there were instances where sounds supplied with some keyboards were different in the Japanese, European and American markets; but increasingly, an effort was made to standardize sound patches in all markets--like popular music itself, sounds came to be regarded as an "international language" (Ibid.: 32).

The role played by musicians in these instances is important: it is one of the ways in which even modern industrial capital must deal, especially within highly specialized markets such as the musicians' market, with individuals at street level. In virtually every local music scene, the relationships between local retail sales personnel and session musicians, shop owners, recording studios and instrument distributors, are intimate and interlocked in complex ways; through these networks of individuals, information is relayed back to the manufacturers. For example, Gary Leuenberger, who contributed to the factory sounds used in a number of Yamaha's FM synthesizers during the early-1980s, was also a

shop owner in the San Francisco area where his contacts with other dealers, customers and professional studio musicians became a source of direct feedback on the acceptance of specific sound programs. This feedback was later incorporated into both the creation of new sounds and new product developments at Yamaha (Ibid.: 31). Similarly, in Montréal, a number of individuals associated with Erikson Music (a Canadian distributor) have had direct input into product development at Korg and, more recently, under the trade name of "Oktal," have created a number of sound librarian, sequencer and other computer software products that are distributed internationally through an exclusive arrangement with Korg. And in Toronto, Jim Burgess, synthesizer programmer, session musician, and owner of a retail operation called Saved By Technology (already mentioned briefly in Chapter 2), has acted as a consultant not only to manufacturers but also to the Ontario School Commission in developing secondary school music programs and teacher training in new technology. In these ways, local networks of dealers, musicians and enthusiasts often become the source of innovative ideas for future product developments at the manufacturing level, on the one hand, and the nodal point for the distribution of new concepts of music-making (and new technologies), on the other.

It was activity of this kind at the local level that appears to have been the initial impetous behind the development of a growing trade in sound programs during the early 1980s. Individual programmers working in studios or out of local retail operations began to sell their own, original synthesizer patches to the musicians they worked with or to customers coming into the shop. Around 1984, this activity began to gain a more national profile as classifieds and display ads for sound patches started to appear in musicians' magazines such as *Keyboard*. These early suppliers were often no more than single-person enterprises operating out of private homes and apartments: one early programmer and computer software developer told me that, at the beginning, he worked out of his home and

would sometimes entrust his five-year old daughter with the task of duplicating diskettes in order to meet the influx of new orders.

A number of the independent suppliers of prerecorded samples were among the only significant exceptions to this rule: because of the costs involved in hiring musicians and booking time in professional studios in order to create original instrument samples, there has been a tendency for sample makers to be part of larger corporate concerns (indeed, most manufacturers of digital samplers have taken it upon themselves to record and release large sample libraries in support of their instruments). In Canada, for example, the most prominent suppliers of sample libraries during the mid-1980s were Sound Ideas, of Richmond Hill, Ontario, and McGill University Master Samples (MUMS), in Montréal. The corporate/institutional base of these two enterprises should not be ignored: Sound Ideas was, and continues to be, a leading supplier of prerecorded sound effects for film and video post-production (indeed, the link here is an interesting one insofar as the only real precedent for the production and marketing of collections of individual sounds lay within the film industry, not the music industry); and, in the case of McGill University, the newly installed sound recording program within the Faculty of Music provided a ready-made technical infrastructure for such a project (and the MUMS project itself offered a limited commercial justification for the program's further development).[1]

But as regards the majority of the companies dedicated to the supply of prefabricated sound patches for digital synthesizers, their operations were extremely small and

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[1] In part, because of the controversies that raged during the mid-'80s concerning digital sampling and its supposed negative impact on musicians' employment, and because of the high-profile nature of McGill University as an institution within the Montréal music community, the Faculty of Music came under immediate attack from the Guilde des musiciens du Québec (union local of the American Federation of Musicians) for its involvement in the sampling business. Interestingly, in its defense, Joel Wapnick, co-producer of MUMS, portrayed the sample library as serving an "anti-eltist function" and argued for its role in the "democratization" of music (*The McGill Reporter*, May 30, 1989, p. 3), an issue of considerable importance later in the thesis.

obscure in origin. Indeed, one of the only ways to trace the general character and progress of this tiny, mail-order "industry" is through an examination of the expansion and diversity of classifieds and display advertising found in the musicians' press.[2] By 1986, for example, the section of *Keyboard*'s classifieds devoted to "software" filled several pages and contained literally dozens of notices for patches--on data cassettes, cartridges, diskettes and even printed sheets--for virtually every synthesizer available on the market, as well as prerecorded sounds for samplers and preset rhythm patterns for drum machines. Among the notices were the the names of a handful of "companies" located, quite predictably, in the centres of pop music production: such as, Deep Magic Music, in New York City, or SoundCorp and K.M. Music, in Los Angeles, and a few with apparent links to recording studios and/or large, urban retailers (e.g., Synthetic Productions and Patch/Works, both of whom had apparently gained the attention and support of Casio, and whose patches were sold through Manny's Music Store, in New York). But, interestingly, the vast majority of the ads appear to have come from small, grassroots operations based in locations far from the centres of power in the music industry: for example, Patchman Music in Lakewood, Ohio; Patchworks in Roswell, Georgia; Mission Control Productions in Houston, Texas; and Synth Sounds in Auckland, New Zealand.

In addition to this groundswell of popular, small-time entrepreneurship, however, there existed a number of larger, more successful operations which, by this time, had begun to move out of the classifieds and to place display ads in the main body of the magazines. For some, such as Deep Magic Music and MIDImouse Music, the simple,

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[2] There are no independent statistics or sales data available on the sound supply industry and the companies involved in this enterprise tend to be rather protective of any information concerning their operations. But even if sales data were available it would not likely be very accurate in an area of the industry so dependent upon mail-order sales: for example, the American Music Conference has, since 1987, begun to compile annual statistics on the retail sale of music software for computers; the reliability of these figures has been questioned by some within the industry precisely because they do not include mail-order sales which constitutes a significant part of the total computer software market.

typeset quarter-page (or less) display ads were little more than extensions of their own classifieds found in the same issue of the magazine. But in the case of several other companies, such as Key Clique, Inc. (a clearing house/marketing outfit, headed by programmer and Yamaha consultant Bo Tomlyn, for his own work and that of a number of other programmers), the ads could include more elaborate graphics and lists of sounds which covered an entire magazine page. Still others, such as those for Symphony Series, Inc., included colour photographs and sophisticated layouts that rivaled even those of the keyboard manufacturers themselves (see, for example, the Symphony ads in *Keyboard* 12 (9), September 1986, pp. 148, 33 & 161).

By the end of 1988 however, this growing cottage industry appears to have reached a kind of peak. Certainly, by this time, its existence had been legitimized (after a fashion) by *Keyboard* (and other magazines) which now included a separate category for "Sounds" in its advertising index, frequent reviews of sample and patch libraries, and a regular column (and contest) for patches submitted by readers. But the brash, full-colour ads had now disappeared and even the double-page spreads of apparently prosperous mail-order companies like Valhala looked drab, cluttered with their endless lists of sounds. A cover article appearing in *Keyboard* in January of 1989 (15 (1), pp. 66-77, 96-102) revealed much about the nature of this fledgling industry and its difficulties. One of the more significant observations found in the article was that the market for sound patches for a number of the most popular instruments had already become saturated. But this fact had perhaps already become obvious even to the most casual reader: classifieds proclaiming 3,000+ sound patches for the Yamaha DX/TX series of synthesizers (*Musician* magazine ran one classified in 1988 claiming no fewer than 6,000 sounds for the DX/TX series), 2,000 for Roland's D-50, 1,000 for Ensoniq's SQ-80, and 1,000 or more digital samples, appeared with increasing regularity. As competition within the cottage industry intensified, it seemed as though everyone was programming sounds for the same instruments.

The structural relationship that underlaid this phenomenon, however, was perhaps more important than simple market saturation. Third-party programmers could only ever hope to interest a fraction of synthesizer owners to buy their sounds, hence, their livelihood was ultimately dependent upon the success of any given synthesizer in the marketplace and, in the volatile market of the mid- to late-'80s, success had become increasingly difficult to predict:

> It's tougher now to target instruments that will sell enough to provide strong profit potential for programmers. As they see it, if you pour your time and resources into creating sounds for Synthesizer X, but the instrument bombs, the resulting lack of sales could wipe out your company. (*Keyboard* 15 (1), January 1989, p. 72)

The structural relationship implied here is similar to that between computer software and hardware companies; but the problems are perhaps even more pronounced in the synthesizer field because of the sheer number of competing keyboard "platforms" and the number of approaches to synthesis with which the entrepreneurial programmers must contend.

And, much like the computer industry, if third-party programmers are understood to be dependent, in some way, upon the success of the manufacturers, then the opposite is also true. By the end of the decade, magazine reviews of new instruments placed as much emphasis on the quality of the presets and the potential for third-party support as on the hardware features themselves. This was made abundantly clear in one review of Yamaha's SY77, heralded as the successor to its popular DX line of synthesizers. While the hardware and operating system enhancements were welcomed in the press, the preset sounds were panned:

> This is where the SY77 falls short of its potential--Yamaha would do well to encourage third-party software...
> ...Once programmers and third-party developers get a handle on the SY77's power (by reading the entire, comprehensive 255-page manual) we expect to hear some really dazzling

> sounds. Producers and keyboardists will find that sound libraries are a must because it takes so long to program "real" sounds. (*EQ* 1 (3), July/Aug 1990, p. 77)

And here again, a third dependency, that of the user, is also cited as a factor within the overall equation.

Another major problem for the sound "industry" is the fact that there is no effective way of copy-protecting their products. And in this sense, the programmers have fallen victim to the same local networks from which they sprang: professional and amateur musicians alike trade sounds freely with one another and local retailers have been known to give away entire libraries of sounds as an enticement to customers about to purchase a big-ticket item such as a digital keyboard. Most of the third-party developers do not have the resources to pursue legal action against retailers (although a few have done so) let alone individual users (*Keyboard* 15 (1), January 1989, 69-71).

But despite these difficulties, the cottage industry that supplies sounds for today's synthesizers appears to have become a permanent part of the industry. Some manufacturers have developed ongoing relationships with third-party developers, offering various forms of distribution and promotional support. For example, in 1991/92, when Korg re-launched its popular M1 synthesizer, it paid tribute to a number of its third-party developers by advertising a series of special discounts on their products with each purchase of a new instrument; Korg's telephone product support lines also offer information on third-party sounds and expansions. Indeed, the longevity of the Korg M1 (which has become something of a phenomenon in a marketplace where new products were once introduced on a semi-annual basis) is no doubt based, in part, on the substantial support it has received from third-party interests: sound patches (now numbering over 5,000), and additional samples and hardware expansions from more than a dozen major developers have contributed to its success. Because of this enormous sound potential, the M1 has been

described as a "chameleon" and musicians appear to have embraced this aspect of the instrument.

At a somewhat different level however, the trend among musicians towards the use of prefabricated sound programs must be seen within the context of the more general development of digital technologies throughout the 1980s. With the advent of inexpensive digital samplers during the early and mid-1980s, and their increasing popularity among many musicians, most keyboard manufacturers turned their efforts towards creating methods of sound "synthesis" that actually used sampling in some capacity (indeed, many new keyboards are little more than sample playback instruments and, in this sense, the DX7, which did not use sampling in any way, was one of the last true synthesizers to be developed for the commercial market). Thus, with this capacity in mind, the quantity and quality of prerecorded samples supplied with, or available for the instruments became a matter of increasing importance to both the manufacturers and the users.

Furthermore, drum machines, which during the late-1970s had also used various means of synthesizing drum sounds, now also employed samples of actual percussion instruments and often included a vast array of preset rhythm patterns (reflecting various styles of music) in their memory banks; the latter could be freely combined as individual components within the rhythm tracks of a song. And finally, with the increasing use of digital sequencers (tape recorder-like programs or devices that record musical data, but not sounds) arrangements of hit songs began to be marketed in the form of MIDI data that could then be manipulated or simply "orchestrated" and played back through virtually any synthesizer. This latter, emerging market, is quickly becoming an area of expansion and revitalization within the field of music publishing and large concerns, such as Hal Leonard Publishing, a leader in music books, instruction manuals and song sheets, have begun to develop a whole new genre of products, known within the industry as "songware," in order to exploit its potential. Thus, in virtually every area of digital musical instrument

design, the coordinated supply of both hardware and software (in the form of prerecorded units of sound or music) has become an important facet of the industry overall.

Within this context then, the growth of sound libraries, and the cottage industry that produces them, are a manifestation of two important aspects of digital musical instrument design. Firstly, they are a sign of the essential nature of these new technologies: digital synthesizers, samplers, drum machines and sequencers are hybrid production/reproduction devices; that is, to "play" one of these instruments is also to "playback" prerecorded sounds and sequences of sounds. With regards to the overall history of the music industries, this puts the digital instrument manufacturers in a position not unlike that of the gramophone industry at the turn of the century: just as one could not sell gramophones without also producing and selling records, one cannot now sell digital musical instruments without also producing and selling prefabricated sounds.

Secondly, and partly as a result of this shift in the nature of the technology, the production and marketing of sound programs has extended capitalist relations deeper into musical production and in this sense constitutes a new level of industrialization and commodification within the music industries as a whole. Not unlike record producers, sound designers and programmers must try to understand musical trends and fashions so as to create the kinds of sounds that musicians will buy (indeed, hit record producers such as Nile Rodgers have been hired to create samples and sound programs by some manufacturers). Furthermore, the nature of this second-order entrepreneurial activity is entirely in keeping with the organizational characteristics of the popular music industry since the mid-1950s as described by Peterson and Berger (1971): rapid changes in technology and market conditions have created a "turbulent" environment incompatible with traditional bureaucratic forms of organization; the record industry (and now the digital musical instrument industry) has responded by shifting the burden of production to outside entrepreneurs and concentrated on promotion, manufacturing and distribution. Such strategies are also characteristic

of David Harvey's (1989) description of the deepening of captitalist relations and recent modes of "flexible accumulation" in postmodern capitalist enterprise.

The Development of the MIDI Specification

The Musical Instrument Digital Interface (MIDI) is a hardware/software specification initially designed for the purpose of connecting commercial synthesizers together; it also allows digital musical instruments to be interfaced to computers. Introduced into the marketplace in 1983, the specification was initially criticized for its technical limitations but, despite such criticism, the specification has become a *de facto* standard for digital instrument communications networks. The impact on the musical instrument industry and on musical production has been profound and lasting: the degree of instrument compatibility required by the MIDI specification has created the basis for a horizontal integration of the synthesizer market (Loy 1985: 20); and the extension of digital control through MIDI to all aspects of sound creation, processing, sequencing, recording and mixing has altered the process of musical production for many musicians and called into question prior notions of musical skill (see Goodwin 1988; these latter issues will be taken up in Part III).

In an essay entitled, "The Coming of the Talkies: Invention, Innovation, and Diffusion" (1976), Douglas Gomery makes use of an economic theory of technological innovation in order to explain the process through which the Hollywood film industry converted to sound during the 1920s. This theory "posits that a product or process is introduced to increase profits in three systematic phases: invention, innovation, and diffusion" (Ibid.: 193-94). I will adopt this three-part framework as a means of separating out different moments in the development of MIDI. An emphasis will be placed on the final stage of this process--that of diffusion--in order to discuss the important social, organizational and ideological conflicts that arose out of the effort to establish MIDI as an

industry-wide standard. These conflicts went beyond the realm of simple profits and revolved around issues of democracy and the marketplace and reflect a set of on-going concerns and confusions regarding the social role of technological innovation.

The technology of digital data transmission is not new and, to a certain extent, MIDI is simply an adaptation of earlier concepts developed for the interfacing of computer terminals. For this reason, the first stage of technical development, the actual "invention" of digital interfaces, need not concern us here. The specific evolution of synthesizer interfacing--initially attempted in the domain of analog electronics during the 1970s--is perhaps more significant. Except for the evolution of an unofficial one-volt-per-octave standard for the control of pitch on synthesizers,[3] most strategies for the interfacing of keyboard instruments, sequencers, and drum machines were developed by individual manufacturers for their own products with little concern given for their compatibility with the products of other companies. Users encountered considerable difficulties with the triggering of sounds and the synchronization of drum machines and sequencers whenever the products of two different manufacturers were connected together; in addition, the lack of standards increased consumer fears regarding product obsolescence (Anderton 1986: 1-13).

In part, these difficulties reflect the relative immaturity of the synthesizer industry during the 1970s. Bob Moog has described the problem of developing standards in a small, highly competitive industry setting:

> At the beginning, when the synthesizer industry was small and there were few competitors, all the manufacturers were developing products and concepts at a rapid rate. Their new developments were kept under tight wraps...Now, whenever you discuss standards, you have to talk about future developments, and that means telling competitors what you have up your sleeve...it's not easy to cooperate

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[3] How this unofficial standard came into existence is somewhat unclear. In an article published in *Keyboard* magazine Bob Moog has simply stated that it exists "probably because one volt per octave is such a nice round number" (Moog 1983a: 58).

> with a new company that's just stepped in and taken a bite out of your market. (Moog 1983a: 58)

Gareth Loy has described the period as one in which the synthesizer market was essentially "vertically integrated": a situation in which manufacturers could often count "on sales of one item of their product line carrying a package sale" (Loy 1985: 20).

Before the introduction of MIDI several manufacturers had developed their own digital systems for instrument (and, in some cases, computer/synthesizer) interfacing: for example, the Oberheim System, the Rhodes "Chroma" and the Alpha "Syntauri" (see Hammond 1983). These were proprietary systems and none were intended for the purpose of interfacing with instruments made by other manufacturers.

The "innovation" stage of musical instrument interfacing began in 1981: after a series of informal meetings between Dave Smith (then president of Sequential Circuits), Tom Oberheim (then president, Oberheim Electronics) and representatives of the four major Japanese manufacturers--Roland,[4] Yamaha, Korg, and Kawai--a formal proposal was made by Dave Smith and Chet Wood at the Fall 1981 Audio Engineering Society convention held in New York City; the proposal called for the creation of a "Universal Synthesizer Interface" (USI; Smith & Wood 1981). This was followed by a meeting of major American and Japanese synthesizer manufacturers at the January 1982 National Association of Music Merchants (NAMM) convention in Anaheim, California, to discuss the possibilities for developing such a device. Differences among the participants arose out of the problem of defining the optimum technical capabilities of the interface and, more importantly, the cost of its implementation. Most of the American companies opted out of further

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[4] According to Dave Smith the original idea for the interface may have been initiated by Roland Corporation's Ikaturo Kakehashi; Smith is nevertheless credited with much of the effort in actually bringing the specification to fruition. Roland Corporation continued to play a large role in its technical development however and in coordinating the contributions from the other Japanese companies (Smith, quoted in Milano 1984: 43-44).

negotiations (including Oberheim) and it fell to Sequential Circuits and the four Japanese companies to actually develop the technical specification. A working specification[5] was developed in 1982 and the first MIDI-equipped instruments were introduced in the winter of 1983 by Sequential and Roland; because of continuing difficulties with technical incompatibilities, the final version of the interface--the "MIDI Specification 1.0"--was not agreed upon until August 1983.

There are a number of points to be noted concerning this stage of the development of MIDI. Firstly, the "innovative" aspect of MIDI was that it would be a non-proprietary device (no one owns a patent for either the hardware or the software portions of MIDI) to be used on any digital instrument regardless of manufacturer, thus setting a major precedent within the synthesizer industry. Secondly, the main source of conflict concerning the specification during the early stage of negotiations was over where the line between technical sophistication and cost of implemention would be drawn. Thirdly, there existed no forum for the resolution of differences between the various parties[6] (and this would become a critical element during the next stage of MIDI's development). And finally, the initial success of MIDI appears to have been based, in large part, on the combined weight in the marketplace of a number of major companies working in consort (the combined influence of the Japanese companies is especially noteworthy in this regard).

Each of these points requires some further elaboration. The non-proprietary nature of MIDI should not be regarded as insignificant: firstly, because without the initial joint decision that no one should profit directly from the development of MIDI, the necessary

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[5] In order to avoid possible legal charges of "restraint of trade" in the U.S., MIDI remains a "specification" and not a formal "standard"; the word "universal" was dropped from the original name of the device for similar reasons.

[6] There seems to have been some precedent for communications between the Japanese companies that did not exist in the United States, where secrecy and competition were more the rule (Jim Mothersbaugh, quoted in Milano, 1984: 48).

trust, cooperation, and good will between the participating companies could not be guaranteed. Certainly, patents have long been an accepted (and central) aspect of technological invention (see Slack 1984: 95-137) but a more important, overriding motivation lies behind the desire for cooperation: recent technological change (especially within the audio, electronics, and computer industries) has tended to be so rapid that voluntary technical standards have become more and more necessary--if for no other reason than simply as a means of stabilizing the marketplace (as noted above, prior to the introduction of MIDI there appears to have been a growing hesitancy on the part of consumers as a result of technical incompatibilities and obsolescence). Dave Smith has stated that from the outset the companies involved in MIDI's early development realized that such an interface could help stimulate the market (personal interview, 1988), and it would now appear to be generally recognized that MIDI has been a major contributing factor in the growth of digital musical instrument sales to their current multi-billion dollar levels, worldwide (Jeff Rona, personal interview, 1989). Thus, the foregoing of patent benefits and the acceptance of increased competition as a result of the horizontal integration of the market would seem to have been more than offset by the advantages of increased consumption overall.

While I do not wish to go into detail here concerning the debates over the technical limitations of MIDI,[7] it is worth noting that much of the difficulty arose out of different intentions and expectations regarding the interface. Electronic music historian Tom Rhea maintains that the initial idea of simply connecting keyboard instruments to one another was "mundane, predicated on equal temperament, and has shackled the development of wind and other continuous controllers" (personal interview, 1989). Others have criticized the

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[7] The most comprehensive (and unbiased) assessment of the technical advantages and limitations of MIDI can be found in Loy 1985; for a general account of the early debates surrounding the introduction of MIDI, see the series of interviews conducted by Milano 1984; a more recent criticism of some of the limitations inherent in the specification are detailed in Moore 1988).

limitations of the serial interface for high-speed transmission of digital information. But in fairness to the developers of the specification, the synthesizer field has been dominated, almost from the beginning, by keyboard instruments (even high-end systems such as the Synclavier made use of standard keyboards); it should therefore not be surprising that keyboards would be the main beneficiary of a commercial interface. Furthermore, many of the uses to which MIDI has recently been put were not foreseen in 1983: for example, no one foresaw the current importance of SMPTE synchronization in MIDI studios.

Of course, the main issue was never really one of foresight, but rather, one of cost:

> From the equipment manufacturer's point of view, the hardware of a musical instrument interface should be as inexpensive as possible. In particular, the connectors should cost about the same as the phone plugs which are now universally used in our industry for audio signal interconnection. (Moog 1983b: 19)

The attitude expressed in this statement gives an indication of the severe economic limitations that were quite likely placed upon the development of the MIDI specification by the innovating manufacturers themselves (in the end, the MIDI interface added approximately $25. to the price of a digital synthesizer; Ibid.: 25). It seems to me that the context of this pricing strategy is often ignored in discussions of MIDI: as mentioned above, at the time of its introduction a number of manufacturers appear to have been consciously attempting to lower the prices of their products in an effort to develop a larger base in the consumer market (for example, in 1983 Yamaha introduced its popular "DX7" at a fraction of the cost of its earlier FM synthesizers). Bob Moog, as quoted at the beginning of this chapter, has described this general trend towards lowering the price of microprocessor-controlled synthesizers and samplers during the early 1980s as a process of "democratization" of the technology (Moog 1985: 42-46). Similarly, supporters of MIDI often labeled those in favor of a technically more sophisticated (and somewhat more expensive) interface as

"elitist." It is important to note the particular notion of "democracy"--conflated as it is with marketing strategies--expressed in such statements (I will return to this issue again in Chapter 6).

If the innovation stage of MIDI's development was achieved essentially through close, relatively informal cooperation between a handful of manufacturers; it soon became clear that the diffusion of MIDI would require a more formal organization that could disseminate technical information about MIDI, answer questions from instrument and software manufacturers concerning implementation, solve problems of incompatibility, continue the work of clarifying aspects of the specification that were still relatively undefined, and deal with problems encountered by users. As criticism of the interface mounted, the need for such an organization became even greater. To make matters worse, during the first year of MIDI Yamaha accidently misinterpreted part of the specification; soon rumors and accusations were heard among the competition concerning an alleged attempt on the part of Yamaha to use its market strength to unilaterally define certain aspects of the specification (Kevin Laubach, personal interview, 1989; Milano 1984: 42-43).

It was at this particular, chaotic moment in the early "diffusion stage" of MIDI's development that the phenomenon of user groups and networks became significant. Before the industry could mobilize itself in such a way as to deal in a coherent fashion with the technical problems encountered with implementing the interface, a "users' group" calling itself the International MIDI Association (IMA)--"dedicated to the growth, development, integrity, and promotion of the Musical Instrument Digital Interface (MIDI) and musical/computer interfacing" (IMA information brochure, 1.0)--was formed during the summer of 1983. While the primary function of the IMA was to disseminate information about MIDI to users (including not only "end users" but also retailers, educators, software designers and manufacturers), its founder, Roger Clay, had far more important plans for the organization. For the moment however, I would like to reserve my discussion of the IMA,

and the role Clay envisioned for the organization, for Chapter 6 of the dissertation where I take up the phenomenon of user groups in greater detail.

Conclusion

What Bob Moog has referred to as the "democratization" of synthesizers technology (1985: 42) is a phenomenon based on at least three separate, though interrelated trends in the electronic musical instrument industry. Firstly, as microprocessor technology became faster and cheaper, it became possible for synthesizer manufacturers to make powerful systems at lower costs. The broadening of the so-called "price pyramid" allowed more musicians (and amateurs) to become involved with sound synthesis than ever before. Decreasing costs however, were only the first step towards the building of a substantial consumer market for synthesizer technology.

The changing character of the instruments themselves also became a factor in the creation of a new kind of consumer. As microprocessors began to be used not only as audio control mechanisms but also for the digital generation of tones, synthesizer programming became increasingly complex; this complexity could easily have become a limiting factor as regards the potential market for the new instruments. But, with the simultaneous expansion of internal and external memory storage, synthesizers could function not only as instruments for the production of sounds but also for their reproduction as well (indeed, digital samplers are essentially devices for the recording and reproduction of sounds--a hybrid recorder/playback device with a conventional keyboard):

> Creating musically useful tone colors with digital synthesis algorithms poses some difficulties...The DX7 appears to be popular not because it is easy to program but because it comes with a large number of good-sounding factory programs, and because there are several sound programmers who sell DX7 sounds by the cartridge. Most DX7 users never manage to master the programming aspect of their

> instruments. For musicians, the relative inaccessibility of the handles on the tone colors of digital synthesis instruments is a problem yet to be solved. (Ibid.: 44, 46)

Thus, lacking adequate knowledge of the technical system, musicians increasingly found themselves drawn to prefabricated programs as a source of new sound material. As I have argued earlier however, an assertion of this kind is not simply a statement of fact; it also suggests a reconceptualization, on the part of the industry, of the musician as a particular type of consumer. Synthesizer manufacturers responded to this new vision of the musician-as-consumer by placing an increased emphasis on the availability of prefabricated sounds; and, as a result of the entrepreneurial initiative of third-party developers, a small, sub-industry structure--a so-called "cottage industry"--has evolved in order to stimulate and meet the needs of this new market.

Finally, the introduction of the MIDI specification contributed to an increased compatibility between instruments by different manufacturers thus stabilizing the marketplace and strengthening consumer confidence. In an industry driven by the need for continuous innovation, the importance of the kind of standardization offered by MIDI should not be underestimated: MIDI has helped overcome consumer hesitation based on immediate problems of incompatibility and the fear of technical obsolescence over time. Furthermore, by creating a standard protocol for communications not only between synthesizers, but between synthesizers and computers as well, MIDI has become a vehicle for the growth of an entire generation of software products dedicated to music production (some of these will be discussed in Part III of the thesis). The context of falling prices and market expansion within the synthesizer industry was an important factor in the concept and design of MIDI: from the outset, market criteria (in the form of cost/performance measures) guided the development of MIDI, defining its form and its technical capabilities. And while various proposals have been made over the years for replacing MIDI with more

powerful interfacing schemes, the manufacturers have made it clear that they will have no part in such deliberations: they realize that market perception of the stability of the MIDI specification is more important than its technical inadequacies.

These three developments have been important in the expansion of the market for digital instruments throughout the 1980s. But none of these developments, alone or in consort, could have been sufficient to create the momentum necessary to achieve the kind of widespread acceptance that the new technologies have enjoyed during the past decade. And it is here that various forms of communication can be understood to have played an important promotional role vis-à-vis the electronic musical instrument industry. Musicians are a small and highly specialized group of consumers and the musicians' press, in particular, has been a vital link between the industry and its market. At the same time, as synthesizer technology has become integrated with the home computer, the types of association typical of computer culture--computer networks and so-called "user groups"--have been adopted by some musicians as well. But the musicians' magazines, networks and user groups also foster a particular kind of group identity and a sense of "community" that is, on the one hand, seemingly democratic and idealistic, and, on the other, curiously bound to an identification with particular objects of consumption in such a way as to bring these groups into even more direct contact with manufacturers and their marketing departments. Taken together, these forms of mediation have had a profound impact on how musicians perceive the new technologies, on how they learn to use them--both technically and in terms of the kinds of pleasure they derive from their use--and, indeed, on how they define themselves, and their collective goals, as musicians. It is to this cluster of issues that I would now like to turn.

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II

Mediation:

Musicians' Magazines,

Networks and User Groups

Chapter 5:

Music Periodicals and Communications Networks:

Some Historical Precedents

> With a view of promoting more general intelligence in musical matters--both theoretical, practical, and social--it has occurred that the periodical publication of a Journal for the Free Discussion of every matter of Musical interest, as well as for the exposition of Canadian Art, must prove acceptable to numerous musical devotees...[the journal will contain printed Music and] Selected Articles on the various branches of Music, Correspondence and Reviews of Music--the latter so arranged that parties purchasing Music may rely upon being able to select it, on reference to the Review, without any hesitation as to its merits or difficulties.
>
> (*Canadian Musical Review*, Vol. 1 No. 1, May 1, 1865, p.1; reprinted in Kallmann, et al, 1981: 742)

The *Canadian Musical Review* was the first Canadian periodical devoted exclusively to music and, from the outset, its "Prospectus" made clear its musical, social and economic goals: to become a medium of communication concerned with the dissemination and discussion of music, to create a sense of Canadian identity through awareness of cultural production, and, not least of all, to provide an authoritative source of information for consumers of musical products. This latter goal was a prominent feature of the publication even in its first issue: advertisements selling musical instruments, practical instruction manuals, and mechanical music boxes filled its pages.

Early music periodicals like the *Canadian Musical Review* are often regarded by historians as important, though sometimes problematic, sources of information concerning the musical life of a society: they supply the historian with facts and insights into music and society of the past but they are also often regional, unsystematic, and lacking in

historical perspective (Kallmann 1960: 195). However, given that specialized periodicals have been an indispensible part of musical life since the eighteenth century, it is surprising that so little scholarship has been devoted to music magazines themselves as a specialized sub-genre of the publishing industry. Indeed, the role played by music periodicals in the formation and dissemination of musical ideas, aesthetics and ideology, in the creation and maintenance of musical communities or "taste publics," and in the marketing, promotion and sale of printed music and musical instruments, has scarcely been acknowledged by traditional musicologists let alone understood (among the exceptions to this rule one might include Loesser 1954 and Kerman 1985).

By and large, popular music scholars have paid more attention to the music press and its relationship to the recording industry but much of this work has been neither systematic nor self-reflective (for a critique of the uses of the music press in histories of popular music, see Thornton 1990) . And much of the scholarly work that does exist has tended to focus almost exclusively on issues concerning the role of the "charts" in the record industry trade magazines, such as *Billboard*, or on the role of mass-circulation consumer magazines, such as *Rolling Stone*, in the formation of rock music ideology. Dave Laing's (1985) account of the rise of Punk music during the 1970s is one of the few studies of popular music to treat the music press as an integral part of musical/cultural processes. For Laing, Punk "fanzines" were the print equivalent of independent record labels and needed to be understood in relation to discursive formations largely determined by institutions such as the record industry and the mainstream music press. In this way, Laing recognised the importance of music periodical publishing in the ordering of music and social power.

Laing's insights regarding the role of the mainstream music press within the wider discourse of music and style needs to be complemented by an understanding of the role that music periodicals play at every level of music-making and in every sector of the music

industry. With respect to the present thesis, an understanding of the role played by magazines in organizing the internal and external relations of the music instrument industry, their role in the process of technical innovation and diffusion, their importance in defining the meaning of new technologies for the consumer, and their role in the life of amateur and professional musicians, is of paramount importance. Indeed, without the promotional and ideological support of the magazine industry, it is unlikely that digital music technologies would have had nearly the same impact and level of diffusion as they achieved during the decade of the 1980s. Furthermore, music periodicals provide a ready-made set of discourses for the framing and resolution of issues concerning technology and music--issues that are socially and culturally loaded. But equally important, musicians have also made use of music periodicals, newsletters, and other communications networks in order to pursue their own goals and interests.

In this chapter, I would like to outline the historical background of the relationship between music instrument manufacturers and the music periodical publishing industry. To do so means to focus in on what amounts to a very a small, little-known and highly specialized subset of the publishing industry as a whole. Furthermore, an understanding of the dynamics of this sector of the publishing industry is made even more difficult by the sheer number and variety of publications that have existed over the years and by the manner in which the contemporary music market has been divided up into more or less discrete functions and categories of interest. For example, in a brief survey of contemporary music periodicals, Michael Fink lists five categories of magazines: trade journals, professional periodicals, "semipro" magazines, educational journals, and popular (consumer) magazines (1989: 209-212). While Fink's categorization may represent a good starting point for an examination of the music periodicals industry, it is clear that his list is neither comprehensive (e.g., Laing's "fanzines"--written and distributed by fans themselves--find no place within his typology) nor are the categories entirely distinct. As regards the latter point,

Fink includes magazines such as *Musician* and *DownBeat*, both of which have a broad-based readership and are widely available at many newstands, in sub-category of "commercial" professional periodicals rather than in the category of "semipro" or consumer magazines. It seems to me that the overlapping of professional, semiprofessional and amateur worlds in these magazines, and in popular music more generally, presents obvious problems for this type of approach to music periodicals. And in this regard, the industry's own practice of describing certain magazines as having "controlled circulation" might be a more reliable indicator of the occupational status of a given target audience than Fink's vague typology.

For the purposes of this chapter however, a clearly defined typology of this kind is perhaps unnecessary (and unworkable) and my account of the history of music periodicals will shift back and forth between a number of magazine categories. But, as this brief historical sketch will make clear, an increasing specialization within the field of music periodicals has taken place during the past century and an understanding of this phenomenon and its relationship to the structure and economics of the publishing, recording, and musical instrument industries is perhaps the best criteria for the development of such a typology.

Finally, as computers have been adopted as part of the technical means of production in music, communications networks typical of computer culture have also emerged within this specialized field. User groups, computer network forums and bulletin boards have become an alternative means of communication for musicians and a marketing vehicle for manufacturers. The phenomenon of technical hobbyist networks is itself not entirely new and I would like to address the recent emergence of such networks in music in relation to the rise of similar hobbyist groups such as ham radio operators during the early years of the twentieth century. While there would appear to be relatively little direct

connection between the two groups, there are interesting parallels to be made between them as regards the nature of their activities and their claims to a democratic political agenda.

Of central importance then in the discussion that follows concerning these various modes of communication is the manner in which readers are constituted as both a market for technological products and as a "public," a community with a common set of goals and interests.

An Historical Outline of Music Periodical Publishing

The formation of a market for specialized publications devoted to musical concerns may in fact predate the advent of periodical publishing itself by more than a century. As already noted in Chapter 2, the sixteenth century was witness to the rise of a growing emphasis on secular music, especially instrumental music, throughout Western Europe. This shift was a broad-based cultural phenomenon occuring in both professional and amateur spheres of music. Donald Jay Grout notes that in support of these developments "a new kind of writing about music began to appear: 'how to do it' books, manuals of instruction for players and singers became important" (1960: 155). The first books of this type, written in the vernacular and focussed on the practical concerns of singers and instrumentalists, began to appear from about 1511 onward. They differed markedly from earlier, Medieval treatises on music, most of which had been written in Latin for a relatively small number of scholars and music theorists (Ibid.: 198). The development of music printing from movable type also dates from the beginning of the sixteenth century and it is interesting to note that the publishing of music collections--in the form of "partbooks" intended primarily for amateur performance and entertainment--runs parallel to the publication of these early "how to" books.

The early emergence of this market for specialized guides to music-making is thus related to a number of interrelated factors: the increasing emphasis on the development of musical instruments, a widening of the professional and amateur base of musicians, the rise of new, popular forms and styles of music, and improvements in print technology. Much later, during the eighteenth and nineteenth centuries, a similar set of factors would be important to the development of specialized music periodicals. In particular, the rise of the middle classes and the institution of the public concert, which provided a platform for middle-class musical tastes, and the expanding market for songs and piano music for entertainment in middle-class homes, would give impetous to the whole field of music criticism and create a need for the publishing of announcements, advertisements, reviews, entertaining articles on music, and short works for amateur singers and pianists. William Weber has argued that as the middle class became increasingly important both socially and culturally, especially during the early nineteenth century, it was possible to discern the emergence of various "taste publics" in European musical life. Furthermore, he argues that it was through their characteristic institutions, meeting-places and communications media that these taste publics came to be defined (1975: 10). The emergence of music periodicals therefore may have a particular significance in the rise of the middle class as a social/cultural formation during this period.

Articles about music had appeared regularly in the newspapers of the European capitals and in general periodicals throughout the eighteenth century but, increasingly, specialized publications devoted to musical matters began to appear from the early part of the century onward. The vast majority were short-lived but, in Germany especially, periodicals flourished and their pages were filled with articles and debates concerning new musical styles and the latest compositions by well-known composers. *Musica Critica*, published in Hamburg between 1722 and 1725, is thought to be the world's first music periodical. Others followed, of which Leipzig's *Allgemeine Musikalische Zeitung* (*General*

Music News; 1798-1848) is among the best known and longest surviving periodicals of this early period (Fink 1989: 202-205).

Loesser regards the *Allgemeine Musikalische Zeitung* as the most important source of information on musical events in Germany during its fifty years of publication (1954: 131) and makes use of it in his account of the rise to dominance of the pianoforte in middle-class musical life. But of particular interest here are his remarks on the role of the *Zeitung* in the promotion of the instrument and its music in the home. In addition to advertisements, the magazine carried reviews of printed piano music that assessed their entertainment value and relative difficulty for the amateur (primarily female) pianist (Ibid.: 291). The prevalence of this type of content in music periodicals of the nineteenth century has already been noted in the quotation at the beginning of this chapter but it's presence in the *Zeitung* becomes particularly interesting when one learns that the magazine was published by Germany's foremost sheet music publisher of the time, Breitkopf & Härtel (Ibid.: 396). Thus, even at this early date, the overlap between content and promotional material, so characteristic of present-day media culture (Wernick 1985), had already taken prototypical form in music periodicals of the nineteenth century.

In North America, periodical publishing got off to a rather slow and precarious start during the eighteenth century. From 1741, when the first political digests and general interest magazines were published in the United States, to the turn of the century, close to a hundred magazines were launched; few had cirulation figures of any significance and most lasted only a few issues (Mott 1957: 24). In any given year, no more than a handful of titles were published so it is perhaps surprising to find that anyone would have even attempted to publish a music periodical. Nevertheless, in 1786, the *American Musical Magazine*, began publishing in New Haven; it contained mostly printed music and lasted for twelve numbers (Ibid.: 29; Richardson 1931: 237-42, offers a more detailed description of the magazine and its editors).

Mott considers the magazine to have been a "novelty in the field" at the time of its publication but it is interesting to note the context of this early attempt at music periodical publishing. Mott states that during the 1780s and '90s a number of attempts were made to reach specialized audiences that had been heretofore ignored--in particular, attention was given to the interests of women (1957: 64-67). In no small part, music, being considered by many during the period as primarily a female pursuit, was regarded as one way of gaining the attention of a female readership. General magazines of the period often carried short musical pieces and, by the beginning of the nineteenth century, titles such as the *Ladies' Magazine and Musical Repository* and the *Ladies' and Gentlemen's Weekly Literary Museum and Musical Magazine* had begun to appear (Ibid.: 172-3).

The connection between piano music and female readers continued throughout the early nineteenth century. In 1820 the *Euterpeiad, or Musical Intelligencer* was published in Boston by John R. Parker, a prominent piano manufacturer, importer and music retailer. Loesser considers it to have been the first true music magazine in America and, after a shaky first year of publication, its publisher gave it the subtitle, *Ladies' Gazette*, and began to focus more attention on a female readership in order to keep it alive (Loesser 1954: 467-8). Similarly, in 1842-43, a literary magazine entitled, the *Boston Miscellany*, was launched: fearing that a purely literary magazine would not succeed, its editors decided that fashion, love stories and music would attract a dependable readership of "factory girls" on which to "float" the more serious content of the magazine (Mott 1957: 719). In such instances then, the stereotyping of gender (and class) roles in nineteenth-century magazines not only tended to place female cultural pursuits in an inferior position with respect to those of their male counterparts but also placed them in the service of male economic goals.

Gender stereotyping of this kind continues to be an essential characteristic of virtually all music industry markets as contemporary magazine formats and ad campaigns attest. This topic will be taken up in greater detail in the following chapter but it is perhaps

worth mentioning a recent promotion in the piano industry as illustration. In what has been described as an "historic" promotional drive, U.S. piano manufacturers and music retailers in selected regions launched a coordinated effort to encourage music in the home. The advertising component of the campaign included a series of television spots designed to air during programs watched by women in the 25 to 54 year old age group (*The Music Trades* 139 (6), July 1991, pp. 133-6). Thus, as I will argue in subsequent chapters, even while the digital musical instrument industry has attempted to lay claim to the home as the site of a new kind of musical production, other sectors of the industry still regard it as their traditional turf. And it is not without significance that these territorial battles over the domestic market have taken place along lines of gender.

In Canada, even prior to the advent of periodicals dedicated chiefly to musical concerns during the nineteenth century, magazines began to play yet another important cultural and commercial role in musical life from at least the 1830s onward. As in the U.S., Canadian literary journals and general interest magazines such as *The Montreal Museum: or Journal of Literature and Arts* (1832-33), *Le Fantasque* (1837-45) and *Le Ménestrel* (1844-45) of Québec City, and the *Anglo-American Magazine* (1852-55) of Toronto had attempted to broaden their readership by regularly offering printed music supplements and, occasionally, articles or concert reviews as a part of their coverage of cultural events (Kallmann, et al 1981: 741-46). At the time, it was still rare to find individual pieces of music on sale in music shops (most printed music was sold in books or in collections). It was only later (around 1850) that a publishing industry geared to individual song sheets would begin to emerge in Canada (Kallmann 1960: 113-15).

Kallmann's account suggests that by publishing those two or three short musical pieces in each of their supplements, magazines provided a kind of direct distribution network where there had not previously been one and, in addition, may have helped to further stimulate the demand for popular songs, dances and marches of the day. In this

way, the musical forms characteristic of early nineteenth-century magazines not only pre-dated similar developments in the music publishing industry but may have also acted as a catalyst to those developments as well.

It is intriguing that the short, sentimental song format often found in these magazines would (albeit, with some alterations in style and mixed with minstrel songs and other influences) eventually become the most characteristic commodity form in popular music culture during the height of the Tin Pan Alley era (roughly 1890-1930; see Loesser 1954: 545-9). Peterson and Berger have argued that the oligopolistic concentration of the Tin Pan Alley industry displaced the "communal" popular musics of the earlier broadside and ballad traditions (1972: 284-6). But to argue this point would seem to ignore the role played by the nineteenth-century middle classes in anticipating subsequent cultural forms and in establishing a market base--the home piano market--for such an industry. In this sense, the music supplement of the nineteenth-century magazine trade could perhaps be regarded as a more likely ancestor to the popular song form than the early broadside or ballad.

Another important characteristic of the early music periodicals in both Canada and the U.S. was their relationship to music education. Mott describes the launching of a Boston periodical, the *Musical Magazine* (1839-1842), as responding, in part, to the introduction of music into public schools (Ibid.: 435). Similarly, Kallmann cites the music journals as "an important aid to musical education" in Canada throughout the nineteenth century (1960: 193). Addressed to amateurs and students rather than professional musicians, the music magazines promoted the bourgeois values of "art music" and led movements for the reform of church music and Canadian school curricula. But, at the same time, the magazines' commercial role in the promotion and sale of salon music and other light musical forms belied these loftier goals (Ibid.: 193-4). Thus, these values and

responsibilities to community life, so vaunted by the music magazines, were always at least partially compromised by the commercial context within which the magazines operated.

In a certain sense, the market context defined the nature of music periodicals in even more significant ways throughout the nineteenth century. The home environment--as the centre of family life and the locus of individual consumption--defined the content of music magazines as they, in turn, attempted to give value and meaning to that environment. In a chapter entitled, "Household Goods Are All Related" (1954: 560-4), Arthur Loesser describes how the middle-class home became the site of a diverse accumulation of durable commodities--an accumulation that necessitated its own peculiar organizational logic. In 1880, a new periodical appeared called the *Musical and Sewing Machine Gazette*: making explicit a connection between commodities that was by then firmly (if only tacitly) established (not only in the homes of consumers, but in many retail showrooms outside the major urban centres as well), the magazine attempted to bring together news and features on the piano, organ and sewing machine trades. The periodical did not last long (it soon changed its name and became solely a music publication) but its focus was perhaps symptomatic of the times. Loesser cites other music magazines of the period which carried ads for sewing machines and a range of other domestic products. As the parlor piano became the symbol of domestic life, magazines helped to ensure that it would also become associated with all those domestic objects that gave middle-class life its meaning: "The sentimental attachment that the piano could arouse was bound up with the things with which it lived" (Ibid.: 563).

But as the range and quantity of commodities became greater during the latter part of the nineteenth century and the early years of the twentieth, an increasing specialization and a wider circulation became necessary components of the success of music periodicals. In part, this development was also a response to the music instrument trade: as already noted in Chapter 2, the increasing production capacity of the piano industry and the

efficient organization of distribution required a national advertising strategy. Most of the periodicals mentioned so far were very local in character--Boston, New York and Philadelphia, Toronto and Montréal, each had their own music magazines. And, as already noted, most were short-lived. But with wider distribution and more secure advertising revenues, magazines (especially in the U.S.) took on a more national outlook and their life-span tended to be much longer (a number of music periodicals founded in the US during the decades surrounding the turn of the century are still published today).

By no means were these developments unique to the music periodical industry. In his book, *Magazines in the Twentieth Century* (1964), Theodore Peterson describes the final decades of the nineteenth century as a "quiet revolution" in the magazine industry in the United States (p. 2): general-interest magazines and a wide variety of specialized periodicals flourished during this period and the number of available titles increased by more than fourfold (Ibid.). Peterson cites a number of factors contributing to this phenomenon, ranging from a general expansion in manufacturing and capital investment, to technological advances in the publishing industry (especially the steam-driven press), to changes in U.S. postal rates and regulations that favoured magazine circulation. The success of many late nineteenth-century music periodicals was simply part and parcel of these larger trends.

With the establishment of large-scale instrument manufacturing and distribution, the need for more specialized mediums of promotion and communication became evident first within the industry itself. The latter decades of the century witnessed the founding of two important industry trade papers in the U.S.: first, the *Musical Merchandise Review* (1879), and then *The Music Trades* (1890); over one hundred years later both remain vital communications links for the U.S.-based industry. The *Canadian Music Trades Journal*, founded at the turn of the century, performed a similar role in the Canadian industry until the beginning of the Depression years (1900-1930).

But the nature and purpose of this specialized medium of communication is equally significant. As John C. Freund, first editor of *The Music Trades*, put it in 1890:

> The value of the trade papers, in any trade, depends upon the fact that by far the principal part of the product is disposed of through jobbers and dealers. By reaching the jobber and dealer all over the country, the trade paper provides the manufacturer with a far more valuable advertising medium for the disposal of his goods than any ordinary daily or weekly paper can possibly offer.
> (*The Music Trades*, Vol. I, No. 2; quoted in Majeski 1990: 30)

Indeed, according to Theodore Peterson, the single most important factor contributing to the rise of the modern magazine industry as a whole was the growth of advertising (1964: 18-43). As demonstrated in the above quote, advertising defined, in large part, the relationship between even the manufacturing and retail sectors of the industry: in order to sell a product to the public, it was first necessary to sell it to the retailer. In both trade and consumer publishing then, advertising "made the magazine a part of the system of marketing...It transformed the publisher from dealer in editorial wares to dealer in consumer groups" (Ibid.: 18).

Even a cursory glance at some of the trade magazines of the period reveals changes in the style and general level of prominence given to advertising. In the mid-nineteenth century, advertising, with its long flowery prose style, resembled formal announcements more than the advertising we know today. By the turn of the century, display ads, with their terse texts and more graphic appeal, were dominant. In what became the standard format of *The Music Trades* at the turn of the century, the front and back covers were given over to display ads (mostly those of the largest piano manufacturers) making them the most prominent public image of the journal. During the first decade of the century the ads of instrument manufacturers were joined by those of the Victor Talking Machine Company (phonographs and gramophones were still sold in music shops at that time); one ad

announced that in support of its dealers Victor's consumer advertising campaigns reached some 49 million people every month (*The Music Trades* XXXI (14), April 7, 1906, p. 46).

In the realm of consumer magazines, the latter part of the nineteenth century also gave rise to a number of music periodicals whose longevity was much greater than those of previous decades. In the U.S., *The Etude*, *Musical America* and *The Musical Courier* (formerly the *Musical and Sewing Machine Gazette* mentioned briefly above) were prominent titles; *Musical America*, founded in 1898, is still published today. In Canada, the periodical industry remained more precarious, in part, because of an advertising base that lagged behind that of the U.S., poor distribution, and competition from foreign publications (see Kallmann, et al 1981: 741). Nevertheless, a number of magazines had substantial runs, including *Le Passe-Temps* (1895-1935, 1945-9), which contained regular music supplements, and *Musical Canada* (1906-1933).

In these early modern magazines, advertising is often as much an indicator of a publisher's target audience as the magazine content itself. In *The Etude* of June, 1915 (Vol. XXXIII, No. 6), for example, one finds that the most ubiquitous ads for products other than musical instruments, printed music, instruction manuals and the like, were for cold creams and facial powders; the back cover contained the only full-page, full-colour ad in the entire magazine--an ad for Palmolive, the soap for the "modern woman." While musical goods certainly made up the bulk of advertising revenue for magazines like *The Etude*, the prominence of these ads for other products are evidence that gender continued to be one of the most important factors in the construction of music magazine readership. And for the advertisers, music-making in the home continued to present itself as an important avenue for the promotion of an increasingly diverse set of feminine commodities.

Of course, magazines were not only a vehicle for advertising; other factors contributed to their growth and to their significance for their readership. In the consumer area, the spread of public education and increases in leisure time contributed to the increased

circulation of magazines from the turn of the century onward (Peterson 1964: 47-49). And among their contributions to public life, Peterson argues that, despite their shortcomings, magazines in the U.S. provided an important forum for public debate and an inexpensive source of both education and entertainment (Ibid.: 448-51).

Furthermore, Peterson argues that the modern magazine, with its broad circulation patterns and its widely dispersed readership, tended to interpret issues and events within a national (i.e., U.S.) perspective, thus contributing to a sense of national community (Ibid.: 449). This was as true for the trade magzines as it was for consumer periodicals and it had a significant impact on the organization and functioning of industry. Initially, magazines such as *The Music Trades* saw their role as primarily one of providing communications links between different sectors of the industry:

> a trade paper has other values than as an advertising medium for the manufacturer. It is the mainstay of the industry it represents. It gives the members of that industry a machinery for inter-communication, which a hundred other publications could not begin to equal.
> (*The Music Trades*, I (2) 1890; quoted in Majeski 1990: 30)

But it was not long before *The Music Trades* began to play a more active role in the life of the industry. In 1900, the magazine was instrumental in helping to establish the ground work for a piano dealers' association. Piano manufacturers had already established their own, exclusive organization three years earlier but it was the trade magazine's lobby on behalf of the dealers that convinced manufacturers that two, complementary associations could best represent the interests of the industry (Ibid.: 57-8). In this way, *The Music Trades* hoped to establish a sense of community between various sectors within the industry, to help them begin to understand their relations and interests as part of an integrated whole.

Outside the area of trade publications, Peterson notes that an increasing diversification and specialization is evident in the development of the magazine industry during the twentieth century. The expansion in the market for this diverse range of consumer magazines is related to a number of factors including increases in leisure time and education, and to the general level of economic prosperity (1964: 44-64). Following on this analysis, the first decades of the twentieth century and those following World War II would appear to be the two periods of greatest expansion.

But while Peterson's analysis may account for the rise of specialized publishing at its most general level, the specific diversity to be found even within the already highly specialized music magazine sector of the industry has also been a response to a number of other factors; indeed, a number of successful music periodicals were launched during the 1930s, an otherwise difficult time for the publishing industry. In particular, the diversity of music periodicals would appear to be linked to the specialized needs and interests of professional and amateur musicians who play a wide variety of instruments, each fundamentally different in its construction and playing technique and used in very different institutional settings; to changes in the technologies of musical production and consumption; and to changes in musical style. In almost every case, the various factors that contribute to the definition of a specific class of readership for specialized music publications also contributes to their differentiation as a market for specific musical products.

For example, virtually every musical instrument imaginable has had a specialized magazine or newsletter devoted to it during the twentieth century and, to one degree or another, most contain advertising for a variety of products related only to the instrument in question. Not only the general popularity of a given instrument but also the relative stability of the institutional base for certain instruments may be a factor in the continued survival of a number of musicians' magazines founded at the turn of the century: e.g., *The Strad* (founded in the U.K. in 1890 for orchestral string players) and *Diapason* (U.S.,

1909, for professional church organists). For some musical instruments, where markets were sufficiently large and sufficiently differentiated, more than one publication could be found even at this early date: e.g., the *Organist* was founded even before *Diapason* (in 1896) and was designed primarily for amateur players of sacred music. Similarly, as music grew to become a more important part of the public school curriculum, magazines and newsletters were launched specifically addressed to the needs of educators: e.g., the *Music Educator's Journal* (U.S., 1914) and the *Canadian Federation of Music Teachers' Associations Newsletter* (formerly the *Canadian Music Teacher*, 1935). Insofar as public schools have long been a major market for band instruments, it should be noted that even this latter category of publications owes its existence as much to advertising as to the needs of its institutional subscribers.

As already noted in Chapter 2, phonographs, gramophones and radios (and later, even television sets) were initially sold through music dealers in many centres and were advertised through the music press (among other media). But soon, the industries manufacturing these sound reproduction technologies developed separate distribution and retail channels of their own and, as demand for the technologies became sufficiently large, it warranted the publication of specialized periodicals as well: such as *The Gramophone*, founded in Britain in 1923, and *Radio*, launched in the U.S. in 1917 (the initial technological and musical content of the latter became more focussed in 1947 when the magazine was renamed *Audio*). In magazines of this type, music becomes primarily a pretext for the show-casing of technological products. Each successive change in audio technology--tape recording, LP's, stereo and CD's--has brought about new titles in the field and the audio magazine has become a marketing and promotional mainstay of both the electronics and the record industries. The importance given to the technical characteristics of music reproduction devices places these magazines within the category of hobbyist magazines (such as *Popular Electronics*) as much as that of music magazines. And, as I will demonstrate in the

following chapter, certain conflicts in content and outlook are evident in recent magazines that attempt to combine these two magazine formats.

Finally, in an apparent acceleration and diversification of what William Weber described as the formation of "taste publics" during the nineteenth century, musicians and fans have increasingly turned to the magazine as a medium of communication concerning specific styles and genres of music. Some of the longest standing genre-oriented music periodicals have been devoted to the bourgeois concert hall tradition: for example, Britain's *The Musical Times* has been published continuously since 1844. And in the twentieth century, various sub-genres within this tradition have also been served: e.g., *Opera News* (founded in the U.S. in 1936). The diversity of popular musics during the past century has also spawned an equally diverse music press. Of the magazines founded during the early part of the century, *Down Beat* is among the best known and longest surviving: founded in 1934 during the heyday of the Swing bands, it came to be known among touring jazz musicians as "The Musician's Bible" (*Down Beat* will be discussed in greater detail in Chapter 6). For their readers, periodicals of this type--whether designed primarily for professionals or consumers--help to construct a coherent world of musical classifications and "distinction" (Bourdieu 1984). And for record companies and for the manufacturers of musical instruments, the exclusive focus of these periodicals have made them an indispensible means of accessing specialized markets for their products.

The contours of the music periodical industry in the post-World War II era will be outlined in the following chapter but it is worth noting here that in addition to the trade and commercial magazines there are also several categories of periodicals--the professional and amateur music association newsletters, academic journals, and others--where advertising plays little or no significance in their format or content. These publications tend to be more dependent on subscriptions and, to a large degee, can be regarded as extensions of the communities which they serve. For centuries, professional and amateur musicians have

formed associations of one kind or another through which they have organized their activities and advanced the practice of their art. In the case of the Medieval music guilds, for example, these associations were marked by exclusivity, formed the basis for a system of apprenticeship training, and ensured continued employment. In many ways, they were the ancestors of the modern musicians' unions with their extensive network of local administrations and their national and regional publications.

But apart from the music unions (which, ultimately, are little different from those serving other skilled occupations), there are a myriad of small and highly specialized professional and amateur associations whose existence is predicated on little more than the enthusiasm of their membership: amateur choral societies, obscure associations for the promotion of specific musical instruments (e.g., the American Banjo Fraternity), and ad hoc groups of fans for marginalized, sub-cultural musics. Many of these associations sponsor magazines, newsletters, programs on community radio or other media, whose editorial content and economic base can be quite different from the commercial media. As specialized as these associations and their characteristic communications media may be, they have helped musicians and their audiences to communicate with one another, to gain a sense of shared interests and common goals, and to achieve a greater sense of "community."

To these various associations one might wish to add the recent emergence of so-called "user groups." However, as I will argue later, despite certain resemblances to the groups described here, these more recent organizations of synthesizer enthusiasts are often linked in significant ways to the manufactureres of digital technologies, thus placing fundamental contradictions at the heart of their activities.

But in the twentieth century, a quite different set of relations and associations have also resulted from the enthusiasm of individuals for the technology of modern communication itself: the amateur radio "hams" of the early twentieth century, the Citizens Band (CB)

radio operators of the 1970s and, most recently, the networks, bulletin boards and user groups associated with computer culture are all, in different ways, examples of this phenomenon. To the outsider, these various movements have often appeared (and been portrayed by mainstream media) as little more than "fads," the transient preoccupations of enthusiasts more interested in the act of communication than in its content. In contrast, to the insiders, the existence of the technology and the guarantee of popular access to it has just as often been associated with the most idealistic notions of community, democracy, and self-fulfillment.

In the following chapter, I will argue that as musicians have adopted digital technology, they too have taken part in the recent, technologically-based forms of communication and association and that the dynamics of these interactions differ in significant ways from the older musical networks and organizations. It is perhaps worthwhile then to examine some of the characteristics of these groups and modes of interaction by looking, if only briefly, at an early manifestation of this phenomenon--the so-called "ham" radio operators of the first decades of this century.

"An Adventure into Space"--The "Ham" Radio Phenomenon

Most histories of radio make at least passing reference to the young, amateur radio enthusiasts--"Marconi's youth" as Erik Barnouw referred to them (1966: 28)--who began operating in the midst of the early, chaotic days of the medium between the turn of the century and the beginning of the First World War (see, for example, Barnouw 1966: 28-38; Dunlap 1935: 159-166; Harlow 1936: 467-500). While there appear to be few, precise accounts of who these enthusiasts were, and there is some dispute as to their ultimate significance in the history and technical development of radio, there is one point on which most commentators agree: that the vast majority of these amateurs were males, mostly

young, and mostly middle class. Given the enthusiasm and background of these amateur experimentors, it is perhaps not surprising that many of them would eventually fill key executive and managerial positions, not to mention the many positions as operators and engineers, in broadcast radio during the years following the war (see Barnouw 1966: 28-31 and, especially, Hornung 1940: 28-29).

The peculiar fascination that seems to have gripped these young men as they hovered over their home-made crystal radio sets and telegraph transmitters has been described with particular sensitivity by J.L. Hornung: he descibes the amateur as a male between 12 and 18 years of age who has spent hours and days building his own equipment, listening, learning, and tapping out messages in code, and waiting for the day when he might hear his own call letters being sent by someone else--a moment "charged with emotion and exultation" (1940: 25-27). It was perhaps this ecstasy, this "adventure" in communication across space that attracted so many young men to the medium of radio, even more so than the content of their "conversations" (Dunlap 1935: 162-5).

It was, in part, this enthusiasm that fueled what would eventually become "one of the largest independent non-commercial amateur fads" of the period (Ibid.: 48): by 1917, (licensed) amateur transmitters numbered over 8,000 and receivers were estimated at 125,000 (Barnouw 1966: 55). But the isolated activities of individuals seldom become "fads" without some help from mass media and it should be noted that the popular science magazines and newspapers of the day, followed by the rise of the amateur radio magazines themselves, played an important role in popularizing radio as a hobbyists' medium (Harlow 1936: 468-9). It was the publishing industry that initially spread the word about the new-found pleasures of the medium to a wide audience and taught amateurs how to build their own sets.

But with so many amateurs crowding the air waves it soon became difficult to ensure uninterrupted communications between shipping vessels (one of the more "official"

uses of the medium during its early days). The Navy and other U.S. government bodies began to regard the amateur transmissions as "interference" in their own legitimate activities and in 1912 the first radio licensing laws were passed in that country. The law separated amateur, shipping and military wave bands, thus forcing amateurs to develop new broadcasting techniques that made use of the so-called "short wave" frequencies.

But what is perhaps most important for my purposes here is the manner in which these events contributed to the mythology of the amateur radio operators. During the years preceding the introduction of the 1912 licensing law the press had valourized the radio amateurs as a group of independent, quasi-scientific experimenters whose lack of formal training in research was more than offset by their harmless obsession with radio technology and the complex phenomena of the air waves. At the same time however, these amateur enthusiasts came to be regarded by the U.S. Navy as a nuisance--a group of clamorous and frivolous pranksters whose activities threatened both safety at sea and the legitimate operations of the military. Amateurs were accused of not only interfering with transmissions but of sending out fake orders to naval vessels and false distress calls (Harlow 1936: 469-70).

This conflict in the "framing" of the ham radio operators and their activities is curiously reminiscent of more recent shifts in the public image of computer "hackers." Regarded variously as technical genius, "nerd," and prankster (see Hayes 1990: 91-99), the hacker has come to be increasingly scrutinized by corporate, government and military interests as a potential perpetrator of computer crime. Indeed, Andrew Ross has described what is undoubtably an overreaction to the threat of computer viruses in the aftermath of Robert Morris' disruption of the Internet network in 1988 as akin to a "moral panic" (1991: 107; for a more detailed account of the Morris affair, see Hafner & Markoff 1991: 253-341).

For their part, the amateurs (both the radio hams and the computer hackers) defended their activities by invoking a rhetoric based on notions of democracy, personal freedom and public access; in this, there were again considerable parallels between the two subcultures. But in the early decades of the century, the radio hams also saw fit to organize themselves, for technical and political reasons, into coherent national and international groups: organizations such as the American Radio Relay League and the International Amateur Radio Union were formed and, in 1915, the magazine, *QST*, became their official organ of communication. In December of 1918, when the U.S. government held hearings on a proposal to allow for a Naval monopoly of the air waves following the war, it was the American Radio Relay League that spoke for the interests of the amateurs (Barnouw 1966: 54-55).

But by that time, the public image of the radio amateur had already begun to change once again. As conscripts during the war, the experience of the former amateurs had proven to be useful to the military: the practical knowledge of the amateurs provided an invaluable resource for the development and maintenance of radio communications on the battle field and the amateurs returned home as heroes of the war effort. After the war, this new perception of the amateur was augmented with stories, published in popular magazines such as *Reader's Digest*, of a variety of emergency communications services being rendered to local communities by amateurs during times of natural disaster (Harlow 1936: 499-500). And organizations like the American Radio Relay League and other supporters began to stress the importance that amateur experimentation had had on the technical development of radio, on research into areas such as short wave transmission, and as a training school for future industry leaders (see Hornung 1940: 28-35). In contrast, those who had an interest in downplaying the contributions of the amateurs (e.g., Marconi himself) continued to argue that their technical and scientific contributions were greatly exaggerated (see Dunlap 1935: 164-6).

But in addition to these supposed strategic, communal, and technical contributions, the activities of the amateurs also came to be infused with a peculiar idealism. Hiram Percy Maxim, president of the American Radio Relay League, was quoted as once having said that, "To me amateur radio has a more important destiny to fulfill than mere scientific attainment, and that destiny is the furtherance of world peace" (Ibid.: 164). In the context of the First World War and its aftermath, such appeals to "destiny" and the goal of "world peace" had, no doubt, a deep resonance for the public and for the supporters of the amateur radio movement. And it is precisely this fusion of arguments--one concerning quasi-scientific and technical pursuits, on the one hand, and another appealing to an idealistic social program, on the other--that appears to have become typical of male, technical subcultures during the twentieth century. In Chapter 6, I will show how a similar fusion of concerns was employed by individuals in the music industry in an attempt to support the interests of technical user groups at a critical moment in the development of MIDI during the early 1980s.

However, in assessing such idealistic claims and the more general "folklore" surrounding any given technical subculture, it once again becomes important to consider who the "amateurs" in question might be and precisely what constitutes the nature of their activities and exchanges. For example, in an article discussing the use of Citizens Band (CB) radio during the 1970s, Hershey, et al, argue that our image of the ham radio operator as someone concerned mainly with the technical aspects of transmission and reception and with the specialized codes and protocols of radio communications suggests that their "electronic neighborhood" is a relatively exclusive one (1978: 238-9). CB users, on the other hand, tend to have relatively little technical knowledge and appear to be more interested in communicating than in equipment or transmission range *per se*; the authors argue that the CB "neighborhood" is thus more "populist" in nature (Ibid.). Their study also shows that despite the media image of the CB user as a maverick truck driver out to

circumvent police radar traps, only a small percentage of CB communications actually have such "instrumental" purposes (Ibid.: 246). The authors classify the vast majority of communications studied as "expressive"--concerned with the maintenance of a network of friendships and social relations--thus supporting their hypothesis that CB radio is primarily an "affective" medium of communication (Ibid.: 247).

On the surface, CB communications would appear to bear certain similarities to at least some of the typical interactions of the early ham radio enthusiasts and also to the various "bulletin boards" and other communications forums commonly found on computer networks. Among other characteristics, Hershey, et al, describe CB communication as non-private, participative, anonymous, affective, and concerned with defining the boundaries of a community of interest (Ibid.: 239); each of these characteristics could be applied equally well to ham radio transmissions and to various computer-based network communications.

But any community of interest requires at least a minimum degree of "commonality" and in the case of technologically-based communications that commonality, at least initially, boils down to possession of the technical equipment itself (Ibid.: 238). Indeed, a frequent topic of conversation on CB networks involves the comparative performance, use and maintenance of the technical apparatus (Ibid.). As mentioned earlier in relation to ham radio operation, factors such as the relative cost of equipment, the level of knowledge required in its use, and modes of user interaction will, in part, determine the degree of exclusivity exhibited in any medium. Such factors need to be weighed against, for example, claims often made by enthusiasts concerning the "democratic" nature of the technology and other assumptions concerning the degree of "global" accessibility. Furthermore, while electronic communications may encourage the formation of communities of interest unencumbered by the constraints of time and space, some recent studies of computer networks show that as the size of the social group grows so does its instability,

thus placing increasing demands on the capacity of individuals to maintain the network itself (see Rice 1987).

A number of recent commentators have remarked on the make-up of computer subcultures and compared this to the folklore that has been generated about them. Dennis Hayes dismisses the popular mythology of the "outlaw" and the computer "terrorist" by arguing that hackers are "typically white, upper-middle-class adolescents" who generally lack political motivation despite their anti-bureaucratic posturing (1990: 92-93). Arguing against Hayes' assumptions, Andrew Ross is less ready to judge the political commitment of hackers as implied by their class status alone or by an overly simplistic interpretation of their activities (1991: 122).

Ross makes a more revealing and potentially more important observation about hackers however, when he argues that despite the hackers' countercultural stance, there exists an underlying "fit" between the hacker's system of values and that of the entrepreneurial elements of computer culture:

> the hacker cyberculture is not a dropout culture; its disaffiliation from a domestic parent culture is often manifest in activities that answer, directly or indirectly, to the legitimate needs of industrial R&D. For example, this hacker culture celebrates high productivity, maverick forms of creative work energy, and an obsessive identification with on-line endurance (and endorphin highs)--all qualities that are valorized by the entrepreneurial codes of silicon futurism.
> (Ibid.: 121)

Ross' description of the adolescent computer hacker bears some resemblance to Hornung's valorization of the energy, freedom and excitement that characterized the working habits of the early ham radio experimenters (1940: 30-32). Hornung referred to this "peculiar psychic or psychological phenomenon" as simply the "amateur spirit in research" but then went on to claim that this "spirit" was valued by many professional engineers of the day, that it was even largely responsible for "America's dominance in technological radio

fields," and that its preservation was essential for "progress" (Ibid.: 33). In this way, Ross, in a critical manner, and Hornung, in a more celebratory fashion, point to what appears to be an essential continuity of values that inform male technical subcultures regardless of their professional or political status.

It is also important to note that this "folklore of technology" (Ross 1991) surrounding male subcultures--the stories of their obsessions, their feats of accomplishment, and their supposed transgressions; and their advocates' idealistic statements of purpose, values and destiny--tends to obscure female relationships to the same technology. Indeed, in the various accounts of the early radio enthusiasts cited here women are not mentioned at all. Even Hornung's book (1940), which is ostensibly an introductory training manual for those interested in a career in radio, assumes that those wishing to enter the field will be exclusively male.

This stands in marked contrast to the prevalence of both men <u>and</u> women in most accounts of audiences for the medium of broadcast radio. But during the early 1920s, broadcast radio had quickly come to be regarded as a domestic medium of entertainment for the entire family in a way that short wave radio had never been. The radio receiver, like the pianola and the phonograph before it, was given a central place in the parlour of almost every home; indeed, some manufacturers even marketed what might be considered as an early prototype of the present-day "home entertainment center" in the form of an upright piano with built-in radio and phonograph player.

By comparison, the early wireless was hardly a domestic instrument at all. Instead, it inhabited an entirely different set of spaces, separate and secluded from family life: "In attics, barns, garages, woodsheds, apparatus took shape. Because of the noise and other menaces and hazards, real or imagined, the activity was for a long time banned from living quarters" (Barnouw 1966: 28). For the moment, I simply want to suggest that this separation from the central spaces of family activity is typical of male hobbyist pursuits;

this point will be taken up again and dealt with more fully in the following chapters in relation to the notion of the "home studio" of the 1980s.

The popular valorization of male hobbyist activities and the corresponding lack of attention paid to women's relationships to the technologies of communication is particularly disturbing when one considers that the activities engaged in by women, at least in some cases, may be more socially and economically significant than many of the isolated, technical preoccupations of male hobbyists. While male users, from the early ham radio operators to the perpetrators of computer "viruses," have been variously portrayed as "pranksters," "mavericks," and "outlaws," there is little evidence that the majority of their "pranks" have been in any way damaging to commercial or government interests. Women's transgressions, on the other hand, often occur in the context of the workplace and thus have a more direct impact on the operational efficiency of the organizations in which they work:

> In the mainstream everyday life of office workers, mostly female, there is a widespread culture of unorganized sabotage that accounts for infinitely more computer downtime and information loss every year than is caused by destructive, "dark-side" hacking by celebrity cybernetic intruders....In many cases, a coherent networking culture exists among female console operators, where, among other things, tips about strategies for slowing down the temporality of the work regime are circulated. (Ross 1991: 123)

Both Ross (Ibid.) and Hayes (1990: 95-6) agree that corporate managers recognise that this widespread ability to tamper with data and programs exists even within unskilled elements of the work force. However, executives are reluctant to publicize the extent to which their companies are vulnerable to this kind of activity and much of it goes unreported.

But quite apart from recent computer technology, the work of Lana F. Rakow (1988) demonstrates how varied and more complex women's relationships to earlier communications technologies, such as the telephone, have been. Rakow relates how the

telephone and its uses were, from the outset, embedded within social relations and practices, contributing both to the maintenance and extension of hierarchies between men and women and, contrary to popular belief, to an uneven distribution of access to the technology and to the possible isolation of women from family and friends. Furthermore, as she points out, the importance of the telephone in the life of women, both at work and in the home, and its stereotypical identification with "women's talk" may be one reason why the medium has been so trivialized and neglected by scholars in the past (Ibid.: 208).

While there are certain parallels to be drawn between the telephone as a medium of person-to-person communication and the use of the early wireless for similar purposes, it is perhaps more instructive to focus on one of the more striking contrasts between the two media. Adopting Marshall McLuhan's terminology, Hershey, et al, describe the telephone as a "high definition" medium: that is, a medium characterized by its individualism, urgency, intrusiveness, exclusiveness, and privacy (1978: 251-2). Two-way radio communications, on the other hand, tend to be communal, nonurgent, nonintrusive, and non-private (Hershey, et al 1978: 252). Rakow however, qualifies these notions of "urgency," "intrusiveness" and "privacy" in telephone communications by demonstrating how they have had drastically different implications for women than for men: for women especially, the private telephone line has contributed to the possible avenues by which they can be abused and harassed by men--a problem that is, again, well known but little studied (1988: 222-24). In common telephone usage, the anonymous phone call is almost always presumed to be perverse, potentially dangerous or, at the very least, an invasion of privacy.

Anonymity in two-way radio communications, on the other hand, has long been a accepted mode of interaction: in the early days, short wave radio enthusiasts often identified themselves only by code (similarly, in the world of CB communications, it is common to invent a "handle" rather than use one's own name). In part, this predilection for anonymity is perhaps a result of the open characteristics of the medium itself: at any given moment,

any number of people might be listening in on someone else's conversation and anonymity offers the participants a sense of protection or security. But one might also interpret this curious phenomenon of personal-yet-impersonal communication as a reluctance on the part of at least some radio enthusiasts to engage in relationships of a more intimate nature. In her study of computer hackers, Sherry Turkle has argued that it is during the psychologically difficult time of adolescence, when social and sexual pressures are particularly acute, that males are most likely to turn to the worlds of technology and formal systems as a means of overcoming their personal anxieties about social relationships (1988:43-44). Her comments concerning the use of computers as a compromise solution to the "conflict between loneliness and fear of intimacy" seem especially appropriate when applied to the ham radio phenomenon: "in its activity and interactivity, it offers the illusion of companionship without the demands of friendship" (Ibid.).

It is perhaps no accident then that the vast majority of the early radio enthusiasts were male teenagers and that their activities and modes of interaction took on such peculiar characteristics. Indeed, elsewhere Turkle has made an explicit link between male adolescent attitudes and a number of activites including computer hacking and ham radio, among others (see 1984: 207-211). In the following chapters, I will argue that the recent formation of so-called "user groups" around particular musical instruments is a phenomenon that bears a striking resemblance to both these male adolescent subcultures.

Conclusion

The relationship between different sectors of the music industries and music periodical publishing has been well established for many years: in the nineteenth century, periodicals were not only the vehicles for music instrument advertising but, even more importantly, an ideal format for the dissemination of popular songs and sheet music for

amateur pianists. Focussed on the home as the locus of consumption, music periodicals played an important role in both the formation of musical taste and in reinforcing bourgeois family values. In particular, the magazines appear to have been a significant factor in the reproduction of gender roles in middle-class culture. For the moment, I want to simply note that the role of women as the centre of family musical entertainment in the home during the nineteenth century stands in stark contrast to the recent, predominantly male preoccupation with the construction of the notion of the "home studio": I will have cause to return to this point again in both Chapters 6 and 9.

In the early twentieth century, with the advent of mechanical reproduction and the gradual waning of the parlour piano as the focal point of musical entertainment in the home, on the one hand, and the increasing circulation and specialization in magazine publishing, on the other, music periodicals began to take different forms. The sheet music supplement in general interest magazines quickly disappeared in favor of specialized magazines devoted to every imaginable musical instrument, to audio equipment and sound recordings, and to magazines catering to a growing diversity of musical styles and tastes. Above all however, these changes must be understood in the context of the rise of modern advertising, the creation of a mass consumer culture, and the integration of magazines within the marketing apparatus of contemporary capitalist enterprise. In modern publishing, there is a constant tension between the role of magazines in servicing the interests and needs of a community of readers and their function in delivering that readership to advertisers.

Outside of these market conditions however, musicians have continued to associate and communicate with one another in various ways: unions, music societies and amateur associations all have their newsletters and other forms of communication and networking. But in the following chapter I want to argue that the increasing emphasis on technology in music production has spawned its own forms of association and communication and for this reason I have looked outside the world of music to the early phenomenon of "ham"

radio operation for a model of more technologically mediated communications. What is particularly interesting in this example and in the others described in this chapter is the predominantly male, hobbyist orientation of these activities; the fascination with technology and the very act of communication; the affective, though largely anonymous, nature of the communications themselves; and the idealistic, democratic and utopian rhetorics that are often mobilized in support of such activities in the face of government regulation and/or commercial investment. As regards the latter, the tensions between individual, community and commercial control over the technology are particularly pronounced and it is precisely this type of conflict that I want to discuss in the following chapter.

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Chapter 6:

Musicians' Magazines, Computer Networks and User Groups in the 1980s

> We write for the readers, not for the industry...we're not advertiser led, nor product led. We are selling a readership to advertisers so our main aim is to develop and maintain a readership. (Publisher, personal interview)

> This, my friends, is power. The ability to learn about new uses of technology, and to discuss its implementation directly with the people responsible for that technology, is the power to directly participate in the evolution of technology...it is happening on a daily basis over the computer Networks...The buzzword is DAILY ACCESS.
> (Leopold 1987: 3)

The contrast between these two statements could not be greater: on the one hand, there is a tension--between writing for a readership and simultaneously selling it to advertisers--that is perhaps all too familiar in any commercial publication; and on the other, there is an idealistic, even utopian belief in the participatory nature of technologically mediated forms of communication. But apart from the contrasting attitudes exhibited in these statements, the contradictions that exist within the two means of communication are equally significant. Indeed, while the computer network may appear, on the surface, as an egalitarian system, in actual fact, the manufacturers that use the network have certain privileges and powers of access that are denied normal members. Furthermore, they make use of the network for their own marketing purposes as much as they use the magazines for promotional support.

In this chapter I want to look firstly, at the modern, highly specialized, publications catering to the musicians market and, later, at the relatively recent rise of computer networks and user groups among musicians. Issues of "community," access to information, and democratic participation in the process of innovation, will be key issues throughout this discussion. Particular emphasis will be placed on the relationship between these means of communication and the marketing of new technology, which is especially important to the study as a whole.

During the 1960s, '70s and '80s successive waves of new technology have transformed the manner in which music is produced, distributed and consumed and, perhaps not surprisingly, one of the most striking aspects of this development has been the number of new magazines that have appeared on newsstands to support the burgeoning market for these new technologies. And nowhere is this phenomenon more evident than with the newest group of magazines designed for pop music's vanguard in high-tech musical instruments and recording devices--the popular musicians themselves. Even the titles of this recent crop of music periodicals--*Music Technology*, *Electronic Musician*, *Home & Studio Recording* and *Music, Computers & Software*--trumpet their commitment to new technology and to music production in the brave new world of the so-called "Electronic Cottage."

Of course, there is an easy explanation for all of this: despite heavy competition from the electronic media, magazines remain one of the most economical means for advertisers to reach a specific market for their products (electronic or otherwise) and this is especially true for the musicians' market which is relatively small, highly specialized, and widely dispersed. But while I would certainly not deny that these magazines are, for the most part, advertiser driven (indeed, this fact is a central element of much of what follows in this chapter), it seems to me that the construction of a consumer market for new musical

technology throughout the 1970s and '80s has been extremely complex, and perhaps unique in many ways.

Similarly, the rise of computer networks and user groups in music can be directly related to the advent of digital musical instruments:

> Since music generation is rapidly becoming more computer intensive, there is a need for the same end-user support that has become common in the personal computer market: an **INDEPENDENT** user's news magazine. (*Transoniq Hacker* promotional brochure, emphasis in the original)

These latter groups, with their newsletters and computer "bulletin boards," operate from a very different economic base from that of the magazines but, as I will attempt to demonstrate, there is nevertheless a good deal of continuity between them at the level of content and in their relations with the manufacturing sector. What is perhaps most important here, however, is the degree to which the networks and user groups appeal to a sense of democratic participation. In the case of the International MIDI Association, the rhetoric of democracy operated at a high level and quickly came to be regarded by the manufacturers as a threat.

The Contexts of Recent Music Periodical Publishing

The contexts in which the recent proliferation of musicians' magazines has taken place are extremely complex and include a number of economic, technical and social/historical factors that, although present throughout the post-War period, have become increasingly significant since the late 1970s and early '80s. Furthermore, these factors are not confined to any one industrial field but relate to a variety of changes occurring more or less simultaneously in the publishing, electronics and music industries.

Firstly, within the world of magazine publishing itself, business and special interest magazines in all fields have increased in both number and in circulation. Peterson has noted that while special interest magazines have been in existence at least since the turn of the century, advances in education, income and leisure time during the '50s and early '60s led to a proliferation of new magazines of specialized appeal (1964: 363). Taft claims that this phenomenon has become increasingly important since the mid-'70s and that if the idea of specialized publications itself is not new, the degree of specialization is (1982: 23): the trend in the magazine industry has apparently been one of moving away from the earlier battle with television for mass-market advertising dollars towards a reliance on more specific ad markets--"moving to a state of 'specialization within specialization' as the market becomes dissected into more minute elements" (Ibid.: 17). The contemporary musicians' magazine is one such "specialization within a specialization" (Ibid.: 278).

Evidence of this general trend can be found in recent data published by Statistics Canada (Ifedi 1990): during the mid-'80s, circulation figures for special interest magazines in Canada grew by 67% while general interest periodicals declined by 3%. But beyond circulation figures, Statistics Canada reveals a more compelling economic reason for the recent success of this category of periodicals: because they rely more heavily on advertising, special interest periodicals (especially those containing business content and consumer information) are more profitable publishing enterprises than general interest magazines (with profits averaging as high as 9% of total revenue compared to 5% average profits in the general interest area; also in this vein, see Desbarats 1991).

One of the largest areas of growth in the special interest category has been in business periodicals--trade magazines, professional and technical magazines with controlled circulation (such as those directed to sound engineers, record producers or club DJs), etc.--and while my main interest here is in consumer magazines, it is perhaps worthwhile mentioning these publications if only briefly (in the music periodical industry,

the business and consumer areas are, in any case, often linked through ownership and editorial control and I will be discussing the significance of this phenomenon below). Industry has only recently realized the value of "business-to-business" advertising: studies conducted during the mid-'80s showed that advertising could be more cost effective when directed towards dealers, retailers and other professionals as well as to end users (see Dougherty 1986) and this has led some manufacturers to adopt a more integrated approach to advertising and promotion. Such an approach is often encouraged by publishers: for example, Norris Publications, publishers of *Canadian Music Trade* (a musical instrument retailer magazine) and the consumer-oriented *Canadian Musician*, has for several years offered advertisers discounts when they place ads simultaneously in both magazines. The same studies revealed the success rates of various marketing strategies, such as the use of reader service cards placed in business magazines; and it is interesting to note that service cards of this kind have now become a regular feature of a variety of consumer electronics publications as well, including magazines for musicians, hi-fi enthusiasts and computer users. Publishers of business periodicals also offer other services to industry: some are part of larger communications companies directly engaged in the mounting of trade and consumer shows, and other events; others publish annual industry directories--an increasingly important function in the fast-changing world of clubs, performance venues, recording studios and video production.

Secondly, technological changes--in the form of computers, in-house typesetting, data transmission and other work--may have contributed to the increased viability of small-circulation specialized publishing during the 1980s (see Taft 1982: 342-343). While such technical changes are certainly not as dramatic as the improvements in printing that gave rise to the mass circulation magazine industry of the late nineteenth century, they have nevertheless become an important aid in overcoming the economic pressures of publishing. In this regard, it is interesting to note that as the more successful musicians' magazines of

the '80s have been absorbed by larger publishing interests they have also introduced new state-of-the-art desktop production systems and have been expected to share personnel and data banks with other group publications, thus reducing production costs and the size of their support staff. The magazines devoted to hi-tech music-making also maintain contact with industry professionals, contributors and their more up-scale readership through a specialized music industry computer network called PAN (Performing Artists Network; PAN will be discussed in greater detail later in this chapter).

A third factor, contributing more directly to the recent increase in the number of musicians' magazines, is related both to the promotional needs of industry and to changing modes of musical production. Since the growth of advertising in the early part of this century, magazine publishing has become part of the marketing system within contemporary capitalism (Peterson 1964: 18) and, to state the obvious, professional, semi-professional and amateur musicians are one of the primary markets for musical instrument manufacturers (other markets include the home market--often referred to as the "consumer" market--and the educational market, among others). But, according to H. Stith Bennett, this fact has become even more salient since the rise of rock and other forms of popular music based around electronic instruments and sound recording: "Performers struggled against the disparity between their recorded sound and their live sound throughout the 1950s and 1960s, and slowly their frustrations were turned into a market by musical instrument manufacturers" (1983: 231). This factor has become increasingly significant with the use of samplers, sequencers and special effects devices of all kinds in studio and stage production during the 1980s.

In this regard, advertising in musicians' magazines is just one among a number of strategies employed by the electronic instrument and sound reinforcement industry in order to reach this critical market: instrument manufacturers often sponsor artists and in return their products are mentioned in tour brochures and album jackets (for example, the album

liner notes for a record by Suzanne Vega reveal, in minute detail, not only the brand of guitar, sampler, and other instruments that she and her band use but also the brand of microphone, cymbals, and even her guitar strings); in the '80s, music video has also been an asset to musical instrument promotion (as one industry spokesperson noted, with music video one can actually see, up close, the make and model instruments that star performers play on--something that is seldom possible in club and stadium concert situations). Increasingly then, we learn not only who plays but also what they play as well.

Magazines still form the most direct link between instrument manufacturers and their market however and it is interesting to note that while musicians' magazines such as *Down Beat* have existed for many years, it was not until the early '70s, that the emphasis on musicians' "gear" came to the fore (and most notably, in magazines such as *Guitar Player* that had a large, youthful, pop/rock readership). This emphasis has increased throughout the 1970s and '80s: for example, in *Down Beat*, small side-bars containing details of the instruments that star performers play began to appear in artist interviews in 1979/80; by 1982 these inserts often contained photos and took up as much as an entire 1/2 page (in the more recent popular music magazines such information is written directly into the interview texts themselves); during the late '80s, *Down Beat* also added a regular column on sound equipment and new products of interest. Similarly, in July of 1985 *Keyboard* announced a "new era" for the magazine: apparently in response to "reader demand," it planned to expand coverage in the areas of equipment reviews and technical applications.

A characteristic common to the majority of these magazines is that they contain only advertising that is directly aimed at musicians; that is, one finds no ads for cigarettes, alcohol, etc. (this fact alone sets these magazines apart from large-circulation periodicals such as *Rolling Stone* or *Spin*). In 1980, *Contemporary Keyboard* magazine stated openly in an editorial that it had "a policy of rejecting all ads that aren't music related" (Vol. 6, #2,

p. 3). The same issue included, for the first time, an advertisers' index--another feature that has become characteristic of most musicians' magazines--thus assuring that the accessing of promotional information from advertisers was as easy for the readership as accessing the magazine's feature articles. In later issues, as if this practice had created some special form of intimacy between advertisers, music magazines and their readers, a headline above the ad index read: "They're in Keyboard because they care about musicians."

A fourth element contributing to the growth in the number of musicians' magazines devoted to new technology is related to recent shifts in the electronics industry and is as much technological as it is economic, related both to production capacity and marketing strategies. Despite the fact that most musical instruments (beginning with the hammer piano in the early nineteenth century) are today manufactured according to industrial processes, there is still a certain premium placed upon musical instruments that are hand made. As mentioned in Chapter 2, there are still companies producing handcrafted guitars and basses (even electric ones) and in the 1960s it was common for engineers to custom-design and build mixing consoles for their own studio needs. Similarly, in the late '60s and early '70s, the synthesizer industry consisted of only a few small, privately owned companies; the instruments themselves bore the names of their inventors (e.g., the "Moog" and "Buchla" synthesizers).

But, as discussed in Part I of the thesis, electronic instruments do not exactly lend themselves to small-scale production and as the market expanded during the late 1970s and, more importantly, as the industry shifted to microprocessor-based technologies, a number of large Japanese corporations (such as Casio, Roland and Yamaha) began to dominate the field. The Japanese corporations (especially Casio, which gears its products more to the amateur musician market) are closely linked to the manufacturers of integrated circuits and utilize modern production techniques. As outlined earlier, these companies pursued an

aggressive marketing str tegy during the early '80s that sought to bring the price of digital instruments down to levels that were accessible to the average musician/consumer (see Moog 1985: 42-44). These two elements--production capacity and marketing strategy--are clearly linked and, as Stuart Ewen (1976) has pointed out, have been an essential feature of capitalist production since the 1920s: with enhanced industrial production capacity, manufacturers increasingly need to concern themselves not only with the production of goods, but also, with the production of consumers.

It is here again that the need for musicians' magazines becomes evident but not simply in terms of advertising. The magazines promote a whole philosophy of music-making that is based around new technology and consumption: in the past when a musician purchased a musical instrument it was usually with the assumption that the instrument would last for years (often, musical instruments were handed down from one generation to the next); but in our culture technology is essentially linked with notions of progress and change and, for the manufacturers of electronic musical instruments, it is important that musicians adopt these values, especially as they relate to the need for renewed consumption of goods. Such strategies have not gone unnoticed by musicians of course (the most prominent criticism of the new technology of the '80s, even among its advocates, has been the excessive speed of technological change) but it is precisely in the musicians' magazines that these issues are most clearly raised and, to a certain extent, resolved.

In this sense, musicians' magazines are unique, I think (at least in relation to their specialty magazine counterparts for hi-fi enthusiasts and computer users), because the relationship between musicians and their musical instruments is such a loaded symbolic terrain: traditional values link musical instruments to romantic notions of authenticity and personal expression and, for this reason, the role of new technology in popular music has become highly contested (see Frith 1986). Musicians' magazines play an important part in

the redefinition of musical values, in renegotiating what William Leiss (1976) might call the "material-symbolic" status of musical instruments as objects of consumption and use.

Finally, there have been a number of factors at work within the music industry of the late 1970s and early '80s that have had a powerful impact on the ways in which young musicians interact and pursue their career goals; these factors have, no doubt, also contributed to the increased popularity of musicians' magazines. Prior to this period it was normal for young musicians to spend their early years learning songs from records, rehearsing with other like-minded musicians and performing in small clubs. H. Stith Bennett has described this process as three separate, though interdependent forms of interaction: a "musician-recording interaction," a "musician-musician interaction," and a "group-audience interaction" (1990: 232).

Since the late-'70s however, with the increased availability of inexpensive drum machines, synthesizers and sequencers, young musicians have been able to work without certain members of the band if adequate players cannot be found or, in the case of song writers, to produce fully arranged demo tapes without the aid of outside musical collaborators. Added to this enhanced technical capability and the possibility of autonomous musical creation was the initial impact that Disco had had on the availability of venues for the performance of live music in many urban centres during the late 1970s and early '80s (in this regard, it is interesting to note that the most significant new forms of popular music to emerge since the late '70s have been Hip-Hop and Rap music--musical forms based around DJ performers, phonograph turntables, studio sampling, and dance-club venues). While the impact of this latter factor has been subject to a great deal of regional variation and seems to have changed with time (by the end of the '80s there appears to have been a resurgence of live music venues in many centres), it is clear that the combination of these factors has placed a certain pressure on young musicians to develop their skills outside of group rehearsal and live performance contexts and to make increasing use of demo tapes in

order to gain exposure to record company A & R departments. Indeed, demo production has become the preferred method of introducing new talent to record companies (bands now regularly produce demos even before they have ever played before a live audience) and greater emphasis has been placed on demos of master quality. As one A & R representative put it: the 1980s became "the era of the competitive demo" (John Kolodner, in Kasha & Hirschhorn 1990: 267).

The technical nature of the new instruments and recording devices ("technical" in the sense that their operation requires a form of technical knowledge that is different from traditional forms of musical knowledge and skill) has forced many musicians to rely more heavily on specialized musicians' magazines as sources of information because of the difficulty of finding local musicians with adequate knowledge of the technologies or the techniques employed in their use. Indeed, during the mid-'80s --the most intense period of technological change in recent musical instrument design--it was often necessary for even the magazine editors to seek out software developers and product specialists as authors of magazine articles on new products--in many cases they were the only people who had adequate knowledge of all the available product features. This situation has become especially important for younger musicians who find they can no longer rely entirely upon local networks of more experienced musicians for their apprenticeship training.

In a more general sense, the music industry context has become more complex throughout the 1980s: for example, in addition to producing demo tapes, aspiring young musicians must now also confront the problems of video production; record deals with major recording companies are increasingly made at the international level, thus making decisions concerning repertoire, production and management more critical and the problems of exposure more difficult; and if they decide to release their own recordings, musicians must choose between a variety of competing technical formats and distribution channels. The "how-to-make-it-in-the-music-business" type of book has long been a staple of the

music publishing industry and while such books continue to appear year after year much of the information they contain quickly becomes outdated. The musicians' magazines have an obvious advantage in this respect in that they can provide more up-to-date information concerning such matters and most of them devote regular features to changes within the industry, professional tips, career advice, etc. And here again, much of this information is difficult, if not impossible, for musicians to obtain at the local level from their peers.

As I have attempted to show here, a number of factors occurring simultaneously across several different industries have contributed to the recent proliferation of musicians' magazines. But for many professional, semi-professional and amateur musicians themselves, I think it is becoming clear that they now operate at increasing distances from one another and from their audiences and that they must often rely on other, more mediated forms of interaction. In this regard, musicians' magazines have come to play a role in supplying musicians with both essential information and, also perhaps, a sense of community--a community that is completely integrated however with their position as a market for musical instrument manufacturers.

The Magazines

In turning to the magazines themselves, one is immediately struck by the sheer number and apparent diversity of these publications--by the manner in which musicians have been divided, for marketing purposes, into discreet categories of interest: the average newsstand or musical instrument shop in Montréal, for example, carries magazines devoted to keyboard players, guitarists, drummers, sound engineers and producers. In many cases, newsstands carry more than one publication in several of these categories: for example, there are four major publications which focus primarily on synthesizer, sampler and related technology alone--two published in the United States (*Keyboard* and *Electronic*

Musician), one in Britain (*Music Technology* which, until recently, also appeared in a somewhat different American edition--Canadians having the dubious honour of being able to obtain both editions), and one, a French-language publication with an English title (*Keyboards*), which is published in France.

At the 1990 summer trade show held by the National Association of Music Merchants (NAMM) in Chicago over 40 publications were on display, the majority devoted to specialized sectors of the musical instrument trade and to consumer magazines for musicians. Given the number of periodicals in the field and their relative degree of specialization it is not surprising that their individual circulation figures are relatively small. The oldest among them, *Down Beat*, which used to think of itself as "The Musician's Bible," has been published continuously since the era of the swing bands (since July 1934); until recently, its content has been primarily oriented towards jazz musicians and fans. In 1972--a period when competition in the field was still relatively low--it had achieved an average circulation of over 90,000 copies per issue; in 1989, when competition was considerably stiffer and its editorial policies had changed so as to allow for coverage of a broader range of musical styles, its circulation was still only 89,000-90,000. The following list (which is by no means comprehensive) reveals the more general pattern of growth in the market during this period: [1, 2]

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[1] In addition to the consumer magazines listed here, there are a number of periodicals directed to sound engineers and producers (such as *db*, 1967, *Recording Engineer/ Producer*, 1970, *Mix*, 1977, and others) whose circulation is generally smaller than the above--ranging from approximately 20,000 to 40,000 copies. Many of these magazines belong more to the category of business publications: their circulations are mostly controlled (i.e., distributed, often free of charge, directly to professionals in the field) and their main revenue comes from advertising. Because of their limited commercial distribution, I have not included them here.

[2] Circulation figures are rounded to the nearest 500. They are primarily taken from *The Standard Periodical Directory* and *Ulrich's International Periodicals Directory*; in some cases, figures were obtained from the publishers themselves or from audited statements (ABC or BPA) when these were made available to me. While figures in the two directories are supposed to be from audited sources, there can be considerable variation between them

Title and Date of First Publication	Approx. Average Circulation in NA for the year 1989
Guitar Player (1967)	132,000
Contemporary Keyboard (1975) (now simply *Keyboard*)	65,000
Musician (1976)	105,000
Modern Drummer (1977)	85,000
Canadian Musician (1979)	28,000
Music Technology (UK edition, 1981) (US edition, 1986)	50,000
Music & Sound Output (1982) (now *Stage & Studio*)	76,500
Home & Studio Recording (UK ed., 1983) (US ed., 1987)	50,000
Guitar, for the Practicing Musician (1983)	152,500
Music, Computers & Software (1985)	56,500
Electronic Musician (1986)	77,500
Rhythm (UK ed., 1987) (US ed., 1988)	(20,000) 40,000
Modern Keyboard (1988)	65,000

The impact of rock music on the music periodical industry (and, by extension, the musical instrument industry) is clear: the two magazines with the highest circulation figures are for guitarists (and there are several other guitar magazines in the field); and, ever since the introduction of synthesizers into popular music, the increase in the number of keyboard

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for individual titles: e.g., *Electronic Musician* is listed in *Standard* with a circulation of 77,500 but in *Ulrich's* the figure is only 65,000. There may be a number of reasons for such discrepencies but the figures quoted here are, to my knowledge, accurate.

and high technology magazines is also evident. Still, when compared to the circulation figures of specialized hi-fi and computer magazines--which can be as high as several hundred thousand copies--the circulation of these musicians' magazines seems relatively limited. It is only when one ignores the apparent diversity (or fragmentation) of the market and looks at the field as a whole that the figures even begin to appear significant.

And at the industry level, this surface diversity also serves to mask what is in actual fact a very high degree of economic concentration: many of these publications belong to "families" of musician-oriented magazines which are published by the same interests. For example, Music Maker Publications, based in Britain, publishes both books and magazines, the latter include *Music Technology*, *Guitarist*, *Rhythm*, *Home & Studio Recording*, *Home Keyboard Review*, and *Hip-Hop Connection*; until recently, three of these also appeared in U.S. editions, sharing about 25% of their content with their British counterparts. Similar conditions existed in the U.S. during the 1980s with GPI Publications (publishers of *Guitar Player*, *Keyboard*, *Frets*, various books and newsletters); Mix Publications (*Mix*, *Electronic Musician*, and the *Mix Bookshelf*--a distributor of books, videos, music software and other products); and Billboard Publications (*Billboard* and, through its various divisions and subsidiaries, *Musician* magazine, books and directories).

The more successful among these enterprises became the object of take-overs by large corporate interests as the decade of the '80s drew to a close. The GPI group was acquired by Miller Freeman Publications, a California-based company founded at the turn of the century and publisher of trade magazines for the natural resource industries and specialized high-technology areas of the medical, computer and electronics fields. It was in turn acquired by United Newspapers, the U.K. media conglomerate. Mix Publications is now owned by ACT III Publishing which also publishes magazines for the corporate video sector and for broadcast engineers (the company itself is part of a larger media group with interests in film production, movie theatres and television broadcasting).

It is difficult to guage the effects of industrial conglomeration of this kind in the publishing industry: while concentration of ownership has long been a concern in the area of newspaper publishing, historians of the magazine industry have generally felt that the sheer number of titles, the relative fragmentation and complexity of the market, and other factors mitigate against the possible adverse effects of conglomeration. Others however have observed that such forces acting in the area of special interest magazines in one particular field may result in a reduction in the number of available titles (see Taft 1982: 287) and something of this kind may be beginning to take place in the field of musicians' magazines. Faced with stiff competition from its rivals in the U.S. (and a general down-turn in the synthesizer market as the 1990s got under way) Music Maker Publications has been forced to allow its U.S. edition of *Music Technology* to suspend independent operations and to be absorbed by its more successful U.S. publication, *Home & Studio Recording*. Later, in the fall of 1990, Music Maker entered into an agreement in which Miller Freeman would take over the publication of *Rhythm* (US) while continuing to share some of its editorial content with the UK edition.

The level of concentration within this specialized area of publishing may also affect relations between the publishers and the industry they serve as well as having an impact on the general character of the magazines themselves. For example, in Canada, where the market is very small and already dominated by foreign publications, there are relatively few Canadian periodicals serving the popular music industry. As already mentioned above, the Toronto-based Norris Publications publishes both *Canadian Musician* (a magazine which attempts to cross over the boundary between a magazine aimed mainly at musicians and one aimed at a more general readership interested in Canadian music) and *Canadian Music Trade* (a business magazine distributed primarily to musical instrument retailers); Norris also launched a new magazine for sound engineers in the fall of 1990 called *Professional Sound*. But perhaps even more significant than simple ownership is the fact that all three

magazines share the same editorial and production staff. Norris also has interests in book publishing (music books and an industry directory) and artist management. In the Canadian situation then, Norris Publications and its affiliates have become a singular, multifunction management, promotion and information vehicle linking several sectors within the industry--from instrument manufacturers and distributors to retailers, artists and consumers.

In contrast, most of the magazines published outside of Canada have separate editorial boards and fewer direct links with the music manufacturing and retail industries. Nevertheless, a large number of editors and contributors from the magazines have, on occasion or in regular featured articles, appeared in the pages of their so-called "sister" publications or in magazines by different (i.e., competing) publishers. Several current editors and other writers have also contributed to (or, in some cases, worked for) manufacturer-sponsored publications or user-group newsletters, written technical manuals or served as consultants for instrument manufacturers, or developed sound programs for new electronic musical instruments. One prominent writer claimed that he could never be accused of conflict of interest because he had worked, at one time or another, for just about everyone in the business; this, apparently, was a guarantee that he was not beholden to anyone.

The net result of such economic and intellectual concentration is a certain homogeneity in general style, outlook, and approach between the various publications. This approach was neatly summed up in the editorial page of the recent inaugural issue of *Bass Player* magazine:

> Our goal is simple: to provide electric and acoustic bassists with the information they need to become better players, more successful musicians, and more savvy consumers of equipment. (Vol. 1, #1, Spring 1990, p. 4)

Canadian Musician (perhaps because of its crossover orientation) put it somewhat differently: "We cover the People...the Business ...the Products" (Promotional brochure, 1990). The elements are the same: star performers and musicianship, business and careers, and, above all, products. Indeed, the two former elements are ultimately collapsed into the latter:

> In today's business, the musician's tools--from instruments to recording technology--can make or break a song. *Canadian Musician's* regular product reports give detailed analysis of some of the latest technology--once again, by people using it on current projects. (Ibid.)

It should perhaps be noted here, if only in passing, that this emphasis on new musical products has not been limited to the pop/rock sectors of the musical world alone; but rather, it appears to have been a widespread side-effect of the increased speed of technological innovation and high-intensity marketing strategies in the musical instrument industry of the 1980s. The *Computer Music Journal*, published by MIT Press, is one of the most prestigious forums of avant-garde electronic music; it publishes only the most specialized, learned articles on the mathematics, theories, techniques and aesthetics of digital sound production. Because of the technical nature of the field the journal has, since its inception in 1977, always included a short "Products of Interest" column and, from about 1979 onwards, began to accept a limited number of advertisements from selected manufacturers; during the early years, the column and the ads together seldom contributed more than a couple of pages to the length of the journal.

Both sections expanded considerably during the 1980s however: in 1985, Yamaha, took out a 2-page display ad at the back of the journal; by 1988, the ads and product reviews often exceeded 30 pages in length, constituting over one-third of the total content of the journal. While the advertising content tends to be somewhat higher (amounting, on average, to 50% of the total magazine pages) these trends parallel, quite closely, similar

developments in the popular musicians' magazines. Even the tone of the reviews sometimes approached that of the popular magazines with expressions such as how much "bang for the buck" a particular product offered. In this regard, there would seem to be little difference between the avant-garde's fascination for technology and that of the pop musician.

What still separates the academic computer music journal from the pop magazines however is the degree to which content can be separated from advertising messages. The articles and interviews found in most popular musicians' magazines place a heavy emphasis on the equipment musicians use and, much like the ads that use star endorsements, an almost elementary process of transferal takes place where the attitudes and values attributed to the artist are transferred to the objects of consumption (in this regard, musicians are no different than any other fan: they are just as susceptible to the blandishments of the star system as anyone else). Again, whatever claims to integrity the avant-garde might have does not make them immune to this process; in an interview with Laurie Anderson, a photo caption reads: "Armed with a Roland D-50 and a challenging view of society, Anderson wails at the Brooklyn Academy of Music in 1988" (*Keyboard*, Dec. 1989, p. 75). In this sense, contemporary musicians' magazines are prime examples of Andrew Wernick's description of media in a "promotional culture": "thematically, ideologically and stylistically, the non-advertising content comes to be angled and coded in terms of the same economically functional categories as those which substructure the ads themselves" (1985: 14). Conversely, ads sometimes disguise themselves as interviews and product reviews and must be labeled, in small print, as advertisements by the magazine editors.

These observations suggest that any discursive analysis of musicians' magazines would have to avoid any strict, conventional categorizations or discursive typologies in favor of an analysis that seeks common procedures that cut across all boundaries and types (see Finlay-Pelinsky, 1983). In the hi-tech magazines, both the advertisements and the

feature articles emphasize various technical discourses, especially those concerned with power and control. But what is perhaps most interesting for my argument here is the manner in which the discursive practices of "futurology" (Ibid.: 18-22) come to serve these magazines in their attempts to stimulate the consumption of new technology. This was especially prominent during the latter part of 1989 and the beginning of 1990 when many of the magazines attempted to sum up the technical achievements of the '80s and to assess the possibilities for the '90s. All seemed to agree that the pace of technical innovation had been too rapid during the 1980s, that a slow-down was welcome and that musicians needed time to learn to use the instruments that they already had. But then, as they turned to the '90s, all the ills of the past decade appeared to be magically resolved by the promise of the new technologies of the future. It is this constant forward looking--this deferral of pleasure and satisfaction into the future--that contributes to the sense of desire and need that is necessary if the pace of technical innovation, and profits, is to be kept at a maximum.

But again, as discussed earlier, the area of musical instruments is a highly contested territory and not all musicians are readily inclined to rally behind the futurist call for newer, ever more powerful technologies. Not unlike the world of classical music, where the fetish for old instruments places an excessive monetary and symbolic value on Stradivarius violins and the like, many pop musicians have a special reverence for guitars and amplifiers of a certain make, model and year--for a particular Stratocaster or Les Paul guitar, for example, or for old tube amplifiers of the '60s. In the world of hi-tech, digital musical instruments something similar exists in the romance with "warm" analog synthesizer sounds of the '70s; Andrew Goodwin has argued that to play an analog synth "is now a mark of authenticity, where it was once a sign of alienation" (1988: 45). *Keyboard* magazine has even dedicated a regular addition to their instructional columns entitled, "Vintage Synths."

But there is something strange about this sudden historical interest on the part of magazines that regularly publish buyer's guides with feature-by-feature comparisons of the latest and the "hotest" gear on the market. It seems to me that this interest in bestowing "vintage" status upon technically (if not musically) obsolete instruments of the past functions somewhat differently in this context than it does in the case of other musical instruments: in effect, the magazines are saying to consumers, "Yes, you can buy that new synthesizer, sampler or drum machine because it will still be worth something several years from now." And at least one reviewer has expressed exactly those sentiments:

> I firmly believe this will be among the last generation of drum machines...Certainly, I can see it being the kind of machine people will be desperate to get their hands on in 1995, or whenever nostalgia for good old 1989 becomes fashionable. We're talking investment opportunities here. (Nigel Lord, in *Rhythm* (UK) 5 (5), November 1989, 55)

In this way, the discourse of "vintage" instruments is a strategic one: it helps to counteract the fear among many consumers of new technology that their purchases will become obsolete and worthless.

Furthermore, as is made clear in the reviewer's comments, the fetish of older musical instruments is essentially a nostalgic one: "vintage" instruments are understood to give the player a form of direct sonic (and sometimes iconic) access to the past and, thereby, an almost magical ability to evoke the power of some past music. And in this sense, there is a curious kind of "fit" between technological "progress" in musical instruments and recording equipment in the post-war period and the dominant modes in which popular music is produced, distributed and consumed. Nostalgia is coded into the lyrics of many pop songs--"Remember when...," "She's gone," etc.--and into their structure (in devices such as the fade-out); D.J. patter and mainstream radio formats frame popular music in terms of the passage of time--"Contemporary Hits," "Golden Oldies,"

"Classic Rock"; and among the various ways in which popular music functions for the listener is the manner in which it helps to organize our sense of the present and the past, our notions of youth and adolescence (see Frith 1987: 142-43). In the age of electronic reproduction, sounds themselves have become an increasingly important part of the way in which musical genres and the passage of time are coded. Musicians' magazines play a critical role in this process by helping musicians to define the various relationships between sounds, musical styles and the passage of time--they help to define those sounds which are truly "new"; those which, through over-use, have become merely stale; and those which have become the signs of a nostalgic past.

Another issue taken up briefly above concerned the context in which some musicians may have come to rely on magazines as a particular form of mediated interaction. And in this regard, it is interesting to explore the manner in which the musicians' magazines themselves work to simultaneously construct their readers as both a kind of musical "community" and a market. They do this in a number of ways: firstly, many of the magazines hold yearly readers' polls; this is typically done in a "Vox-Pop" style (i.e., readers are asked to choose amongst a select group of star performers who they think is the best jazz or new age synthesist, rock guitarist, classical pianist, etc.). Such events offer the readers a chance to "vote" and to gain thereby a sense of authority and competence in their ability to choose (in part, because it is a process in which they reaffirm the choices they have already made when purchasing recordings); at the same time, they offer the magazine a chance to address the readers as a kind of pseudo "public" (and a chance to obtain information that can be useful in planning future interviews and articles). *Keyboard* magazine (then known as *Contemporary Keyboard*) made use of this type of polling during the mid-'70s shortly after its first year of publication. By the early '80s *Keyboard* was engaged in a different kind of polling however--one that was more focused on probing into the personal habits of this "body politic": since that time, readers have been regularly asked to respond to ques

tions concerning their age, sex, income, interest in the magazine, the kind of instruments they own and, more importantly, how much money they are likely to spend on their next purchase and the kind of instrument it will likely be.

The shift to this type of information gathering is as significant for what it says about the changing function of the magazines themselves as it is for what it reveals about their readership. These surveys would seem to indicate a shift away from an ideology concerned with the representation of a readership, a "public," towards one more clearly based on supplying marketing information to advertisers: the stated aim of the surveys is to "monitor current consumer trends, and to anticipate their future needs and buying habits," "to gather valid data on the technology-based music instrument market," and to provide advertisers with "unique insights" that will allow them "to better position their products and services in the mind of the consumer" (advertisers' report, *Trends in Technology II*, Miller Freeman Publications, 1990, p.3).

In an interview, one publisher responded with the following remarks (already quoted at the beginning of this chapter) when I asked him whether the magazine was "advertiser-led":

> We write for the readers, not for the industry...we're not advertiser led, nor product led. We are selling a readership to advertisers so our main aim is to develop and maintain a readership. (Publisher, personal interview)

For him, there appeared to be no conflict whatsoever between the requirements of writing for a readership and simultaneously selling it to advertisers. Others have told me that conflicts often arise when manufacturers attempt to have the amount of editorial content devoted to their products tied to the amount of advertising dollars spent in the magazine; all deny that their own magazines bow to such pressure but suggest that other, less scrupulous editors do.

For their part, some of the manufacturers seem to feel that the magazines do not cooperate enough with them in their marketing efforts. At the trade shows--those semi-annual rituals where the industry meets face to face--there have been incidents where manufacturers berated magazine editors for adopting a flippant or arrogant attitude towards reviewing their products. But ultimately, the industry knows it must accept bad reviews along with good ones, for as Chapple and Garofalo have pointed in their discussion of the record industry and the music press: what really matters is the implicit promise that the products will indeed be covered (1977: 165-166). And whatever credibility with their readership that the magazines may gain through their apparent honesty is then used by the manufacturers when they reproduce (with the permission of the magazines) the reviews of their products for distribution in musical instrument shops. The more "objective" the review, the more excellent the promotional tool.

Readership: Gender & Community

As for the community of readers themselves, the surveys reveal that they are largely young and male--as high as 98% of survey respondents in the magazines devoted to new technology--thus reflecting the more general male domination of production in popular music and, more specifically, the male orientation of technical culture. In editorials, the magazines all appear to be critical of this state of affairs and thereby attempt to absolve themselves of any responsibility in the matter but even a cursory look at the division of labour within the magazines, their editorial and advertising content, or the discourses and modes of address used in the construction and sharing of technical knowledge reveal a definition of technology and musicianship which is highly gendered.

Indeed, the overriding character of female involvement in the world of musicians' magazines is one of near-total absence. As regards the division of labour in the magazines

the vast majority of the senior editors and the regular contributors are male; women most often occupy positions as editorial assistants, as designers on the production staff, or as marketing and sales reps, etc.--positions of low visibility (to the readership) and with little opportunity to speak publicly for themselves or their magazines. In this way, popular musicians' magazines are an area where males retain a monopoly on speech.

An absence of female performers is also evident in magazine content: by the end of 1989, after fifteen years of publishing (a total of over 160 issues), *Keyboard* had devoted its cover story to only a handful of select, female artists: among them, Wendy Carlos (a transsexual, born Walter), Kate Bush and Laurie Anderson. The track record for the other magazines is generally no better but the magazines with the highest commitment to new technology, such as *Electronic Musician* or *Home & Studio Recording*, tend to avoid the issue entirely by not putting people on their covers at all--with technology filling that role instead, all social ills seem to disappear into the glossy surface of the technical objects themselves (the magazine editors and marketing representatives generally feel that photographs emphasizing "hardware" and copy dealing with technical specifications are gender-neutral).

Perhaps even more intriguing is the manner in which new technology and technical production activity is portrayed in its colonization of the private sphere. The home has been the traditional site of female music-making but as the magazines have turned their attention to building the notion of the "home studio" there has been a noticable lack of female (or family) participation in this project. The so-called "electronic cottage" has been located, or so it would seem, in a remarkably deserted terrain (I will return to this point in Chapter 9 of the thesis).

On the rare occasion when the magazines have attempted to tackle the question of gender in the musicians' community however, it is again interesting to see the manner in which such questions are immediately linked to issues of marketing. A guest editorial

written by Marsha Vdovin (marketing director for a software company) and published in *Electronic Musician* (November 1989, 130) raised the problem of how women have been "discouraged from technological paths." But typically, the most convincing argument that she could muster for why women should be welcomed into the technological community was not that they stood to benefit individually or as a group from such a proposition, but that "they represent a market of amazing potential" and that marketing people should use tools such as advertising to "both *create* and tap into" this market (Vdovin's emphasis). This fusion of arguments concerning technology, economy and social equity is not unique to questions of gender but rather, it has long been associated with discourses that centre around notions of "democratization" and technology.

Musicians' magazines also attempt to create a sense of community by adopting terms and strategies that are characteristic of more traditional rituals of musician interaction: for example, regular articles dealing with musical technique in magazines such as *Keyboard* are titled "Private Lessons," thus invoking a traditional sense of musician apprenticeship. *Keyboard* also makes extensive use of musical notation in many of its articles and regularly carries transcriptions of popular songs; in this way, the editors make certain assumptions about the musical training of their readers and place the magazine firmly within the range of activities--Bennett's "musician-recording" and "musician-musician interactions"--described earlier as typical among popular musicians. *Electronic Musician*, on the other hand, seldom makes use of traditional notation and, instead of transcriptions and lessons in musical technique, instructs its readers in how to build electronic devices and how to write com puter software (thus reflecting its roots in the tradition of hobbyist magazines such as *Popular Electronics*). Such divergences in approach are not only significant in terms of the readership they attract but, more importantly, in the way in which they define two very different kinds of activity as meaningful forms of musical behaviour.

Divergences of this kind are also evident in the editorial attitude taken towards the relationship between conventional musical skills and new technology. In response to recent reports concerning the spread of lip-syncing in live performance contexts, one magazine editor espoused the virtues of live performance and "the level of human interaction that only real-time singing and playing can provide"; continuing, he pleaded with his readers that they not get "lost in the search for *perfection*...Reach for your potential as a performer and do the best you can with the gear you've got" (Scott Wilkinson in *Home & Studio Recording*, July 1990, p. 76). A few months later, taking an opposing stance, *Electronic Musician* published a guest editorial that referred to performing musicians as mere "technicians" and decried the necessity of "spending several years learning (and maintaining) the specialized skills required to play a musical instrument." The solution to this dilemma was to be found in the search for new technology:

> ...manufacturers should make an effort to appeal to the composer in us all...there are those of us who are more interested in and able to work with the overall shape and feel of a composition than the details that comprise it...
> ...let's envision instruments and software aimed at the composer instead of the technician.
> (Chris Meyer in *Electronic Musician*, 6 (9), Sept. 1990, p. 114.

Interestingly, the more moderate, conventional argument is stated in terms of the personal opinion of the editor and makes its appeal to the reader on the basis of traditional notions of musical skill. The radical, techno-utopian vision on the other hand adopts a mode of address that makes constant use of the third person pronouns "we" and "us" and contains an explicit call for the increased production and consumption of goods. In this way, the author invites his readers to join in this call for the development of new, innovative technologies, thereby contributing to both the formation of a market and the creation of a sense of communal ideals.

The sharing of knowledge in less formalized settings than that of the private lesson is also typical of local communities of musicians. And in this regard, the conventional ritual where pop musicians share new "licks" they have learned is reflected in the technical magazines' regular columns devoted to synthesizer sound "patches" submitted by readers. The prerequisite for participation in these mediated rituals is, of course, that one must own one of the synthesizers in question. Technology becomes, in this sense, the communal bond itself.

This idea--that technology has become the tie that binds--is the implicit, guiding assumption that pervades much of the content of the new musicians' magazines. In the same way that musicians have always identified themselves in terms of the instruments they play, the magazines now refer to this new community of musicians as "electronic musicians" or "recording musicians." But whereas subtle differences of class, taste, and musical style are still conveyed by the appellation "violinist" as opposed to "fiddler," these new terms appeal to a kind of universality--they make no claim to any stylistic or regional difference. This general attitude is perhaps most explicitly demonstrated in an advertisement that appeared in 1989 celebrating the success of the Korg M1 synthesizer:

> In less than a year, the M1 has become more than the world's best-selling keyboard. It has become a form of communication. A universal tool allowing everyone in the creative process of music to exchange new sounds. Develop ideas. And collaborate on projects.
> ...[the M1 is] creating a worldwide network of professionals who are bringing about changes in music faster than ever before.
> ...And with the number of M1 products--and users--growing every day, you can imagine the potential of such a universal language.
> Just think, then, how great your potential will be once you begin to speak it.
> (Korg product ad; *Electronic Musician* 5 (6) 1989, p. 3)

Thus, technology has replaced music in the old bourgeois myth of the "universal language" -indeed, technology has become transparent, "a form of communication," "language" itself. If one learns to "speak" technology (that is, if one becomes a consumer of technological products--a "user") one is immediately admitted, or so it would seem, into that international fraternity of musicians--the "worldwide network of professionals." In a musical world where it has become difficult for the aspiring young musician to have meaningful inter actions with other musicians and with audiences, where it has become difficult to even secure a gig at a local club, the myth of technology is, no doubt, a powerful force with which to contend.

Some General Comments about Commodities and Users' Groups

The existence of computer clubs, users' groups and newsletters has been a common feature of various subcultures that have developed around personal computers since the mid-1970s and, to a large extent, the recent proliferation of such groups around digital musical instruments has been patterned after similar groupings of computer "hackers." For example, the independent newsletter, "Transoniq Hacker," initially formed to provide information to users of the Ensoniq "Mirage" sampler (and, later, all Ensoniq products) was founded in 1985 by Eric Geislinger, an engineer, and Jane Talisman, a music/synthesizer teacher. According to Talisman, "Transoniq Hacker" currently has about 4,200 subscribers, many of whom are "hacker types who come from the technical end of the spectrum--engineers and tech' types with musical interests" (Talisman, personal interview, 1989). Talisman acknowledges computer and software users' groups as the model for "Transoniq Hacker" and feels that for musicians this type of group works best when organized around digital samplers rather than synthesizers: "because of the disk operating system, people (especially hackers) will be developing new or improved uses of the

technology and, as with computer users, they will be predisposed to network-type information sharing" (Ibid.).

Talisman's technical rationale for the formation of user groups can only go so far in explaining the existence of so many groups of this nature even around systems that are not disk-based. In fact, it might be quite reasonable to assume that the desire to form such groups and networks has relatively little to do with the unique capabilities of the individual instruments themselves; indeed, it could be argued that one of the problems with synthesizers today is the degree to which they all seem to resemble one another and that it is only through marketing and promotion that they achieve any sense of identity at all.

This latter point bears some resemblance to arguments made by William Leiss concerning twentieth-century commodities more generally in *The Limits to Satisfaction* (1976). Drawing on the work of Kelvin Lancaster, Leiss states that commodities have reached a certain level of complexity during the twentieth century and that consumers no longer judge them purely on the basis of their objective properties but also on the particular "characteristics" that they seem to embody. Advertising, socialization patterns and interpersonal relations all play a role in determining the "imputed" characteristics of commodities:

> Imputed characteristics are those that people believe to be present in things; these beliefs arise out of the innumerable messages about things that each individual becomes acquainted with through advertising and the opinions of other consumers...Commodities are not straight-forward 'objects' but are rather progressively more unstable, temporary collections of objective and imputed characteristics--that is, highly complex material-symbolic entities. The disintegration of the characteristics of objects stands in reciprocal relation to the fragmentation of needs. (Leiss, 1976: 82)

If one considers synthesizers and samplers as not merely musical instruments but as "material-symbolic entities" then it is clear that user groups and information networks do

not simply exist as a means of exchanging technical information; it might also be said that they exist as a means by which consumers develop alternative ways of defining their needs and new forms of satisfaction from their relationships to commodities and other consumers.

Another way of thinking about this process that is perhaps more directly related to the introduction of new technologies and the phenomenon of user groups can be found in Howard Becker's account of the early development of stereographic image technology during the nineteenth century (1982: 314-317). Firstly, photographic experimenters needed to communicate with one another in order to define the nature of the new technical possibilites. Secondly, for consumers, it was necessary to learn the specific pleasures offered by the new medium: "In addition to learning to read the stereographic image, viewers must have learned a taste for its unique pleasures. The early appreciative articles dwell on these..." (Ibid.: 317). Similarly, articles and product reviews in popular synthesizer magazines and user-group newsletters serve a dual function: they not only provide information about product innovations but also suggest specific applications in which new musical pleasures can be experienced. Thus, as new sounds, instruments and techniques develop, new forms of pleasure develop in tandem with them--"unique pleasures" that are experienced individually but arrived at collectively.

To a certain extent, the communication and sharing of information can itself become part of the process of technical invention and innovation. In this regard, the role played by the "Transoniq Hacker" magazine in "up-loading" user feedback to the Ensoniq Corporation can have positive results. Talisman claims that the "Hacker" has managed to maintain its independent status while facilitating a system of two-way communication between manufacturer and users (Ensoniq technicians respond to user questions in the pages of the "Hacker"); furthermore, and partly as a result of this openness, Ensoniq has apparently

acquired 5 or 6 times as much third party software support for its products than other manufacturers (Talisman, personal interview, 1989).

For Ensoniq, the user group is not simply a source of technical feedback however; Ensoniq advertises the existence of the "Transoniq Hacker," various other information networks, third party software companies, etc., as part of its overall promotional strategy. For example, in an ad entitled, the "Mirage Diner" (*Keyboard* 13 (1), January 1987, p. 111), Ensonliq lists both the "Transoniq Hacker" and the Performing Artists Network (described below) as among the basic advantages of owning Ensoniq equipment: direct access to other users as sources of information is regarded as a fundamental enhancement to ownership. Ensoniq also buys issues of "Transoniq Hacker" and places them with the owner's manual and other support information included with the sale of their instruments. In this way, user groups have become a factor in promotional strategies of many hardware and software manufacturers currently involved in the production of musical technology.

This latter aspect of the users' group phenomenon has become increasingly important to the larger manufacturers of samplers, synthesizers, and software: giving the appearance of having users' group information support for new products is now a common marketing tool. For example, Roland Corporation publishes a glossy, in-house magazine called "Roland Users Group," complete with instrument "reviews" written by its own product specialists (of course, these resemble television "info-mercials" more than objective assessments of the instrument's capabilities); similarly, Yamaha puts out a newsletter for its "official" users' group entitled,"Aftertouch," excerpts of which appear regularly as news/ads in commercial magazines; and Passport Designs (a software company) has recently formed a user group called "Club Passport," membership fees include access to the PAN network (described below), newsletters, and other benefits. The information that comes back to the corporations as a result of this increase in direct contact with consumers can be used for future design and/or marketing purposes. In this way, the musical instru-

ment/user group phenomenon resembles certain aspects of Kevin Wilson's description of the possible use of home networking as a means of enhanced, point-of-sale marketing strategies, or "transactional marketing" (1986: 28-33). It also indicates a tendency towards the fusing of the conventionally separate stages of design and marketing into a single, integrated process.

However, the exact nature of the manufacturer/user relationship via networking is not easy to define. In the promotional literature for the PAN network, a number of ways in which the network has been used for research and development, advance product announcements, user feedback, direct sale of synthesizer sounds via MIDI, etc., are described. Whether one considers a number of these incidents as representing the power of consumers to directly participate in the evolution of technology or simply as good marketing strategy on the part of manufacturers is a matter of interpretation.

Another point of contradiction concerning the phenomenon of user groups and musical information networks concerns the nature of their membership. On the surface, the heterogeneous make-up of these groups would appear to contribute to the general blurring of distinctions between musician and technician, amateur and professional, that has often been noted as a typical result of innovation in musical technology. But any group based on relationships involving the acquisition of technical knowledge and/or the capacity to consume will inevitably generate its own set of distinctions. The evolution of the Pennsylvania-based Performing Artists Network (PAN) is perhaps a case in point.

According to Perry Leopold, founder and director of PAN, the network began in 1981 and was originally conceived as a service providing information (in the form of directories sent through the mail) concerning new performance venues, recording opportunities, etc., primarily to self-managed musicians. As the organization shifted its services to computer-based networking however the composition of its membership was radically altered: representatives of the record industry (such as CBS) joined the network,

as did synthesizer manufacturers, professional musicians, and many others. As a result of the decision to shift to computer-oriented services, the network became, in effect, more mainstream and professionalized. This change in general orientation itself appears to have been quite inadvertent: "When I started out I never thought I'd be helping CBS to make money" (Leopold, personal interview, 1989).

The type of information carried by the network also changed according to its user base. For a time the network was almost entirely oriented around information, education and help for MIDI and synthesizer users (PAN is the on-line resource for the International MIDI Association and the MIDI Manufacturers Association). Later, as the mid-'80s explosion of technology leveled off, the organization became less education oriented and returned to its original concept of connecting free-lance composers and musicians with film producers, recording studios, etc., but the emphasis was now fully oriented towards professionals.

Today PAN is made up of approximately 2,500 members (25% of whom live outside the United States) who represent virtually every facet of the music industry: well-known musicians (such as Herbie Hancock, Madonna, and Pete Townsend), sound track composers, recording studios, instrument manufacturers, computer programmers, accountants, tour managers and technicians. PAN now screens prospective members and discourages "amateurs" from joining, in part, because its new, up-scale clientele needs to be insulated from fan mail. But in the process young, entry-level musicians have also tended to be squeezed out: "a kind of class differentiation has developed...professionals and non-professionals don't mix" (Ibid.).

The professionalization of PAN, and the tendency towards employing user groups for the purposes of manipulative marketing strategies indicates that the diffusion of computer-based technologies and the formation of user networks does not necessarily lead unproblematically towards greater levels of democratization (as many utopian accounts of

the new technology would have us believe). Indeed, new technologies often present a variety of potential uses but their introduction into existing social and economic structures can have a constraining effect upon them.

The social and economic context need not be totally determining however: there is always the the possibility of intervention in the evolution of technology (at least at the of new technical practices developed by individuals through their own specific uses of technology), though the conditions for such intervention appear to be somewhat rare and haphazard. For a brief, chaotic moment in the early diffusion of MIDI however, a call for direct, democratic user participation in the development of the technology was heard; the conditions which gave rise to that call and the manner in which it was ultimately contained is the subject of the next part of this chapter.

Democracy and the International MIDI Association

As mentioned briefly in Chapter Four, the founding of the International MIDI Association (IMA) during the chaotic early months in the life of the MIDI specification gave the organization a potentially powerful role to play during this critical stage of the diffusion of the technology. Roger Clay, founder of the IMA, appears to have had an innate sense of the importance of the moment and immediately began to formulate a game-plan for how the user group might have the maximum amount of input into the decision-making process surrounding MIDI.

Those plans included participation in the formalization of MIDI as an official technical standard (in preparation for which the IMA joined the American National Standards Association (ANSI) in 1984); the establishment of a network of local chapters of the IMA in major metropolitan areas; and the creation of an independent MIDI Research and Development Center "to continue research on instrument/computer interfacing technologies and

designs, and to initiate MIDI software development in a cooperative, open environment" (*the IMA Bulletin*, Spec. Ed., Dec. 1983, p. 3).

In the midst of the fast-moving, highly competitive synthesizer industry of the early 1980s, there is something curiously idealistic and naive about the notion of a research facility--conceived as something part way between the commercial industry, academe, and a regulatory agency--where "co-operative" research could take place. Clay seems to have been possessed by a "zealous attitude towards the technical possibilities of MIDI" (Doug Provisor, personal interview, 1989). And he was convinced that the IMA had an important role to play not only in the development of MIDI but in the future of music as well:

> Accurate information and helpful advice on products and resources are important to any creative process. In the new world of musical equipment/equipment interfacing (lets call this **musical cybernetics**) they become essential services.
> The IMA is designed to provide you these services and offer assistance in locating the resources you will need to creatively interact with the new artistic technologies.
> At the same time, we believe that it is important to encourage humanistic approaches to our use of these devices; they are tools to use not gadgets to collect...
> ...We at the IMA are working to insure that we move beyond the toy stage...and onto stages that will allow us to better realize our artistic potentials.
> (*the IMA Bulletin*, Special Edition, Dec. 1983, p. 2; emphasis in the original)

The emphasis on the importance of the IMA as a disseminator of "information"--information that is essential to the discovery of the potential hidden within the machine--appears to reinforce the arguments put forward by William Leiss (as outlined above) concerning the complexity of commodities and the need for information that will release the power of their objective and "imputed" characteristics. But equally important are the values expressed in this early editorial statement from *the IMA Bulletin*--especially those concerning the "artistic" side of technology, the "humanistic approach," and the realization of "our artistic potentials." These appear to be not unlike the ideals voiced by many people

involved in the early stage of the introduction of personal computers as described by Sherry Turkle: "people...whose work experiences prepared them to use the machines...and gave them a desire to exploit the machines' potential for creating worlds of transparency and intelligibility" (Turkle 1984: 171). Continuing, Turkle states that there was also a political agenda behind these notions of creativity:

> There is something else notable about the introduction of personal computers: they came on the scene at a time of dashed hopes for making politics open and participatory. Personal computers were small, individually owned, and when linked through networks over telephone lines they could be used to bring people together. (Ibid.)

This latter point is clearly in keeping with Clay's vision of an IMA network and his politically idealistic notion of a "co-operative and open environment" for independent research.

A similar analysis of the "counterculture" roots of much of the enthusiasm for recent technologies is presented in the chapter entitled, "Alternative Technology," in Jennifer Daryl Slack's book, *Communication Technologies and Society* (1984: 30-39). Slack argues that the fascination with technology, and the "commitment to the equation of technological growth and social progress" places too great an emphasis on the uses of technology at the expense of an adequate analysis of the relations of production (Ibid.: 38).

This would appear to have been the case with Roger Clay: his enthusiasm for the technical potential of MIDI may have prevented him from seeing that there could be no easy reconciliation of the needs and demands of "users", on the one hand, and the responsibility of the manufacturers to make a profit, on the other. The problem for the IMA was that it essentially had no political mandate: some of the manufacturers cooperated with the IMA, others refused to acknowledge its existence, and many were hostile to the idea of being told by "users" how to conduct their business (Clay had proposed that a lab be set up to test

products and insure that implementation of MIDI was up to proper specifications; in the competitive and secretive synthesizer industry, few manufacturers would likely be willing to release pre-production models of their equipment for such testing; Kevin Laubach, personal interview, 1989).

At the January 1984 NAMM show, the synthesizer manufacturers created a Steering Committee of Manufacturers of MIDI Equipment and, later in the same year, the MIDI Manufacturers' Association (MMA) was formed (today, the MMA, in conjunction with the Japan MIDI Standards Committee (JMSC), jointly oversee changes in the MIDI specification). Membership in these organizations was restricted to manufacturers and representatives of the larger software houses; as a result, interested users began to feel even more alienated from the process of improving MIDI. As tensions between various factions increased, the tone of Roger Clay's editorials in *the IMA Bulletin* became more desperate:

> As Network Coordinator...I support and promote the MIDI Open-System Concept...
>
> Unfortunately, the actions from some isolated but potent members of the manufacturing community have been anything but nurturing. In fact, their actions on a couple of occasions has bordered on the out-and-out malicious...
>
> MIDI is supposed to belong to everyone (*non-proprietary!*), attempts by one manufacturer or a self proclaimed consortium to "control" the access to MIDI information, or to band together to exclude those who may wish to get involved if they are "not of the party" is counterproductive to the concept...
>
> Let me make it clear that while we are very interested in the developments of MIDI as a concept and an interface, we *are not* interested in joining in any manipulative politics!
>
> (*the IMA Bulletin*, 1 (3), 1984, p. 2)

Clay continued to promote his version of the "Open-System Concept" and to work towards the development of new standards in conjunction with MIDI. During the summer of 1984, the IMA sponsored a conference for software developers--"MIDISOFT'84"--in San Francisco. The aim of the conference was to provide information about MIDI to

software developers and end-users, and more importantly, to establish a "MIDI Software Standards Board." Clay had already realized that as musical software for MIDI devices began to develop there would soon be a real need for common file formats; in this area, as with many of Clay's ideas and instincts concerning MIDI, he was basically correct and far ahead of the rest of the industry in his thinking (Laubach, personal interview, 1989).

The conference drew over 200 participants, many drawn from the ranks of independent software developers; only a handful of representatives from the manufacturing sector bothered to attend. The atmosphere at the conference, especially during the question and answer periods, appears to have been highly charged and the general level of discussion quite sophisticated: participants criticized the technical limitations of MIDI and offered possible solutions, openly expressed anger and disappointment at the lack of manufacturer cooperation with independents, discussed the role of the IMA itself, and formed Special Interest Groups to work on various aspects of the MIDI specification with the intention of sharing their findings with the manufacturers.

Dr. Gareth Loy, software coordinator of the Computer Audio Research Laboratory at the Univ. of California, San Diego, and one of the featured speakers at the MIDISOFT event, has described the character of the sessions devoted to the establishment of a MIDI Software Standards Board as "open threshing sessions held in the style of a town meeting" (*the IMA Bulletin,* 1 (5), 1984, p. 1). With regards to the MIDI phenomenon as a whole--including its technical, political and economic aspects--Loy is an astute observer, participant, and commentator; and although the phrase quoted here does not draw undo attention to itself in the original text, the precise choice of words used in this "Open Letter" to the IMA readership should not go unnoticed. Loy conjures up the image of the "town meeting"--with all its attendant associations with the roots of democratic process in America--and, in so doing, seems to sum up the entire struggle of the conference participants (and by implication, the struggle of the IMA itself) to contribute to the development

of something they believe in despite all resistance from an industry seemingly bent on excluding them from that process. Even in the opening sentence of the "Letter," Loy is careful to establish himself as a legitimate spokesperson of the conference participants, thus emphasizing the collective nature of the proceedings and their importance as a model for the development of "open, honest dialogue" concerning MIDI: "I have been asked by a unanimous floor vote of the participants of the MIDISOFT '84 Conference...to compose this letter which describes some important developments which transpired there, and to enlist your support and encouragement of these developments" (Ibid.).

It seems to me that it is important to understand this stage of the development of MIDI not only in terms of technology and economy (one of the limitations of Gomery's theoretical framework, discussed in Chapter 4, is that it can only understand technological innovation as motivated by the desire for increased profits), but also, as I have implied above, in terms of notions of power and democracy. In a series of essays published in *Democratic Theory: Essays in Retrieval* (1973), C.B. Macpherson describes two different ontological assumptions that underlie our liberal theories of democracy:

> One of these is the liberal, individualist concept of man as essentially a consumer of utilities, an infinite desirer and infinite appropriator. This concept was fitting, even necessary, for the development of the capitalist market society, from the seventeenth century on: it antedates the introduction of democratic principles and institutions... The other is the concept of man as an enjoyer and exerter of his uniquely human attributes or capacities, a view which began to challenge the market view in the mid-nineteenth century and soon became an integral part of the justifying theory of liberal democracy. (Macpherson 1973: 24)

The first concept supports those democratic theories that emphasize the freedom of individual choice and justify liberal democracy by claiming that it allows for the maximization of individual satisfactions, or "utilities," and that it does so equitably; the second downplays consumer satisfactions and emphasizes human attributes, such as creativity, as

ends in themselves and justifies liberal democracy by claiming that it maximizes the freedom to use and develop one's innate capacities. The first claim is an economic one, intimately linked with the emergence of capitalist market society; the second, an ethical one, arising with nineteenth-century demands for the extension of democratic franchise. In actual fact, the two concepts are incompatible and Western liberal democracy has been incapable of delivering the goods in relation to either claim (Ibid.: 4-12; 25-36).

Clearly, Bob Moog's notion of the "democratization" of digital synthesizer technology, mentioned in Chapter Four, is related to the market society concept of democracy: it assumes that the cheaper technology becomes and the more that it is made available to the average consumer, the more that democracy has succeeded in the equitable distribution of utilitarian satisfactions. In contrast, an ethical notion of democracy was clearly implied (though never explicitly made claim to) in the early goals of the IMA: it placed a humanistic emphasis on the creative, "artistic potentials" of individuals and stressed the importance of the association as a facilitator of "open" dialog in the develop ment of technologies that could help release those potentials.

But it is also important to note the contradictory role played by technology in these arguments. On the one hand, the companies involved in the innovation of MIDI feel that they have been vindicated against their critics by the fact that MIDI has been accepted in the marketplace: the MIDI specification may display a certain lack of technical excellence but it has nevertheless proven itself to be useful by thousands of musicians. The success of the technology as a consumer product thus proves to be more important than its precise technical capabilities. The argument is a bogus one of course because consumers were never really given a choice between MIDI and some other interfacing scheme.

For those involved in the initial organization of the IMA on the other hand, the contradiction was more profound: because they regarded technology itself as a prerequisite to the enjoyment and development of human creativity, they were obviously more sensitive

to the technical limitations of MIDI but nevertheless felt committed to promoting it as an idea. The often extravagant claims for the possibilities of "musical cybernetics" made by people like Roger Clay certainly contributed to the acceptance of MIDI in the marketplace; ironically, such enthusiasm may have actually enhanced the position of the major manufacturers as the primary arbiters of the specification.

Once the manufacturers had established their own association (the MIDI Manufacturers Association, MMA) to guide the future development of MIDI there was no longer a clear a purpose for an organization such as the IMA. It has continued to exist however (without the leadership of Roger Clay) as essentially the information service of the MMA: that is, it distributes information from the manufacturers to users but does not take an active role on behalf of users' interests. The organization continues to publish *the IMA Bulletin* but refuses to distribute any issues of the *Bulletin* that pre-date November 1984. According to Lachlan Westfall, current president of the IMA, some of the views expressed in these older issues were "almost slanderous and took a position not in keeping with current IMA philosophy" (personal interview, 1988). Some of the information for this chapter was taken from that first year of IMA publications (obtained from other sources) and it is difficult, in my opinion, to find anything particularly offensive in them. Nevertheless, the industry appears to be still quite sensitive about this period of early dispute and would prefer to forget that it ever occurred. In an article published in *Keyboard* magazine in 1989, Bob Moog took the occasion of the sixth anniversary of the introduction of MIDI to "talk a little about the politics behind the MIDI specification" and described its history as "a story of remarkable collaboration of dozens of manufacturers across the electronic musical instrument spectrum" (Moog 1989: 117). The entire year or more leading up to the subordination of the IMA to the interests of the manufacturers' group is summed up as a period of "many informal meetings of both manufacturers and MIDI users (and a couple of organizational false starts)" (Ibid.).

Perhaps Moog's rewriting of the social history of MIDI is relatively insignificant. Certainly, for some, the current interdependence of the MMA and IMA, with its explicit, hierarchical division of labor, and power, "fulfills the original intent of the IMA but even better" (Doug Provisor, personal interview, 1989). For others, despite the present informality and relative openness of the structure of the MMA (it now has about 80 members including a large group of software manufacturers), there still exist influential power blocs within the organization: "anyone can propose a change [to the MIDI spec], but implementation of the change is very political and it is getting increasingly difficult to get major changes" (Bill Southworth, personal interview, 1989). But what no one seems able to predict is whether this supposed "remarkable collaboration" of manufacturers could actually effect an evolution out of MIDI and into a wholly new specification. For Dave Smith, one of the original innovators of MIDI however, the answer is as clear now as it was during the early 1980s: "the only way to go would be to get the four or five big manufacturers together and make it a *de facto* standard" (personal interview, 1988).

Thus, as far as industry standards are concerned, the problem of technical innovation in the synthesizer industry is not simply one of profits but also of power: "This industry is so small that it's easily dominated and swayed by the people that own 30% of it" (Carmine Bonanno, quoted in Milano 1984: 60). While it should be noted that much of the new development in MIDI (such as MIDI Time Code) has been proposed by software manufacturers in recent years, it should also not be ignored that such improvements must occur essentially within the framework of MIDI as it was originally formulated by the major manufacturers and, to be successful, must meet with their approval. In this respect, the manner in which the MMA (essentially a trade organization) operates is significantly different from the more formalized procedures of a professional society or standards organization.

In the fall of 1988, representatives of the MMA were invited by the Audio Engineering Society (AES) to discuss the possibility of formalizing MIDI as an ANSI-approved standard. The process of ratifying a new standard is complex and involves the negotiations and approval of two separate committees, the S4 Committee and the subcommittee S4-1:

> The membership of S4...is composed of organizations, both industry and professional. In addition, government agencies, consumer organizations and a few individuals of significant professional standing are members...As a subcommittee, S4-1 may be composed of individuals rather than being restricted to organizations as is S4. In either case, a reasonable balance must be maintained within each membership, ensuring fair representation of all interests: producer, consumer (domestic and industrial), general interest and government. (Langdon, et al 1982: 230)

According to Jeff Rona, then president of the MMA, the MIDI group was "appalled by the ratification process" and felt that "it would set the MMA back five years" (personal interview, 1989). It is perhaps significant that what bothered the MMA representatives was not only the time consuming nature of the process, but also the number of organizations, external to the synthesizer industry itself, that would have to be consulted (Ibid.).

Of course, as far as the manufacturers of MIDI are concerned, outside interference in technical matters is what they have been trying to avoid all along. For the MMA, there are no longer any significant political problems that confront the further development of the MIDI specification, only technical ones: "ANSI doesn't understand the excellence of the MMA technical group...overall competition disappears once the engineers start looking for solutions to bugs in implementation...there's no dialog with the public, we just hack out problems" (Ibid.).

Conclusion

The 1980s were witness to an enormous growth in the innovation, diffusion and use of digital musical instruments in the production of popular music. This phenomenon was supported by the rise of various user groups, information networks and, especially, commercial magazines devoted to musicians and technicians; indeed, without the simultaneous growth of the musicians' magazine industry, it is unlikely that this phenomenon would have achieved anywhere near the magnitude that it has today (by the late 1980s, the production of digital musical instruments had become a multi-billion dollar industry).

In several of my discussions with the publishers and editors of these magazines I have found that they recognise the role that they have played: they feel that they have not only reflected the musical and technical trends manifest during this period but also feel that they have helped to establish those trends in the first place. Indeed, when in July of 1988 *Electronic Musician* published a special issue on the past twenty years of achievements in musical electronics, one of those "achievements" included the launching of a newsletter called *Electronotes*--a publication which, according to *EM*, played a critical role in the development of electronic musical instruments during the 1970s. But it is the combined influence of these two publications that is perhaps most significant. Their influence is not unlike that of the early photography magazines described by Howard Becker (1982: 314-317): *Electronotes* belongs to that category of publications that grow out of the need for experimenters to communicate with one another in order to define the nature of new technical possibilities; magazines such as *Electronic Musician*, on the other hand, appear at a later stage and are more geared towards promotion and consumption, their main purpose being to help users to learn the specific pleasures offered by the new technical medium. In this regard, the publishers and editors also realize the power that they wield within the

musical instrument industry: as one publisher put it, "the industry recognises that we are the link between them and their market" (personal interview).

But as I have attempted to argue here, this phenomenon has taken place both within a high-intensity market context and in a context in which musicians have been compelled, for a variety of reasons, to operate at increasing distances from one another and from their audiences. In this sense, musicians' magazines have perhaps become a link not only between the musicians and the industry, but also, an essential mediating factor in "musician-musician interactions." This double mediation contributes to their simultaneous construction as both a community and a market.

Peterson has stated that the creation of a "cultural bond" and a sense of "national community" has been an important characteristic of magazine publishing in the United States throughout the twentieth century (1964: 449); the development of national magazine publishing itself complemented an expansion in the manufacturing and distribution of consumer goods that took place at the turn of the century. But in the context of increasing internationalization of commodity production, the logic of the "cultural bond" has perhaps changed: the formation of a sense of community takes place within specialized consumer groups whose frame of reference is less national than international, less bound to a sense of shared "perspective" than to a bond with commodities themselves.

This observation is perhaps even more true of the user groups where the identification with specific consumer objects is even stronger and, also, loaded with an idealistic rhetoric of democracy. I have attempted to understand this phenomenon, in part, as a response to the complexity of present-day commodities, their status as "material-symbolic entities," and the need for information as a means of increasing consumer satisfactions. In addition, there appears to be an attempt on the part of manufacturers to make use of such forms of association for their own marketing purposes. In the case of a "user group" such as the International MIDI Association however, it is clear that the formation of these groups

can be motivated by a desire on the part of independent developers and end-users for greater participation in the process of technological innovation itself. In this way, the user group phenomenon can have important political implications.

For C.B. Macpherson, the realization of the political aspirations of groups such as the IMA ultimately depends upon the evolution of our notions of democracy--in particular, the resolution of the contradiction between economic and ethical views of the democratic process. And in this regard, Macpherson argues that twentieth-century developments in technology are certainly one of the focal points where such a resolution must take place. But in this, I think, Macpherson perhaps places too much emphasis on the role of tech nology as a prerequisite for the realization of democratic aims: Macpherson argues that technology offers the possibility of increasing the general level of productivity and freeing society from the need for compulsive labor; as a result, he finds it conceivable that the market concept of human essence could potentially be discarded, thus enabling society to concentrate more exclusively on the development of human capacities (1973: 36-38). In this way, Macpherson falls prey to a kind of technological utopian vision. Furthermore, he appears to adopt, uncritically, the nineteenth-century humanistic vision of democracy as his own (a vision which, in his book, he portrays as being something of a stop-gap strategy of the bourgeoisie to distract attention away from the spectacle of their own capital accumulation, which, in the face of demands from the working class, could no longer be justified by the older democratic ideology).

This contradiction in the work of Macpherson is indicative of the on-going confusions that exist in our society with regards to the relationships between technology, individual creativity, and social and political processes. Given the close relationship (both real and imagined) between musical instruments and notions of personal creativity and expression in music, it is not surprising that individual musicians should wish to become involved in the development of new technologies such as MIDI; but what is interesting is

that such a desire should also become linked to a collective call for democratic access to the process of technical innovation itself. Significantly, the confusions that resulted from this conflation of aims and motives tended to disguise the actual political nature of the challenge represented in the IMA's conflict with the larger forces at play in the capitalist marketplace.

For the moment, the most likely outcome of technological development (of which Macpherson was perfectly aware) is that consumption will be made (in part, through the creation of new desires) even more attractive, thus reinforcing the image of human essence as one of infinite consumption. This latter possibility appears predominant in the world of digital technologies. For while it is always possible in a capitalist market society that new technologies will be invented outside of the immediate pressures of the marketplace, the innovation and diffusion of technology can only be justified on the basis of potential marketability. The continuous flow of capital that is required to bring any technology to its full development requires that many technologies be released in stages--each time submitting them to the vagaries of the marketplace. In part, this accounts for why the ultimate test of a product in the synthesizer industry today is not its technical excellence but its success in the market. MIDI succeeded because it proved that it had a large degree of utility despite its lack of technical excellence.

With these issues in mind, I would now like to reexamine the problem of technology and consumption again, but this time from the standpoint of musicians and musical practice.

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III

Consumption/Use:

Technology and Musical Practice

Chapter 7:

Music, Technology, and Musical Practice

> I am reminded that the transition from acoustic instruments to digital ones, *mutatis mutandis*, has not included a corresponding transition from acoustic to digital music...What has necessarily been a search for a new instrument should now mandate a search for a new music *endemic* to its nature. That is: *computer* music. Here I conceptually implicate *piano* music and *orchestral* music, for instance, with respect to their accumulated *sensibilities* (but not their materials).
>
> (Gaburo 1985: 43; emphasis in the original)

The search for a new music and the technical means with which to express that music has preoccupied various quarters of the musical avant-garde ever since the dawn of modernism. Indeed, for many composers, true "progress" in the one area, "music," could not take place without a parallel "progress" in the other. For example, writing during the early years of the twentieth century and calling for a new system of harmony based on microtonal intervals, Ferruccio Busoni described the need for new instruments of production as both "important and imperious;" questions of musical notation were, by comparison, only of secondary importance (1967: 14-15). Thus, realizing that his program for musical change would remain only a dream without new instruments, Busoni took great encouragement in the news from America of the invention of the Dynamophone, an electronic instrument for the production of "scientifically perfect music" (invented by Thaddeus Cahill, ca. 1906); interestingly, he had never seen nor heard the instrument but had simply read about it in a magazine article (Ibid.). Following in Busoni's footsteps, Edgard Varèse's life-long search for "an entirely new medium of expression: a sound-*producing* machine" (Varèse 1967: 196-201) has become legend in the history of electronic

music and his notion of "the liberation of sound" has assumed something of the status of a guiding ideology (or rather, an "ideological reflex," Théberge 1987: 87-8, 115-16) for avant-garde composers of electronic and computer music alike (see, for example, Russcol 1972).

But for the avant-garde, the question of how new musical instruments could become a truly vital part of musical practice, of how they should be put in the service of musical form, was not simply one of means and ends. For Kenneth Gaburo, quoted above, the idea of using computers to pursue musical ideas based on principals derived from acoustic instruments is to "trivialize" the domain of digital music (1985: 41). And here again, Gaburo is only repeating what had been one of the more rigid propositions of avant-garde electronic music emerging during the 1950s. Under the burden of such beliefs, even the modernist "revolution" in musical language launched by composer Arnold Schoenberg--and valorized by Theodor Adorno (1973) as the negation of both the tonal system of music and, by implication, the social order to which it belonged--came to be regarded as "impure" by composers such as Karlheinz Stockhausen because of the "fundamental contradiction" that supposedly existed between the twelve-tone system of composition and the harmonic structure of traditional musical instrument sounds; the turn to technical means of production in the German school of *electronische musik* was an explicit attempt to eliminate the possibility of such contradictions by submitting both musical and sonic material to the dictates of a single, unifying compositionsal logic (see Eimert 1958, and Stockhausen 1961; for a more detailed examination of these and other issues concerning the avant-garde in electronic music see Théberge 1987: 77-117).

However, what most interests me here in these statements of aesthetic purpose is the underlying assumption of the essential identity between musical form and its means of expression. A similar kind of "theorizing" takes place (albeit, only rarely betraying a similar degree of essentialism) among pop fans and critics when they make the familiar

observation that rock, or heavy metal, is *guitar* music. Indeed, for many fans it is the predominance of the sound and image of the guitar--a "real" instrument--that, in part, still sets rock off from pop, with its "unnatural" synthesizers and drum machines (and that image is, necessarily, a male image as well; see Frith 1986: 268). But such statements not only beg the question of the nature of the relationship between musical instrument, sound, and idea, but also demand a more thorough-going consideration of a complex set of issues ranging from the intimate, physical relationship between performers and their instruments (and, not incidently, the social relations between performers, composers and engineers as well), to the role of instruments in the definition of musical genres and in musical change, and to broader theoretical issues concerning technolc ;y as a "means" of production versus technology as a "mode" of production (Blacking 1977).

While I do not intend to debate the validity of the avant-gardist preoccupations outlined above (the focus of my interest here is on the wider influence of digital technology in popular music culture), it is worth pointing out one fundamental flaw in their arguments if only as a way of introducing a number of broader issues concerning technology and musical practice. It seems to me that the concept of an "*electronic* music" or a "*computer* music," as espoused by Gaburo and others, is based on a musical and an historical error that seeks, in typically modernist fashion, to divide these musics off from all previous or contemporaneous musical forms, thus making claim to an unprecedented uniqueness and originality. And while Gaburo may be right in pointing to a repertoire of music that can be considered as "pianistic" or "orchestral" in nature, these concepts are not as exclusive with respect to one another, or to the music as a whole, as he suggests.

For example, throughout the nineteenth century, orchestral music was typically composed at the piano and piano transcriptions of orchestral works were prepared, as a matter of course, for study <u>and</u> performance without any sense of either medium being "trivialized" in the process. Furthermore, it is not uncommon for innovative performers to

adopt playing techniques or concepts of sound derived from instruments other than their own and, when these innovations in performance style are recognized by audiences and other musicians, they become part of what may well be described as the "accumulated sensibilities" of the instrument. And finally, while there are certainly fundamental differences between electronic or digital technologies and acoustic instruments (and some of these will be discussed in the following chapters), such differences do not inevitably separate them from the broader continuum of musical expression: only the crudest form of technological determinism could support the argument that musicians approach these new technologies without bringing with them at least some of their own "accumulated sensibilities" with regards to music-making.

What is important to determine however, is precisely the manner in which *selected* characteristics--physical, acoustic, stylistic or aesthetic that constitute the total "accumulated sensibilities" of a piano, a guitar, an orchestra, or even a computer--interact with a variety of musical and extra-musical factors to create innovations in musical form. I stress the word "selected" here because it is primarily through their use that technologies become musical instruments, not through their form. In this sense, musical instruments are not "completed" at the stage of design and manufacture, but rather, they are "made-over" by musicians in the process of making music.

And indeed, the process of "making" the one, and the other, is intimately tied but perhaps not entirely in the ways suggested by Gaburo and others of the avant-garde. For Gaburo, a new kind of music will be created out of the various "interactions" between composer and machine (1985: 41-42). But such an attitude assumes that the machine is already fully constituted, endowed with a "nature" that is already more-or-less complete and given; whereas what I want to suggest here is that the machine too, is, in a sense, "created" by the user in the act of making music. In the context of the present dissertation especially, where the notion of musicians as "consumers of technology" has been put

forward, the ability of the consumer to define, at least partially, the meaning and use of technology is an essential assumption and theoretical point of departure.

In this chapter I want to explore, in as brief a fashion as possible, a wide range of issues related to music and technology that will serve to highlight, in the final chapters of the dissertation, certain continuities and discontinuities in musical practice that appear to have occurred with the adoption of digital musical instruments during the 1980s. The focus then, is not so much on technology *per se*, as on "technique," understood in its broadest possible sense: and here I refer to the notion of technique not simply in the limited sense commonly employed in music (e.g., performance or compositional technique), but to the full organization of means--material and social--employed for musical ends (see, for example, Ellul's notion of technique as "*means* and the *ensemble of means*" 1964: 19).

But I also want to make use of the term "technology" itself in a number of different ways. Firstly, in keeping with the notion of technique mentioned above, one might consider the symphony orchestra or the recording studio--each with its own characteristic hierarchies, hiring practices, conventions and patterns of work--as a form of "social technology" (Frederickson 1989: 194-197). Social technologies are thus distinct from, though they may be related to, specific "machine technologies" (Ibid.).

Secondly, I want to examine certain "technologies of music": that is, "technologies" in the form of discourses, institutions and practices--aesthetic, scientific, pedagogical, legal or economic--that "produce" representations of music that have concrete ideological or material effects on music-making[1] (I will continue, however, to use the more common

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[1] In adopting this expression, I take as my point of departure the work of Michel Foucault, who has developed the notion of a "technology" of sex (1980a: 90, 119) and that of Teresa de Lauretis (1987), who has put forward a complementary concept: the "technology of gender." In certain respects, Lawrence Grossberg's notion of a rock and roll "apparatus" (1984: 236-240)--itself derived form Foucault (1980b: 194-8)--might be an even more appropriate concept than "technology" in this instance. But then, Grossberg has tended to describe the "apparatus" as a "machine" (1984: 237) and, while the two concepts may, or may not be interchangeable (they may only be the result of differences in English

expression, "musical technology," to refer to musical instruments, recording devices, etc.). In this sense, copyright law might be considered as a particular "technology of music": a set of principals and legal instruments that define "music" in specific ways, assign authorship, and parcel out legal and economic rights. In its day-to-day operations, this legal "technology" can have a profound impact on not only the profits of individuals and large corporations but also on defining the limits of legitimate musical/creative activity (I will explore this latter issue in more detail later).

It follows then, that this brief examination of "musical practice" will necessarily be diverse in its approach, making use of theories and observations derived from a variety of sources and disciplines, including musicians' accounts of their work, music theory, ethnomusicology, sociology and law.

Instruments and the Body in Musical Knowledge and Practice

In the curriculum of the conservatory or the university music program, the study of the techniques of instrumental performance are kept separate from the study of theory, composition, and, to a lesser extent, even history. In this way, the tools and the practice of music come to be thought of as distinct from the discourses of knowledge about music. Thus, we are presented with two systems of "logic": one concerned with the practical--a world of skill, dexterity, immediacy, expressive action, style and subjectivity--and the other, with knowledge--analytic, methodical, detached, formal, structured and objective (c.f., Bourdieu 1990). And to a large degree, this separation is an expression of a more

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translation), my preference for the term "technology" over "apparatus" seems justifiable given the context of the dissertation. In addition, to continue to use the term "technology" affords me a certain degree of linguistic ambiguity that may prove useful, if somewhat confusing for the reader.

fundamental division in Western culture, that which exists between the body and the mind (for a discussion of the impact of this split in music see McClary 1991: 23-5; 53-4; 136-9).

Of course, these divisions are in many ways artificial but nonetheless deeply rooted in the history of Western (art) music and thought. Indeed, the long philosophical tradition that has debated the status of music as a "language" has been essentially idealist in character and lacking in a sense of the social and corporeal aspects of music-making. As Bourdieu has pointed out, aesthetic theories from the time of Kant have been based on a notion of purity of form as the primary source of pleasure--a "pleasure totally purified of all sensuous or sensible interest" (1984: 493). Even in the comparatively recent work of philosophers such as Suzanne Langer, one finds a distrust in the special qualities that the performer brings to music. While Langer states that the performer plays an integral part in the expression of music, she sees the performer's role as one of delineating the deep formal structure of the music. If the performer plays in a passionate manner the performance becomes a mere "symptom of emotion" rather than a clear articulation of expressive form (Langer 1953: 145). For Langer, emotion in music must be "formalized, and the subject-matter 'distanced'" (1969: 222; emphasis in the original).

Music theory and analysis, though certainly the domain of a more narrowly specialized group of musical thinkers than that of philosophy, has, especially since the beginning of the nineteenth century, adopted an outlook remarkably similar to that of the aestheticians. Indeed, the reduction of theory and analysis to the task of explicating musical form could be considered as the necessary technical support structure (a "technology") of idealist musical aesthetics (see Kerman 1985: 64-85). By the turn of the century, Schenker's methods of musical analysis could not only dispense with the performance of music but even the surface details of the score itself; and in the twentieth century, music analysis has increasingly turned to abstract, mathematical models of explication (Ibid.: 90-112; see also Dunsby & Whittall 1988). For Foucault, the genesis of such a complex

"technology" is always a response to an "urgent need" and thus has a certain "strategic function" (1980b: 195); in the case of the nineteenth-century development of positivist musicology and music theory/analysis, Kerman has suggested that the preoccupations of these disciplines tended to mask the nationalist, religious, and class interests of the European middle and upper classes (1985: 31-6).

If the musical (and social) context of these theoretical and philosophical attitudes is the bourgeois concert tradition of notated art music (I will return to the topic of notation below), then it is not surprising that the popular musics of the West, and indeed the musics of much of the non-Western world, were for a long time considered to have no *bona fide* music theory of their own (see, for example, Feld's critique of ethnomusicology, 1982: 163-5). But this is far from the truth, although it may indeed be difficult in many of these musics to separate theory or aesthetics from the specific contexts and practices of music performance. In a very real sense, the ideational aspects of these musics are intimately bound to the very processes of music-making, to the instruments employed, and to the characteristic verbal constructs, often oblique and metaphoric in nature, used to describe musical activity (Ibid., and Feld 1981).

The field of ethnomusicology, its theories and methods, may be useful here in offering a model of how concepts and practices are intertwined in meaningful ways in music-making. For example, in the theoretical research model put forward in *The Anthropology of Music*, Alan P. Merriam distinguishes three analytic levels: the conceptualization of music (concepts and values concerning what music is and should be); behaviour in relation to music (physical behaviour, both in producing and responding to sound, as well as social and verbal behaviour); and music sound itself (1964: 32-6). Interestingly, in his elaboration of the basic model, Merriam begins with sound, the third level of analysis, and works backwards to the level of musical concepts. Music sound in this context is understood to have structure, and may be part of a system, but it is

inseparable from the human behaviour that produces it. Furthermore, this model of music-making is dynamic: the third and first levels form a feedback loop that represents the learning process of the musician and the non-musician alike (Ibid.).

But I am also uncomfortable with various aspects of Merriam's model. In particular, there is an implied one-way linearity (or circularity) in the model that suggests that changes in one area--concept, behaviour, or sound--lead unproblematically to changes in the other areas. And more importantly, there is a sense that this "feedback loop" operates in the manner of a relatively closed circuit: that is, the mutual influences and interdependence of musical behaviour and other types of social and cultural behavior are difficult to discern from within the model; in this regard, Merriam's concept of the role of music in culture appears to stem from a functionalist outlook (Ibid.: 47; for a more elaborate assessment of Merriam's model, see the journal article by Timothy Rice 1987, and the various responses appearing in the same issue).

Having stated this however, I still think that Merriam's formulation of music-making as a integrated process has distinct advantages over the way that music is dealt with in traditional music theory and in musicology and I will make use of his model, at least implicitly, in much of what follows. In addition to his tripartite model, Merriam describes six areas of inquiry constituting a program for the in-depth study of music in culture (Ibid.: 44-48), several of which are of immediate interest to the study at hand, the most relevant being what he refers to as "musical material culture"--essentially the study of musical instruments, their recognized taxonomy, physical characteristics, techniques of performance, symbolic value, distribution, and the economics of their production (Ibid.: 45). Again however, I see these areas of inquiry to be interrelated to a degree not entirely evidenced in Merriam's work: for example, I have already shown in previous chapters how the successful production and marketing of new musical instruments cannot be entirely separated from the training of musicians (a separate area of inquiry in Merriam's scheme).

In turning now to the question of the role of musical instruments in the formulation of musical concepts and practices, it is instructive to consider one of the most fundamental problems of music theory: the structuring of pitch materials in the form of modes, scales and tuning systems. Questions of pitch, and especially tuning, are commonly considered to be among the more abstract areas of music theory but, while the pitch systems of the West have often been represented in the most mathematical and/or metaphysical of terms (e.g., in the language of ratios or in appeals to "the music of the spheres"), the origin and the significance of most scales and tuning systems is usually to be found in musical practice, not in abstract science. This fact has come to be well understood in a number of recent anthropological studies of musical cultures where there appears, on the surface at least, to be relatively little in the way of formalized music "theory."

For example, Hugo Zemp's (1979) account of the panpipe music of the *'Are'are* people reveals a subtle differentiation of pitch relations--differences in the "interval" between two tones--which are systematically linked to the characteristics of the various panpipes in use, to specific performance practices, to the melodic figures and polyphonic organization of the music, and even to the spatial configuration of musicians playing in ensembles. All of this is described by the *'Are'are* through an extensive vocabulary which makes frequent use of visual metaphors of distance and movement. Thus, the musical concepts of the *'Are'are* and the tuning of their panpipes are closely interwoven into the context of musical practice and constitute a kind of "system," but one that is not easily recognized as such through simple observation or by analysis of the instruments themselves.

Following on these insights, it could be argued that virtually anywhere that drums, pipes or stringed instruments are found, there will also exist a clearly defined "logic of practice" (Bourdieu 1990) which, even if it only takes the form of distinguishing between different types and sizes of instruments, nevertheless constitutes a kind of musical "theory"

(I use the word, "theory," in this instance in a looser, more general fashion than Bourdieu, where the term is more often reserved for forms of objectified knowledge):

> Partial as these native theories are, ...they demonstrate how terminology and technical theory may well develop where there is an object or instrument on which an otherwise abstract system can be observed in visible operation; the growth of musical theory and of scale-systems also is connected with observations on musical instruments, not on the singing voice or on acoustic phenomena in the abstract.
> (George Herzog quoted in Zemp 1979: 34)

In sharp contrast to these practically-based notions of pitch relations however, the way in which the scientists and theorists of music in the West have come to study the sounds produced by various instruments is quite different from the manner in which performers might approach the same (or similar) objects. For example, at least since the time of Pythagoras in the sixth century B.C. a great many theorists in the West have developed (or justified) their ideas on musical scales and tuning by observing the vibratory characteristics of a string instrument known as the "monochord"; following Pythagoras, the vibrations are usually classified according to the mathematical ratio of the string lengths that produce them. What is interesting about this practice for my purposes here is the fact that the monochord is seldom considered to have been a significant instrument of musical performance *per se*: although the vibrations of the monochord are essentially no different than those produced by any stringed instrument, the monochord only found a very limited use in musical practice during the Middle Ages (primarily as a pedagogical aid in the training of singers and occasionally in ensemble music; Sachs 1940: 268-71). Indeed, despite its importance among music theorists, the instrument existed almost entirely outside of any significant tradition of musical performance. The monochord was thus a very peculiar form of technology--an instrument of science, not music--and knowledge derived from it was, from the outset, rational, objectified knowledge.

But while scientific knowledge of the physical characteristics of sound has certainly played an important role in the development of Western concepts of tuning, scales and harmony, it was far from being the deciding factor leading to the adoption of our modern system of twelve-note, equal-temperament tuning. Other factors of a more practical and musical nature were also influential: including the limitations of the human hand, problems in instrument design, the system of music notation, and the evolving taste among musicians and audiences for music in a modulatory, harmonic style (see Partch 1974: 407-19; Weber 1958b: 97-103).

The development of keyboard instruments--first the organ, then the clavier instruments, and finally the hammer piano--was of the utmost importance in all of these matters however because of the extended note range of the instruments, the fixed nature of their tuning, and their widespread use in both polyphonic and chordal music. But interestingly, these developments, being of interest to both musicians and theorists, occurred both within and without the mainstream of musical practice, and for this reason tended to have a quasi-scientific character. Max Weber has argued that the objective, rational approach taken towards experimentation with keyboard instruments, especially from the sixteenth century onward, became a model of experimental method that would only later be adopted in science (1958a: 141-2). Thus, for Weber, instrument design in the West has, at least since the Renaissance, exhibited a marked tendency towards rationalization.

Unlike the monochord however, the central role of keyboard instruments in musical practice ensured that modifications in the mechanics and tuning of keyboards would proceed, at least in part, in response to the requirements of science, aesthetics, <u>and</u> musical performance: the size of the human hand, the need for a common practice among musicians, habit and training, all contributed to the continued dominance of the twelve-notes-to-the-octave limitation on tuning and to the traditional 7-white-5-black configuration of the keyboard (Partch 1974: 408; and even today, with few exceptions, these factors continue to

exert a considerable pressure towards conformity on the designers and marketers of new musical instruments). Furthermore, as a consequence of the increasingly widespread use of keyboard instruments in both professional and amateur music-making during the eighteenth and nineteenth centuries, significant modifications in keyboard design were almost guaranteed to make substantial contributions to the evolution of musical style. Thus, the adoption of a fully chromatic, equally-tempered scale in keyboard instruments during the eighteenth century contributed to the realization of complex modulations and chromaticism in European art music and this, in turn, placed greater demands on all musical instruments: for example, improvements in the technical design of woodwind and brass instruments--specifically, the addition of key mechanisms and valves during the nineteenth century--were a direct response to the increasing demands of chromaticism in orchestral and chamber music of the same period (Carse: 200-219). In these examples, it is clear that musical instruments take part in a dynamic interplay with musical concepts at the most fundamental level; material culture and abstract systems of musical thought and organization thus form a dialectical relationship of the utmost importance in music-making.

Ultimately however, musical instruments, scales and tuning systems are only the material and conceptual infrastructure on which musical style is built: they may, in part, determine <u>what</u> sounds are played but they have much less influence on <u>how</u> they are played. Indeed, the manner in which one plays on an instrument can transform both the instrument itself and the nature of the musical sounds produced. One need only compare, for example, the characteristic body postures, hand positions, and bowing styles of the orchestral violin player to those of the folk fiddler to realize that there is more to the difference between "classical" music and "folk" music than just the relative complexity of musical form. The folk fiddler neither holds, nor plays, nor even tunes the instrument in the same manner as the orchestral player; indeed, as their names imply, there is a sense in which the "violin" and the "fiddle" can hardly be considered as the same musical instrument

although, in virtually all respects, they are physically identical (for a perceptive discussion of such differences see Marion Thede's brief account of her own transformation from "violinist" to "fiddler," 1967). And for all their superior training, the violinist can seldom match the sense of style that any fiddler acquires intuitively through direct musical experience; even when the violinist is able to imitate the techniques of the fiddler, it will sound "wrong" to their ears and they will tend to adapt the music to their familiar playing technique (Ibid: 14).

In a certain sense, the physical attitudes taken towards a musical instrument, like one's attitudes towards one's body and the material world more generally, and the intuitive sense of style that one develops only through living in a particular musical culture, are elements of what Bourdieu refers to as the *habitus* of a given social group or class--"the system of structured, structuring dispositions, the *habitus*, which is constituted in practice and is always oriented towards practical functions" (1990: 52). But what most trained musicians do in order to acquire and maintain instrumental technique has little to do with the *habitus*: even in the most refined expressions of the awareness of bodily balances and movement, the activities of the professional musician are concerned with a conscious disciplining of the body (for example, see Menuhin et al 1976: 14-85). For Bourdieu, the *habitus* is precisely that which does not pass through discourse and consciousness but is learned through imitation, or rather,

> a practical *mimesis* (or mimeticism) which implies an overall relation of identification and has nothing in common with an *imitation* that would presuppose a conscious effort to reproduce a gesture, an utterance or an object explicitly constituted as a model" (1990: 73).

In music then, the *habitus* takes the form of that unconscious yet fully structured system of sounds, gestures, meanings and conventions that we commonly refer to as "style."

The important issue concerning musical style for the present study is that, for musicians, style is something that is primarily felt--it is an awareness that is as much physical as it is cognitive. Nowhere is this fact more evident than in improvised and semi-notated forms of music where a sense of the relevant musical traditions and conventions are passed on, not through discourse, but through practice. In his discussion of jazz improvisation, Howard Becker (in terms reminiscent of Bourdieu) has observed that: "Conventions become embodied in physical routines, so that artists literally feel what is right for them to do...They experience editorial choices as acts rather than choices" (1982: 203-4). Similarly, David Sudnow has described the technique of jazz improvisation as "the knowing ways of the jazz body" (1978: xiii). Fluent improvisational technique, because it must answer to the needs of performance in "real time," demands that the body become accustomed to routines, not simply as a form of acquired technique, but as elements of musical style:

> Only after years of play do beginners attain that sort of full-fledged competence at place finding that the jazz pianist's left hand displays in chord execution...Through repeated work in chord grabbing, an alignment of the field relative to the body's distancing potentials begins to take place, and this alignment process varies in delicacy and need in accordance with the form of the music. The rock-and-roll pianist's capacities for lookless left-hand reaching differ from the baroque specialist's, and these both from the stride-style jazz pianist's. Every musical style as the creation of human bodies entails correspondingly constituted tactile facilities for its performers. (Sudnow 1978: 13)

Similar observations could be made about virtually any group of instrumentalists: for example, drummers know that to move between playing the steady beat of rock, to the shifting accents of reggae, to the melodic and polyrhythmic style of jazz requires not simply a knowledge of relevant rhythmic patterns and phrases, but a realignment of the body and its balances--a complete re-"patterning" of the coordination of the limbs. Style then, for the

musician, is something that is acquired only through an extended *process* of learning through practice.

Furthermore, style, thus acquired, is not necessarily as rigid, as mechanical, or as unchanging a thing as one might suspect, at least not for the improvising musician: style becomes a physical resource through which variations--and indeed innovations--are created. Sudnow relates how, after a lengthy period of playing jazz piano in a relatively spatial and tactile manner--a manner governed by visual and conceptual schemata and supported by a certain physical dexterity--he began to consciously "aim" for particular sounds (not simply "places" on the keyboard; Ibid.: 37). The capacity to hear, in advance of an action, is a subtle (and essential) aspect of a performing musician's creative ability:

> it is one thing to recognize familiar sounds you are making and another to be able to aim for particular sounds to happen. A different sort of directionality of purpose and potential for action is involved in each case. (Ibid. 38)

What is essential in Sudnow's account is the fact that this inner hearing is related to action in a temporal way: he describes this momentary pre-hearing of a note-to-note course of action as the "emergence of a melodic intentionality" that had been dormant in his playing prior to that time (Ibid.: 41 -42).

I will return to this notion of inner hearing and intentionality in music in the following chapters but for the moment it is perhaps worth pointing out that accounts such as Sudnow's may go a long way in explaining the particular attachment that so many musicians have to specific instruments, the importance they place on the acquisition of skills of execution, and, consequently, the threat felt by some of them when confronted with new technology. When a drummer, for example, approaches a digital drum machine for the first time it is not primarily an unfamiliarity with the functioning of the device that is the source of a certain discomfort; it is, in part, the apparent loss of that entire "field" of

physical/spatial/aural potential, so intimately tied to their sense of musical style and purpose, that is perhaps most disquieting. Adopting new instruments, new sounds or a new style of playing is thus a very gradual process for most musicians, as attested to by even jazz trumpeter Miles Davis, a musician whose long career, perhaps more than most, was defined by change:

> When I started playing against that new rhythm--synthesizers and guitars and all that new stuff--first I had to get used to it. At first there was no feeling...You don't hear the sound at first. It takes time. When you do hear the new sound, its like rush, but a slow rush. (Davis 1989: 323)

At the risk of belabouring the obvious, it should nevertheless be noted that "the sound" that Davis refers to in this instance is not the same notion of "the sound" with which much of this thesis is concerned--the notion of a "sound" as an isolated object of reproduction; rather, as with Sudnow, "the sound" which Davis is trying to hear is that inner projection of a musical action. For the improvising musician, new musical contexts require new ways of feeling and an attentiveness to hearing/playing new patterns of sound.

A musical style is thus always *learned*, to paraphrase Leonard Meyer, even by the musicians who "invent" it (quoted in Feld 1988: 76). And, in this sense, musicians are little different from other listeners (i.e., audiences): the codes, habits and strategies of a given style or genre of music come to be intuitively felt by listeners as a set of implied relationships and expectations that are "empirically real, but...necessarily general, vague, and physical" (Ibid.). For the listener (and here I again include musicians), the problem of translating these vague feelings into more concrete terms usually involves language and is thus always an active and ongoing interpretive process--a process that is (like music itself) both subjective and socially interactive, composed of a set of "interpretive moves that metaphorically locate, categorize, associate, reflect on, or evaluate music experience" (Feld 1984: 16). Furthermore, like musicians, listeners learn to anticipate certain features and

patterns within a given style and, if this sense of anticipation is not as precise nor as specific as the "aiming" process of the improvising musician, it is nevertheless essential to the formation of the listener's sense of stylistic "boundaries" (Ibid.: 11). More than a simple matter of recognition, the perception of boundaries or "frames" becomes part of that other musical practice--consumption--where issues of "value," "identity" and "coherence" are instantly, and simultaneously, felt and reflected upon.

Thus far, I have used the terms style and genre almost interchangeably but at this time it is important to point out that the two concepts are not equivalent. Franco Fabbri has offered a definition of genre as "a set of musical events (real or possible) whose course is governed by a definite set of socially accepted rules" (1982: 52); the definition is rather broad but contains the possibility of also defining "sub-sets" or "sub-genres." For Fabbri, style or musical form are but one factor defining the character of a given genre of music: other factors, including various semiotic, behavioural, social, ideological and economic "rules," as well as the structure of the musical community itself, combine to identify a particular genre (Ibid.: 54-60). So while much of the present discussion centres around the use of musical instruments in stylistic, temporally-based expressions of musical sound and form, it should be understood that musical instruments, the sounds produced on them, elements of style or form are never, in themselves, sufficient to define a genre (Ibid.: 55). Understood in this way, it is clear that individuals can adopt unique approaches to playing their instruments or idiosyncratic ways of dealing with musical sound and syntax while remaining within the confines of a given genre. The distinction between sound, style and genre will become important in the following chapters, especially in dealing with the problem of technical reproduction and musical genre.

But putting aside, for the moment, the problem of musical genre, I would like to take up again the fact that musical performance, and perhaps especially improvisation, is bound to a set of acquired physical and aural techniques and capacities that are oriented

towards action within a particular temporal flow--a flow that places present and future into a relationship of intimate proximity (hence, as noted above, the importance of anticipation, even among listeners). The same temporal relationship also characterizes the actions of musicians when they perform together and, as Bourdieu has pointed out, this temporal dimension--the implied "presense in the future"--may indeed be essential to all forms of practical "logic." Bourdieu offers sport as an example of its operation:

> A player who is involved and caught up in the game adjusts not to what he sees but to what he fore-sees, sees in advance in the directly perceived present; he passes the ball not to the spot where his team-mate is but to the spot he will reach--before his opponent--a moment later, anticipating the anticipations of the others and...seeking to confound them. (Bourdieu 1990: 81)

Bourdieu's description of this play of anticipations is remarkably similar to Alfred Schutz's account of the social structure--"the structure of the mutual tuning-in relationship" (1964: 162)--that is characteristic of any musical performance by two or more individuals (even one governed by the dictates of a musical score):

> Either [performer] has to foresee by listening to the Other, by protentions and anticipations, any turn the Other's interpretation may take and has to be prepared at any time to be leader or follower. Both share not only the inner *durée* in which the content of the music played actualizes itself; each, simultaneously, shares in vivid present the Other's stream of consciousness in immediacy. This is possible because making music together occurs in a true face-to-face relationship--inasmuch as the participants are sharing not only a section of time but also a sector of space. (Schutz 1964: 176)

And even when a musical event is not, in itself, communal in structure, it could be argued that the collective experience of playing and listening together still informs the subjective, temporal impulses of the practicing musician:

> Every once in a while the time would get into the fingers as I sat...setting a beat first by getting my shoulders going around a little, while I tapped my foot and snapped my fingers before play; counting off the time with a care I had never taken before, a care for the jazz to be played, a care for the others with whom I would have been coordinating my moves, for that bass player and drummer who were never around...a care for the new listener I had become myself and for the one who had been missing, ready to hear that song, that jazz, to tap his fingers to it. (Sudnow 1978: 115)

This inner feeling for the imagined presence of the other that Sudnow describes is derived, in part, from the same phenomenological experience of musical time that, for Schutz, constitutes the basis of a "social relationship" between composer, performer and listener (regardless of whether that experience is mediated by mechanical devices, such as recordings). Schutz argues that, from a communicational point of view, the experience of listening to music is qualitatively different from, for example, reading a book: the experience of music requires what Schutz refers to as a "coperformance" that must, of necessity, occur within a shared temporal domain constituted by the moment-to-moment flow of the music itself (quite apart from whether this "coperformance" takes place in a genuine face-to-face relationship; 1964: 169-75). For Schutz then, we are always "making music together" (the title of his essay).

In this sense, the experience of musician and listener again have much in common: the feel of musical time--whether conceived of primarily in terms of rhythmic patterning or, more broadly, in terms of Schutz's inner experience of *durée* (the concept itself derived from Bergson)--is shared by musician and audience. But Schutz goes further than this; he argues that while the musician's performance requires that their sense of time be geared towards the "outer world," that of the listener remains "merely an internal activity" (Ibid.: 175). While I agree with Schutz that the musician's mental and physical attitudes may well be directed towards a specific kind of action that requires a direct awareness of the temporal flow of note-to-note configurations and musician-musician interactions resulting in what

Bourdieu refers to as a feeling of "urgency" that is a property of all practice (1990: 82); his characterization of the listener's experience as "merely internal" is, I think, biased by his implicit adoption of a model of audience dispositions drawn from the contemplative mode of listening typical of nineteenth-century concert hall tradition. In this regard, Bourdieu's analogy of the scientist as a "spectator" at some sporting or dramatic event also depends heavily on a rigid distinction between "actor" and "spectator" that may not be in keeping with various forms of popular production and consumption.

Without wishing to collapse the very real distinctions that exist between musicians and audiences (and here the notion of "urgency" may well be an important issue), it should be pointed out that the reception of popular music, especially popular forms oriented towards dance, is far from the kind of passive activity (quite apart from the interpretive actions suggested above) that most cultural critics have taken it to be. The relationship between music and dance has long been lost within the tradition of European art music: even by the eighteenth century, so-called "dance suites" had already become autonomous and highly stylized forms of instrumental music. And in this regard, it is perhaps not surprising that Schutz should turn to the more abstract (even reified) notion of *durée* rather than rhythm in his discussion of the essential experience of musical time.

Much popular music of the twentieth century, on the other hand, especially those forms based on Afro-American sources, has never made as complete a break with dance. As a result, there exists a different level of participation in the consumption of popular music through dance that mitigates against the distanced logics of reception and objectification suggested by both Schutz and Bourdieu. Indeed, ethnomusicologist John Blacking (1971) has argued that, in the West, we have tended to confuse specific musical skills (e.g., the ability to perform on an instrument or to compose music) with musicality itself; he maintains, however, that any true theory of "musical competence" must be based instead on the more general ability to *listen* in a creative or structured manner. He goes on

to suggest that in some African cultures communal dancing is the first stage in the acquisition of a more specific set of musical skills related to performance (Ibid.: 24-25).

In dance, the body both responds to the shaping influence of rhythmic sound and makes use of it--channels it towards another kind of expressive action that is at once related to, but different from, musical performance. The active and potentially creative nature of these practices poses problems for conventional notions of "consumption." Critical theory of the past has too often dismissed dance as a form of meaningless abandon or, worse, as in the case of Adorno's account of the "jitterbug" craze of the 1930s and '40s, as a set of mere "socially conditioned reflexes"--false consciousness in its most frenzied and hysterical form (1941: 45-48). More recently, pop culture theorists have tried to recoup dance as a meaningful process of self-realization through the body (e.g., Chambers 1985) and placed considerable emphasis on the importance of dance in the gendered expression of self-control, pleasure and sensuality (McRobbie 1984): whereas males have been able to make use of musical instruments in public displays of physical control and technical mastery (e.g., the electric guitar), women have had fewer outlets for similar forms of public expression--dance has come to be considered as one of those outlets.

But for my purposes here, the importance of the relationship between popular music and dance can also be seen in the manner in which the latter feeds back into musical production practices. Much like Sudnow's statement above concerning the way in which the feeling of musical tempo would "get into the fingers" as he prepared to play; it seems to me that the function of popular music as dance music can inform the subjective impulses of popular musicians even as they engage in the relatively detached and analytic practices of electronic production (e.g., as when programming a drum machine). This feedback--of consumption into production--is both conceptual and physical in nature, both fully intentional but also intuitively felt. Thus, a history of personal and collective consumption

can form not only the basis of an awareness of the general outlines of musical style but even the precise "feel" for the details of musical form.

From the foregoing discussion it is perhaps clear that the question of how one learns to make and to listen to music cannot be limited to issues concerning the direct physical or cognitive relationship between a musician and their chosen instrument. Indeed, while Sudnow's perceptive and poetic account of the experience of learning to play jazz piano may be revealing, it also portrays the learning process as essentially a personal (even solitary) journey towards both the acquisition of skill and the realization of individual potential; similarly, in addressing the creative role of new technology in music, it is often assumed by music theorists (such as Kenneth Gaburo quoted at the beginning of this chapter) that the most important issues revolve around the problems of human/machine "interaction" (see also Truax 1976). In either case, the focus of attention is almost exclusively at the level of the individual and, as important as the phenomenological and communicative relationship between individuals and musical instruments may be, other problems of a more collective or social nature are equally significant.

Among the latter are the conventional sociological issues related to race, class and gender: for if learning is indeed a social process, then questions concerning how these factors are influential in determining not only who has access to musical knowledge and skill, in the first place, but how that knowledge is transmitted, need to be addressed. For example, throughout most of their history keyboard instruments have generally been the province of the middle and upper classes: compared to other musical instruments they are relatively expensive, they need to be kept indoors, they must be regularly tuned and serviced by trained technicians, and playing even a simple accompaniment on them might demand considerably more study than is required on an instrument such as the guitar. Not surprisingly then, the piano was one of the last musical instruments to be mastered by Black performers in America and incorporated by them into Afro-American musics (Jones

1963: 90). The early Blues and boogie woogie pianists played in an extremely percussive style and at least one historian has suggested that this may not have been simply the result of musical predilection: in his book, *The Jazz Scene*, E.J. Hobsbawm has stated that most of the boogie woogie pianists were "limited" at best and, even among the most expressive players, some were "technically downright bad" (1989: 120).[2] Thus, it is clear that access to particular instruments as well as the level of training available to individuals in any given social group will have an impact on their approach to music.

Sociologists have also paid some attention to popular music as an occupation and the role of the musicians' community in the formation of particular social attitudes. As a rule, popular musicians have relatively little formal training (Denisoff & Bridges 1982) and develop their skills and knowledge of musical conventions by pursuing casual and semi-formal relationships within local networks of other, often more experienced musicians. These local musical cultures tend to be exclusive in character, in part, because of the social stigma attached to being a popular musician. In his participant observation study of dance musicians in the late 1940s, Howard Becker has described how popular musicians often develop an attitude, a style of dress, and a specialized vocabulary that sets them apart from the rest of society: conventional society regards the life-style of the dance musician as "deviant" and, in response, musicians further isolate themselves from social norms through their attitudes and behaviour and thus become "outsiders" (Becker 1963: 79-100).

The local network acts as a kind of support group and can be important both in terms of the type of music played by musicians and on the career development of individual performers. In some cases, the spiral of social isolation and self-imposed segregation can result in self-conscious innovations in musical style and the creation of "avant-garde"

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[2] Ragtime preceded boogie woogie as the first Negro music to make extensive use of the piano but many historians of jazz regard its pianistic style (introduced by a handful of musically educated players) and its composed forms as the least typical expression of Afro-American musical traditions (see Jones 1963: 90 and Hobsbawm 1989: 119).

movements within popular music: as a group of musicians struggles to define musical values and to maintain notions of artistic integrity, they resist interference from outside and may attempt to push even further the boundaries of both social and musical convention. But regardless of the degree to which one rejects social and musical norms or simply becomes a "commercial" musician, one's success as a performer often depends on the ability to maintain ties within the network of "interlocking cliques" where jobs are allocated and skills adjudicated (Ibid. 103-114).

One of the more immediate consequences of pursuing a career in an occupation defined as "deviant" is that it places pressures on the family life of the individual. In Becker's account, parents tend to discourage their children from pursuing careers that are both financially insecure and socially unconventional; and when the musician marries, the pressure towards maintaining a steady income and a stable home life is intensified (Ibid. 114-19).

But what is striking here is the degree to which it is assumed that the dance musician is male: Becker's entire description of the deviant group mentality, the control of work opportunities by cliques, and the pressures of family life, ignores how each of these factors makes it extremely difficult for women to enter into the culture of the popular musician. Adopting a "deviant" life-style is always more socially damning for women than it is for men; historically, men have tended to exclude women from the workplace (and this has been true in virtually every genre of music, from the concert hall to the recording studio); and the pressures of family life, especially as regards the raising of children, are that much greater for women.

In more recent forms of popular music, such as rock, the male domination of musical performance and studio recording appears to be equally problematic. Mavis Bayton (1990) has described some of the difficulties encountered by women seeking to enter into the world of rock: these include not only the issues of deviant life-style vs. family

commitment described above, but also, the very relationship of women to music, instruments and amplification. Bayton argues that unlike young male musicians, women are less likely to be proficient on their instruments when they enter a band or, because of the limited number of females who play rock instruments (especially bass guitar and drums), women often end up playing an instrument other than the one on which they are most familiar. Furthermore, many female players have backgrounds in classical, notated music, which can be an impediment to their ability to learn songs from records (I will return to this point later) and to their adoption of rock instruments and playing techniques (e.g., Bayton describes the transition from classical keyboard to the synthesizer in terms not unlike those used by Thede in her description of violin vs. fiddle playing, cited earlier); and women often feel that it is more difficult for them than it is for males to become comfortable with both the ancillary technology of rock (amplifiers, mixing consoles, and the like) and the specialized technical terms and abbreviated slang employed in its use (Bayton 1990: 238-243, 248-9).

However, the problems cited by Bayton extend beyond simply deciding to adopt a certain instrument and becoming comfortable with its related technology. How one plays an instrument is influenced by social stereotypes, teachers (formal and informal), and a variety of other factors: for example, Charlotte Ackerley has described how female guitarists have been systematically discouraged from playing lead guitar; with the exception of only a handful of artists (such as Bonnie Raitt, who is one of the few female artists in the Country/Blues tradition who can boast a career as both a singer and a lead guitarist), most women learn to play rhythm guitar or accompaniment-type patterns (1978: 260).

Clearly then, musical practice, even at the most fundamental level of the relationship between musicians and their instruments, cannot be separated from either the specific contexts of musical style and genre or larger issues of race, class and gender. In this way, the constitution of individuals as social subjects has at least as large an impact on their

relationship to musical technology as the form of the technology itself, an issue that is almost completely ignored by theorists, like Gaburo and others, in their attempt to construct an unproblematic relationship between humans and machines.

For the moment, I want to leave these initial observations concerning musicians and their instruments so that I might return to them for the purposes of elaboration in the following chapters. But I also do not want to abandon them entirely in the current discussion: for in turning to the twin problems of musical notation and sound recording, the contrast between various notions of musical style, knowledge and performance will be useful in illuminating the implicit perspectives on musical practice that are embodied in the structure of musical technologies.

The Role of Notation in Western Musical Practice

It is not possible in the present context to detail the gradual but profound changes in musical culture that attended the development of musical notation--a process which required several centuries to come to full fruition--or, in the following chapters, to fully appreciate the equally momentous changes in musical production and consumption that have occurred during the past century since the introduction of the technology of sound recording. However, in the following pages I would like to address a number of specific issues concerning musical notation as they relate to composition and performance, to the organization of musical labour, and to matters of economy. These issues will be taken up again in subsequent chapters and discussed in relation to the uses of sound recording and digital instrument technologies in contemporary music-making.

While musical notation and sound recording are, in most respects, fundamentally different from one another--both technically and with regards to the modes of production, distribution and consumption with which they have become associated--there are,

nevertheless, certain areas in which one can consider notation as having prepared the social, cultural, and economic ground for sound reproduction. Furthermore, while both notation and sound recording were initially conceived of as primarily mnemonic or reproductive technologies, each has, in its own manner, become *productive*--become a vehicle for the planning and creation of musical works. And finally, recent computer-based programs, such as sequencers (which will be discussed later in Chapter 9), exhibit characteristics that are related to both notation and sound recording; it is with an eye towards such continuities as well as the discontinuities between these technologies that I wish to proceed.

The development of a refined notational system in Europe during the Middle Ages constituted Western music's first real break with a mode of musical production based essentially in performance and oral tradition. The significance of notation--both theoretical and practical--in Western music should not be underestimated: music historians have generally regarded the invention of staff notation as an event of momentous import--an event as important to music as the invention of writing in language. But while histories that deal specifically with the development of notation have often taken a technical/musical approach to their subject (e.g., Rastall 1983), it should be stressed that this history is as much social as it is musical.

Introduced initially as a simple mnemonic aid in the performance of monastic Chant, early notations based on the system of *neumes* (from about the ninth century or earlier) were relatively imprecise and still left considerable latitude in interpretation to performers (Grout 1960: 39, 55-56). According to Max Weber, "This circumstance favored flexibility of official musical patterns with respect to the musical needs of ordinary practice and favored the penetration of popular tonal traditions into musical development" (1958b: 86). The innovation of early staff notation by Guido d'Arezzo (ca. 995-1050) was

one attempt to remedy this "un-orderliness" in liturgical music and, implicitly, a means of suppressing secular influences on sacred tradition (Ibid.).

Such power, implicit in notation, was not wielded unilaterally for long however and, ultimately, notation would come to be one of the means by which musicians would break with liturgical and other musical traditions. By the fourteenth century, French composers of the *ars nova* were achieving new levels of rhythmic subtlety through the adoption of duple time division (itself derived from secular sources) and the invention and exploitation of new rhythmic and formal complexities in musical notation (new time-signatures, coloured notes, dots, stems and flags; Grout 1960: 106-16; 127-8; Rastall 1983: 61-78). By the end of the century an extreme form of "mannered" notation--where the visual impact of the score was as important as the intended sounds--had come into use in certain types of music (Rastall 1983: 79-96).

But what interests me in the history of the development of these various notational innovations is the manner in which Western art music begins to evolve as a specifically notated art form from about the fourteenth century onward. The increasing trend towards polyphonic vocal music during the latter part of the Middle Ages had undoubtably created the need for greater precision in notation but by the fourteenth century *composition*--as a form of musical activity separate and distinct from performance--had begun to emerge. The role of notation, which prior to this time had been primarily descriptive (i.e., an attempt to accurately record the essentials of an oral tradition), now became prescriptive--a set of more-or-less clearly defined instructions written by one individual to be executed by another.

This activity was, from the outset, characterized by a relationship to time that was different from performance: with notation, not only did the musical work come to be preserved in a concrete form, but musical time itself was represented in a spatialized pattern; the "urgency," anticipation and shared sense of time characteristic of performance

was replaced (for the composer at least) by a detached set of quasi-mathematical calculations and operations executed with little reference to "real-time" modes of action. In this sense, the characteristic compositions of the extreme notational art forms of the period--isorhythmic motets and, later, mensuration canons--display a rationalization and objectification of temporal (and tonal) relations which is more closely related to the "logic" of science than that of practice. The rationalization of temporal, dynamic and tonal relations in recent digital technologies, such as sequencers and drum machines, is not unlike that of notation and I want to explore this issue further in the following chapters.

It should be noted that not all systems of notation allow for the same degree of rationalization and large-scale planning. From at least the late fifteenth century onwards,[3] various types of "tablature" were developed to meet the needs of the growing number of amateur instrumentalists: these include tablature systems for keyboard instruments, the lute, guitar, and a variety of other instruments (see Rastall 1983: 143-171). While they gradually fell into disuse in art music after the seventeenth century, various kinds of tablature are still in widespread use in popular music today.

Tablature systems sometimes share certain characteristics with conventional staff notation (especially with respect to rhythm) but they are otherwise unique to the type of instrument in question: tablatures are designed to indicate the position of the fingers on the keyboard, fretboard, or other sound producing mechanism, rather than the actual sounding pitches (indeed, where string instruments are concerned, the use of non-standard tunings often makes it difficult to determine, in advance, what the sounding pitches will be). Because of their close relationship to the physical layout of the instrument itself and the

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[3] Tablature systems are probably as old as the most rudimentary forms of musical notation: according to Rastall, examples of keyboard tablature date back as far as the Middle Ages. While they are most often associated with music of the sixteenth and seventeenth centuries, the use of a variety of tablature systems in popular music of the twentieth century is a testimony to their continued viability as a form of notation for specific musical instruments.

mechanics of performance technique, tablatures are relatively easy to learn; the ability of the performer to make use of tablature as an abstract means of musical organization or as a tool of analysis, however, is extremely limited. In the following chapters I will consider synthesizer patch diagrams (used as a means of recording the technical parameters utilised in the production of individual sounds) and graphic pattern displays in sequencers and drum machines as analogous to tablature both in terms of the possibilities they offer to popular musicians who do not read notation and in terms of their inherent limitations.

Historically, however, it was only through the development of the more abstract conventions of staff notation, not tablature, that composition would evolve into an art-form based on the detailed calculation of technical means and the coordination of many-voiced musical ensembles. With regard to the latter, the evolution of a "social technology" organized for the purposes of realizing the work-plan embodied in the musical score would eventually culminate in the eighteenth and nineteenth centuries with the development of the symphony orchestra, with its balanced, specialized sectional divisions and its highly trained personnel all under the musical/administrative control of the conductor. But before this could happen another musical role had to be invented: whereas a certain anonymity had accompanied compositional activities prior to the fourteenth century, from that time forward individual musicians began to achieve public recognition in their new-found role as *composers*, eventually setting themselves apart, as "artist" and "genius," from the rest of the musical world.

If the advent of complex multi-voiced music organized through notational art can be regarded as a critical step in the creation of the role of the composer in Western music, it can also be regarded as the first step towards the devaluation of the role of the performer as well: with increasing precision in notation, the composer began to take exclusive responsibility for more and more of the significant detail of music. Indeed, from the standpoint of contemporary musicology, theory and analysis, the score defines what is, and is not,

significant in Western art music: Michael Chanan has argued that with notation, the subtle uses of vocal or instrumental timbre, and rhythmic and tonal inflection which are part of the essential, expressive domain of performers "cease to carry structural significance in the music because structural significance is granted only by what the notation renders articulate" (1981: 236).

At first, this took place only slowly: from the fourteenth to the seventeenth centuries much musical detail in certain types of music was left to the discretion of the performer who interpreted the score according to generally understood conventions. And even during the period after 1600, when much that had previously been left to convention came to be specified in notation, the ability to improvise or to realize a figured bass line (a short-hand system for indicating harmonic progression) was expected of any soloist or accompanist (and again, the parallel between this seventeenth-century practice and the uses of "chord charts" in popular music during the twentieth century is striking; see Rastall 1983: 204-206). But by the beginning of the nineteenth century, most of these areas in which the performer had formerly made direct contributions to the structure of a work had been eliminated: accompaniments were written out in detail and cadenzas and other improvisational episodes in musical works likewise became the responsibility of the composer rather than the performer. Musical notation alone, of course, could not exact compliance from musicians: as is still true today, it was the task of the various social institutions concerned with music education, professional training and criticism to both define and delimit the role of the performer in relation to the score.

> The classical artist operates within a social organization of professional certification, excellence, and competitiveness...his circumstances placing extraordinary demands upon a faithfulness to the score, where what 'faithfulness' and 'the score' mean is defined by that social organization. (Sudnow 1978: 53)

The growing importance of the score as the authoritative source of meaning in music provoked an opposing reaction among a group of performers (or rather, performer/composers) and their followers during the Romantic period. Richard Sennett has argued that task of the nineteenth-century virtuoso was to distract attention away from the musical text and draw it, instead, towards themselves as performers--towards themselves as individuals possessing extraordinary powers (1977: 198-201). Practical knowledge was thus transformed into technical mastery. The art of the virtuoso was an art of immediacy, personality, shock and stimulation (Ibid.); it was, in short, everything that notation (and conventional performance) was not. It operated, in part, because of a complementary self-disciplining of the audience to a position of silence (also an "invention" of the nineteenth century, Ibid.: 205-7) and, by virtue of the emphasis placed on individual personality, it established, in prototypical form, the basic character of the star system in Western music (Attali 1977: 138-144). The legacy of nineteenth-century Romanticism is thus one consisting of two opposing schools of genius: one focussed on the composer as master of the "language" of music and the other on the virtuoso, the performer who exhibits extraordinary physical powers.

For the moment it is important to point out that between the sixteenth and the nineteenth centuries the score also gradually became the vehicle for an economic and moral right which would again ultimately grant status to the composer as the individual creator of the musical work. This was not entirely evident at first however; according to Jacques Attali, music publishers were the first to attempt to exploit copyright as a means of bringing about a capitalist organization of musical production and thereby enhancing their own economic control over it:

> Cette valorisation de la musique s'est construite contre tout le système féodal, pour qui l'oeuvre, propriété absolue du seigneur, n'avait pas d'existence autonome. Elle s'est construite sur l'existence concrète d'une valorisation mar-

> chande possible dans un objet, la partition, et dans son usage, la représentation...Car le droit d'auteur est, dès le début, non pas une défense des droits des artistes, mais un outil du capitalisme contre le féodalisme. (Attali 1977: 104)

Thus, within the early capitalist organization of musical production, the reproduced score was regarded as a separate entity from both the original manuscript created by the composer and its eventual performance.

Composers themselves however still had few legal rights but as the feudal system continued to break down and composers began to work outside the confines of court life, they too began to attempt to wrest control of the score away from first, the lord, and then, the music publishers:

> Peu à peu, comme les musiciens se dissocient des cours, ils obtiennent une parcelle de la propriété de leur travail, c'est-à-dire la dissociation de la propriété de l'oeuvre d'avec l'objet fabriqué par l'imprimeur: même s'ils vendent le droit de l'imprimer, ils conservent sa propriété et le contrôle de son usage. (Ibid.: 107)

In this way, the simultaneous ideological and economic valorization of the score--as definitive artistic statement, on the one hand, and object of exchange, on the other--became the source of both the composer's musical status and socio-economic independence.

It is important to note here again the reduced importance of performance within this evolving "technology" of legal rights and economic entitlement: performers were given no special rights or privileges with regards to the sounds they made, to their improvisations, or to their specific interpretations of the musical score; indeed, for the purposes of copyright, performance was regarded as little more than a generator of income for those who could claim ownership of the score and its reproduction. Granted, such performer-oriented issues would only come to the fore when a means for the mechanical reproduction of sound became possible, but still, the interests of performers have not, to this day, been

well served by copyright law. Janet Mosher (1989) has suggested that twentieth-century forms of experimental music that rely less on the details of a given score and more on the interpretive and improvisational characteristics of individual performances pose problems for conventional copyright law. The law remains committed, she argues, to a strategy of fixed forms and cannot accommodate the open-ended structures of these more recent categories of artistic work.

Mosher's argument is primarily concerned with various forms of experimental art music where graphic scores and other types of non-specific notation are employed. But in twentieth-century popular music, especially jazz, one finds an even more salient example of the problem of performance vs. copyright that is perhaps analogous to the situation, prior to the nineteenth century, when all performers were expected to improvise. For the jazz musician, the melodies and harmonies of a song are only the bare-bones framework within which a musical process--the improvisation--evolves. In this sense, the song "chart" (the score in its most elementary form) is simply the pretext for a different kind of music-making. Yet, under the law, the composer of that song has more rights and protections than does the performer, even if the performance has been recorded (I will return to this point in the Chapter 9).

As already suggested above, one of the reasons why the skills of improvisation have fallen into disuse in Western art music is because of the increasing use of notation in musical training; but the ability to improvise is only one aspect of this phenomenon. In the West, formalized musical training has, until quite recently, been associated with either relatively exclusive social groups (in the Middle Ages, the Church or the municipal guilds) or with the aristocratic and the middle and upper classes (those who could both afford a formal education or private instruction and had the leisure time to enjoy it). While formalized training in the tradition of Western art music may include instruction in a range of skills, including *solfège*, vocal or instrumental technique, music theory, history and

composition; it is characterized above all by the need to acquire skill in music "literacy," i.e., the ability to read and to interpret musical notation and to gain, thereby, an introduction to the repertoire of so-called "great music." Thus, as with the comments concerning musical style in the previous section of this chapter, one never simply learns to play a musical instrument: in the process one also assimilates both a repertoire and a set of musical/aesthetic values.

Learning to play a musical instrument through the mediation of the notated score also changes the nature of the learning process itself. In Sudnow's account of learning to play jazz piano, discussed above, there is an emphasis on the physical/spatial aspects of execution but also on a certain aural and rhythmic intentionality that relates directly to the music to be played. In the technical training of performers in musical traditions dependent on notation, the acquisition of performance skill is standardized in the form of the *étude*. And while the piano *études* of composers such as Chopin and Liszt could sometimes achieve great musical and poetic depth, the vast majority are tedious and banal, giving only the impression of skill, and often responding to little more than an "interest in the simple athletics of piano playing" (Loesser 1954: 254-56). In this context, the notion of musical skill is transformed into mere "technique"--a purely physical phenomenon scarcely requiring (at least in the case of the piano) any aural capacity at all.

Musical literacy has never been equally distributed across social classes however and, even within the privileged classes, it has not been equally distributed across lines of gender. In nineteenth-century Europe, whether one learned music primarily through private lessons or at one of the private or state-run music academies, professional-level training was reserved almost exclusively for men (with the exception of vocal training). And while an ability to sing or to play music was considered a desirable part of any cultured woman's upbringing, women were actively discouraged from pursuing professional careers and their training limited to "a smattering of knowledge...only sufficient

for the domestic drawing-room at best" (Rieger 1985: 142-3); in particular, the study of music theory or composition was considered completely unnecessary for women (Ibid. 141). Furthermore, certain instruments tended to be reserved for males (most orchestral instruments including both strings and winds) and were considered unfit, within the standards of middle-class propriety, for females (women were primarily limited to singing, playing the piano and, to a lesser extent, the harp or the guitar (Koza 1991: 107-8). At the same time, the status of "amateur" music-making in the home came to be denigrated during the nineteenth century in a way that had never been the case, during the eighteenth century, when upper and middle-class males themselves had engaged more readily in amateur musical activites (Ibid.: 112-13; Rieger 1985: 143).

Feminist writers have rightly described this situation as an example of male domination in music and the systematic repression of female creativity (e.g., see both the Koza and Reiger articles cited above and McClary 1991). But the fact that the majority of women were not allowed to participate in the full range and extent of musical practice (either as performers, composers or teachers) also has a particular importance for the study at hand. For while the role of nineteenth-century women as amateur musicians in the home cast them as musically "inferior" to the public, male professional, it also placed them in a position of dependency upon those same professionals: the female amateur became the musical "consumer" *par excellence*. And, as already noted in previous chapters, many composers, publishers and piano manufacturers dedicated themselves to exploiting female amateurs as a market, applying themselves to the task of creating a technically and aesthetically suitable repertoire, thus simultaneously reponding to, and creating the conditions for, a specifically-defined "feminine" taste in music. In a certain sense then, the character of female musical practice in the home has traditionally been defined along the same lines as conventional notions of consumption: as essentially lacking in creativity (and therefore "passive" in the eyes of male critics) and rooted in the aesthetics of fashion.

The Western middle-class values of musical literacy and educational methods organized around notated music have been adopted in most public school systems throughout Europe, North America and, indeed, in many non-Western countries as well. In this way, Western notation has become the dominant system of notating music throughout the world (although that dominance is certainly on the wane; see Bennett 1983: 224-5) and has had an impact in genres of music quite removed from the tradition of Western art music. Christopher Small has argued that in education the reliance on the notated score places one in the position of receiving a product rather than engaging in a creative process (1980, 30-31). Further, he argues that the producer-consumer relationship characteristic of modern society and the notion that knowledge exists essentially outside and independent of the individual fosters a consumer mentality within the entire educational enterprise (Ibid.: 182). While in this latter context Small does not place undue emphasis on the role played by musical notation alone, it is clear that it has become an important component in a complex set of objects, rules and procedures--an "educational technology"--which, taken together, "serve to confirm the pupils as consumers of knowledge" (Ibid.: 185).

Conclusion

The relationship between musical instruments and the entire process of music-making as analyzed by Merriam--including the conceptualization of music, musical behaviour, and sound--is extremely complex and, indeed, can only be separated out in theory--that is, through an application of the "logic" of science, not that of practice. For the performing musician, as I have argued in this chapter, both the relationship to musical instruments and the musical process itself are completely fused in practice in such a way as to virtually defy analysis: in learning to play a musical instrument, the musician develops a

sense of style that is intuitive, a sense that is felt as much as it is consciously understood. Sudnow's reflections on playing jazz piano reveal the degree to which performance practice is dependent upon more than the acquisition of simple "technique" (in the limited sense of physical dexterity); it relies, rather, on a type of listening that involves a "directionality of purpose" that comes primarily (although, as I have argued, not exclusively) through practice.

Musical skills, attitudes, and a sense of style are not acquired in a vacuum however, and the social networks of popular musicians, by their very nature, have tended to exclude women. With regards to new technology, this makes for a form of double exclusion: as noted in the previous section of the thesis, musicians' magazines are overwhelmingly male in their orientation and, with the male domination of popular musical practice, it thus becomes difficult for women to gain access to either technical knowledge or practical skill.

The gradual development of a sophisticated form of musical notation in the West made possible the conceptualization and rational planning of large-scale musical works; only through notation could "composition," as a distinct form of activity entirely different and separate from performance practice, exist. As I have argued however, not all forms of notation (for example, instrument tablature) necessarily lead to the same levels of rationalization. It was only through the evolution of a complex social technology--in the form of an educational system, a trained and disciplined orchestral ensemble, and a legal system of rights and entitlements--that notation could come to play the role that it has in Western musical culture.

Notation, and the music publishing industry that came to be associated with it, dominated both art and popular music during the nineteenth and early twentieth centuries. With the advent of the technical means for the reproduction of sound however, a new relationship between technology, musical practice, and the capitalist oraganization of production began to evolve. Musical "sound," as the product of both the unique contribu-

tion of the performer and a technological process, became the focal point of this development. And it is to musical "sound," as a conceptual category, a concrete entity, and a commodity, that I would now like to turn.

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Chapter 8:

The New "Sound" of Music:

Technology and Changing Concepts of Music

> I've been getting into sounds lately... realizing that if something has an interesting enough sound, you don't have to play as much on the instrument. If you get a keyboard that has an interesting sound, you don't have to play a lot of notes on it. The sound takes over... They're part of the composition, even though I think a lot of people...might see it as being kind of superfluous to the essence of the music. But in this music I think it's really important.
> (Marcus Miller quoted in Milkowski 1987: 22)

The use of synthesizers and other digital musical instruments has had a profound impact on musicians and their conceptualization of musical practice. With the expansion of sonic resources available through new technologies, the musician is able to engage with the micro-phenomena of musical sound itself and such an engagement often forces a reassessment of the role of more traditional categories of musical practice: for example, a concentration on the selection of the "right" sounds for a given musical context can have the effect of shifting the musician's attention away from other, more familiar levels of musical form, such as melody, rhythm and harmony. In this sense, Marcus Miller's reflection on musical "sounds," quoted above, clearly constitutes a kind of "theoretical activity"--a kind of "tactical device" that draws "attention [his own and his listeners'] towards selected aspects of the music-making process" (Blum 1975: 217).

But implicit in Miller's statement is an attitude towards production and consumption that is quite different from traditional attitudes towards skill and the inherent sound capabilities of musical instruments; indeed, the contrast between Miller's statement and the atti-

tudes expressed in Sudnow's work quoted in the previous chapter could not be greater. In the past, one certainly might have purchased an instrument for its particular sound qualities but one's own approach to playing could be as important a factor in such a decision as the inherent quality of the instrument itself. One need only think of the various means through which musicians have coaxed new and unorthodox sounds from an instrument such as the electric guitar--the "bottle neck" slide technique, B.B. King's sustained vibrato and trill, George Benson's right hand finger-tapping (more akin to piano technique than conventional guitar playing), Jimi Hendrix' use of feedback, and other techniques--to realize that traditional instrument technologies can sometimes be considered as little more than a field of possibility in which the innovative musician chooses to operate. The particular "sound" produced in such instances is as intimately tied to personal style and technique as it is to the characteristics of the instrument's sound producing mechanism.

Ironically, despite the enormous variations in sound generation possible with modern programmable synthesizers, there is a sense in which many musicians have become increasingly concerned with whether the instruments they purchase already possess "an interesting sound" or, similarly, whether the instrument in question gives the owner access to a desirable range of easily obtainable sound programs:

> When I buy a sampler, I think in terms of libraries, rather than capabilities. I rely heavily on available sounds, and get variety by layering timbres, EQing them, and finally adding effects during mixdown. (Michael Josephs, TV composer, in *Keyboard* 15 (6), June 1989, 23)

Clearly, the emphasis here is on the acquisition and technical modification of pre-existing sounds rather than on their direct production through performance gesture and/or original

programming. Indeed, unlike other musicians, synthesizer players are rarely spoken of in terms of their playing technique at all.[1]

There are a variety of reasons for this apparent opposition between "sound" and performance skill, consumption and production; but what interests me most is precisely the manner in which a particular interest in musical sound has been represented and theorized, even by its advocates, in terms of such binary oppositions in the first place. Many of the controversies surrounding new musical technology can be traced to a long tradition of rigid dichotomies, such as instrumental sound vs. the "language" of music, and sound reproduction vs. "live" musical performance; attitudes towards new technology have become imbricated with these arguments in a fundamental way and, as a result, the place of synthesis within the larger history of musical and cultural change is often misunderstood.

In this chapter I would like to explore some of these oppositions as a means of understanding what, to many musicians, seems to be at stake in the adoption of new technologies. The conflicts that arise between musicians are the result of different value systems and different conventions and priorities that operate in different genres of music. The relationship of sound to various musical genres is important and, in this regard, it should be noted that in Miller's statement above, he does not speak of all music but of particular genres of music. Alan Durant has argued that many of the fears concerning new technology and the perceived loss of human input into music-making can be attributed to a clash of values surrounding different genres of music and their associated conventions (1984: 227).

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[1] One exception to this rule is keyboard player Jan Hammer who is highly regarded for his ability to imitate guitar sounds and playing styles on the synthesizer. Not surprisingly, this ability is based as much on Hammer's feel for guitar voicings, fingering conventions and pitch-bending techniques as it is on his knowledge of synthesizers (see *Keyboard* 11 (9), July 1985, 38-39)

One way of approaching the problem of sound and genre is to examine the speech of musicians and audiences themselves and the manner in which they portray their activities and their responses to musical sound. In musicians' language, in particular, one finds a wealth of concepts, slang and metaphor that describe the qualities of musical sounds and their importance in the musical texture. Through an examination of the characteristic words and phrases used by musicians who make use of new technologies, I hope to demonstrate how the concept of musical sound has become increasingly associated with the technology of sound recording as the dominant mode of production/reproduction in the late twentieth century.

But in addition to the linking of specific instruments and sounds with particular genres of music, I want to explore the contemporary idea of a unique and identifiable "sound" itself as a concept that has evolved since the rise of various media of electronic and mechanical reproduction: radio, television sound film and phonograph recording. In particular, I want to examine how "sound," as a conceptual category, has come to be regarded as separate from the "language" of music as represented in the notated score. At issue here is not simply music however, but a complex set of social and legal conflicts that seek to maintain a particular order of status and economic reward for those engaged in the production of music.

Instruments, Sound, and the Language of Music

As noted in Chapter 7, many cultures do not recognise a clear distinction between musical instruments, sounds and musical theory and this has often made it difficult for outside observers to understand native musical concepts and practices; the problem is further compounded in cultures where there exists little difference between playing music and dancing to it, or a clear division between spoken and sung speech. Some traditional

African languages, for example, do not even have a precise word for "music," as such: in East Africa, the word *ngoma* stands for "drum" but it also refers to the integration of music, dance and drama; where a generic term for "music" exists in Africa it has often been adapted from European languages (see Bebey 1975: 12, 119-124; and Wallis & Malm 1984: 31-32).

But in the West, the development of a science of physics and acoustics and, equally important, the development of a precise form of musical notation, have led to a series of distinctions which tend to separate, conceptually if not always practically, sound from music, and performance from composition. The work of John Cage and, in electro-acoustic music, that of Pierre Schaeffer and other composers of *musique concrète*, are part of the twentieth-century avant-garde's self-conscious response to the on-going musical dilemmas posed by such conceptual dichotomies.

In Chapter 7, I also argued that one of the legacies of the eighteenth and nineteenth centuries was the growing separation between the score, as musical text, and performance, as mere execution, on the one hand, and virtuosic display, on the other. The apparent division between composition, conceived of as an analytic activity, and performance, as an activity based in skill, expression and shock, has been one of the most enduring characteristics of Western musical culture. This complementary division of specialized musical activity also articulates a hierarchy of distinction: for despite the public enthusiasm for the virtuoso performer, it is always the score that constitutes the "immortal" and more valued artistic statement. Indeed, in the more extreme forms of this discursive polarity, the actual physical sound of music, as produced by musical instruments, is often considered to be little more than an unfortunate, though necessary medium for the presentation of the "pure" structure of the music manifest in the score.

This distinction in music has been rallied, time and again, by composers, from Beethoven to Charles Ives to Milton Babbitt, whenever their music has been declared (often by inadequate performers) as "unplayable":

> Some of the songs in this book, particularly among the later ones, cannot be sung, and if they could, perhaps might prefer, if they had a say, to remain as they are; that is, "in the leaf"...a song has a *few* rights, the same as other ordinary citizens...Should it not be free at times from the dominion of the thorax, the diaphragm, the ear, and other points of interest?...In short, must a song always be a song? (Ives 1961: 130-131)

Ives' passionate individualism was as much a mark of his alienation from the (largely conservative) musical culture of his time as a personal character trait. But what is striking in this passage is the degree to which "music" is taken to exist as an ideal, separate from any possible manifestation in sound. The (notated) song is anthropomorphized, given an existence and a will of its own, afforded "rights" and prerogatives (the appeal to a kind of democratic spirit should not be ignored). Certainly, in a culture that lacked musical notation, such a statement would be impossible.

But the problem goes beyond one of simple distrust between composers and performers; the fundamental opposition between formal structure and its expression in sound that is inherent in the representation of music through notation has become a basic tenet of Western musical aesthetics. Perhaps one of the most virulent demonstrations of this opposition can be found in Theodor Adorno's polemic against the music of Igor Stravinsky. Adorno argues that Stravinsky's exploitation of instrumental techniques in his compositions is motivated by nothing more than the desire for "effect" and that his heightened sensitivity to instrumental color overpowers his music resulting in a "fetishism of the means":

> The means in the most literal sense--namely the instrument--is hypostatized: it takes precedence over the music. The composition expresses only one fundamental concern: to find the sounds which will best suit its particular nature and result in the most overwhelming effect. There is no longer any interest in instrumental values per se which will...serve the clarification of continuity or the revelation of purely musical structures. ...the intensification of "effect" had always been associated with the progressive differentiation of musical means for the sake of expression...The goal of musical effects is no longer stimulation...in the emancipation from the meaning of the whole, the effects assume a physically material character... (Adorno 1973: 172-173)

Adorno's argument is clearly influenced by his desire to connect particular tendencies which he perceived within modernism (and manifest in the music of various composers from Wagner to Stravinsky) to his analysis of capitalism and the "culture industry": the adaptation of Marx's theory of commodity fetishism, and the concern for the manner in which the "progressive differentiation" of means and the pursuit of "effects" obscures musical (i.e., social) structure, are all consistent with his more general social critique. While I do not wish to debate the overall validity of Adorno's critique here, it seems appropriate in the present context to point out the entirely conventional (even conservative) nature of the musical assumptions upon which Adorno bases his broader analysis: it valorizes the unity of musical structure above all else (this is even more clearly the case in his analysis of the music of Schoenberg), and demands that all coloristic and expressive tendencies be sublimated to the force of compositional logic, to "purely musical structures."[2]

Curiously, the language with which Adorno describes the compositional tendencies (minus the social critique) in Stravinsky's music--the concern for choosing the right sounds

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[2] Adorno's comments concerning Schoenberg's experiments in orchestration are revealing: initially Schoenberg's music shows a tendency to explore instrumental timbre as an independent compositional element; once he adopts the twelve-tone system of composition however, timbre returns to its subordinate role of illuminating musical structure (1973: 87-89).

for a given context, the progressive differentiation of musical timbre, and the manner in which sounds come to assume an independent, physical and material character--could be equally applied to the more recent tendencies associated with digital synthesis and sampling in popular music during the 1980s. Indeed, among critics of the new technologies, the articulation of a basic opposition between the apparent fetishism of "sound" and the demands of compositional structure are virtually the same:

> a lot of the technology has made it so easy for facile writers and inconsequential writers to play with the sound, rather than write a great piece of music, that it's tended to water down a good deal of substance in composition. (singer/song-writer, Billy Joel in *Keyboard* 16 (1), January 1990, 54)

But while there are certainly still valid distinctions to be made between "songs" and their realization in sound, there is a sense in which, for much popular music, such distinctions have become increasingly difficult to make. Indeed, musicians today (and critics and audiences as well) often speak of having a unique and personal "sound" in the same manner in which another generation of musicians might have spoken of having developed a particular "style" of playing or composing. The term "sound" has taken on a peculiar material character that cannot be separated from either the "music" or, more importantly, from sound recording as the dominant medium of reproduction. With regards to the latter, the idea of a "sound" appears to be a particularly contemporary concept that could hardly have been maintained in an era that did not possess mechanical or electronic means of reproduction.

Indeed, such a concept could not have been viable, for example, during the period of Tin Pan Alley popular music (roughly 1890-1930) when sheet music dominated the production and consumption of popular songs. Even when songs were "plugged" on radio, they were seldom associated with particular artists to the same degree that they are today and, in any event, once purchased in the form of sheet music, the ultimate act of

consumption/reproduction lay, quite literally, in the hands of the consumer. Mike Hobart (1981) has argued that there existed four distinct forms of "capital" during the early part of the twentieth century--publishing, touring, broadcasting, and sound recording--each exerting its own pressures and priorities upon the character of music and its production and reproduction. It was not in the interest of the publisher, for example, to promote among performers a unique approach to sound or to foster the display of virtuosity and improvisational skill, for neither would be reproducible by amateur pianists in the home. The opposite was true, however, for the other media where the essential commodity was the star performer themselves. Hobart's historical observations and, at a more theoretical level, the recent analyses of sociologist Bernard Miège (1982, 1986) concerning the specificity of various forms of capital operating within the cultural industries and the potential conflicts between them, are an indication that the capitalist organization of culture is not as unified in its structure or purpose as Adorno would have us believe.

In the case of sound recording, the essential identity of the individual performer as manifest in sound was made clear almost from the outset: the first great star of the recording medium, Enrico Caruso, impressed himself upon the public as much by the force of his unique voice (as conveyed by the gramophone recording) as by the repertoire which he sang. During the '30s especially, radio and Hollywood sound film played even a larger role in establishing the equation between individual performers and their equally individual sounds as revealed by technology: Simon Frith has argued that during this period the rise of "crooning," as a distinct style of vocal production, was dependent upon microphones and electronic amplification (1986: 263). Furthermore, from at least the early-1930s onward, a preoccupation with sound quality itself became an important issue among record enthusiasts: Read & Welch (1976) have described how, with the advent of the microphone and electrical methods of recording during the mid-1920s, notions of "high fidelity" and

sonic "realism" slowly came into being; for the first time, it became apparent that the recording engineer had a powerful influence on the ways in which the public heard music.

By the 1950s, independent record companies began to make a mark on the industry not only in terms of the new styles of music that they promoted--e.g., rhythm and blues, and rock 'n' roll--but also in terms of their basic approach to the recording medium itself:

> Tommy [Dowd] did revolutionary things with how he would mike the bass and drums. Nobody used to mike drums in those days [the 1950s]...later on he started using multiple miking. We learned all the advantages of remixing and sweetening.
> ...Back in those days we had a thing called the Atlantic sound. I would describe our sound best as clean funk. We had a very strong bass line, a lot of bottom, a lot of bass drum. We had a very good midrange, and I always fought for treble in the remix. It's amazing how, to this day, people are careless about getting the top end in the proper perspective. (producer Jerry Wexler, quoted in Fox 1986: 146)

Thus, in arriving at what they considered to be "the proper perspective," engineers and producers also created a new aesthetic of "sound."

While it is difficult to locate the beginnings of a public awareness of this phenomenon with any degree of accuracy, it is clear that by the early-1960s, the notion of a "sound" had come a part of the vocabulary of popular culture. Phil Spector was perhaps the first pop producer to be recognised as having created his own unique sound--"Spector Sound," (also known in more general terms as the "wall of sound")--and a variety of recording studios and musical genres soon came to be identified as the promoters and/or possessors of a particular "sound": e.g., the "Nashville Sound" and, somewhat later, the "Motown Sound." The concept also appears to have gained some currency in Hollywood film of the same period: in *Two Weeks in Another Town* (1962) Edward G. Robinson admonishes his younger colleague, Kirk Douglas (both playing the role of film directors), to follow his lead, to dub his film in order to create the "Kreuger Sound"; here, a particular

approach to sound--achieved through the kinds of technical enhancement only available through post-dubbing--is juxtaposed with the "realism" of direct sound and comes to define the director's sense of personal style and integrity.

My emphasis here on the idea of a distinct and recognizable "sound" is important because the expression gives semantic weight to a change that was much more fundamental in nature. For ethnomusicologist John Blacking (1977), any true transformation in the mode of production in music must be recognised by musicians and listeners alike; the notion of a "sound" as an identifying feature by which musicians, record companies, critics and listeners categorize the music they make, promote and listen to is one indication that such a change was already well under way by the 1960s. But it should be made clear, especially with regards to this period in the development of sound technology, that the concept of "sound" is not simply a "technical" phenomenon in the limited sense of the term: technology must be understood, as mentioned in the previous chapter, as a complete "system" of production involving the organization of both social and technical means.

This perspective has been well illustrated by William Ivey (1982) in his discussion of the development of the "Nashville Sound" between 1957 and 1971 (the label itself appears to have gained widespread currency around 1963). Ivey describes the rise of the Nashville Sound, firstly, as a particular response to the pressures of the marketplace (the need to create a "permanent niche within the larger popular music spectrum of the United States") and as a specific outgrowth of the industry's drive to increase the availability of country music on commercial radio (Ibid.: 131-132). In technical and musicological terms, the Nashville Sound was the result of several factors: an emphasis on a unique instrumentation, consisting of small ensembles of primarily fretted stringed instruments; a distinctive approach to arrangements (often created on the spot) that allowed for a relatively sparse instrumental sound that was subordinate to the sound of the lead vocal; the use of a non-standard notation that allowed non-readers to draw on their skill and sense of musical

tradition in providing semi-improvised accompaniments; and an approach to recording that emphasized sonic clarity over the "wall of sound" techniques then prominent in popular music (Ibid: 133-137).

Ivey's analysis is interesting in terms of the attention given to the interlocking skills of sound engineers, producers, arrangers and, above all, a network of studio musicians,[3] within the overall commercial contexts of record production and radio airplay; the "music," as such, cannot be easily separated from these contexts and the attendent mode of studio production. But equally interesting is the fact that while Ivey places much emphasis on the role of these specialized, local networks of individuals, he later argues that the Nashville Sound quickly became so familiar and repetitive that, by 1975, "a performer could cut a record in Los Angeles, New York, or London and have it emerge in perfect emulation of the Nashville Sound" (Ibid.: 138).

The fact that one could record in the Nashville style (or any other style) just about anywhere in the world was a sign that by the mid-'70s, the recording studio apparatus had become a global phenomenon: both the technology and the social organization of the studio system had evolved to the point where the sound studio, as a mode of production, had become an important factor in the internationalization of musical sounds and styles. As local networks of session musicians became less of a determining factor in the constitution

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[3] In his analysis of the role of craftsmanship among studio musicians, Ivey draws directly on the work of Peterson and White (1979). Their work follows on many of the concerns laid out in the work of Howard Becker (1963, 1974, 1982) and, along with Faulkner's study of session musicians in the Hollywood film industry (1971) and Kealy's initial research on the role of sound engineers in rock (1974, 1979), constitutes a defining moment in the sociology of pop music production in American scholarship. Peterson (1982) describes this focus on occupational careers as one strain of thought among several that emerged, by the late-1970s, as a coherent approach which he refers to as the "production of culture perspective." Janet Wolff (1981: 31-32) has described some of the ideological, historical and contextual limitations inherent in this dominant school of American empirical sociology.

of musical "sound," star performers could choose to record wherever the technical or financial advantages seemed to be greatest.

In Canada, in part because of the establishment of broadcast quotas for Canadian content in 1970, studios began to acquire the latest and most complex equipment in order to meet the demand for new recordings. In addition, certain tax advantages helped to attract foreign recording artists to Canada, especially in the pop field. During this period, for example, André Perry's Le Studio, first located in Montréal and, after 1974, in Morin Heights, Québec, became one of the most sought after recording facilities in the world, producing approximately 75 gold or platinum hits by Canadian and international stars by the mid-1980s; in 1985-86, the studio's recording and post-production work generated some $2.8 million in total revenues (*The Montreal Gazette*, 2 August 1986, C1). Prior to this time, Québec would never have been considered as a production centre for styles of music destined for the international market.

Of course, the success of Le Studio was built not on country music but on mainstream pop and rock music, two genres of music that, during the 1960s and '70s, had perhaps become more fully integrated with the technology of sound reproduction than any prior style of music. Edward R. Kealy has argued that, except for the drums, most rock instruments were already electrified during this period and made use of electronic signal processing to one degree or another (even in live performance); as a result, it had become increasingly difficult to draw a dividing line between the musical instrument and the recording apparatus in rock music (1982: 106-107). And with the rise of sophisticated synthesizers, samplers and drum machines during the late-1970s and early- '80s, it could be argued that this trend towards the fusion of instrument and recording device had become complete:

> Electronic music making today is a main stream activity and few popular music recordings are made that do not use

> synthesis or sampling in some capacity. In fact this may well be the last issue [April 1988] in which it is possible to see any dividing line between electronic music and the recording process. (K. Spencer-Allen, "Editorial." *Studio Sound*, 30 (4), April 1988)

One of the reasons for this fusion of technologies is simply economic: it is much cheaper to use synthesizers and samplers in the studio, especially for certain types of production such as advertising and low-budget film scoring, than it is to hire even a small ensemble of players. As sampling techniques became more sophisticated and more convincing in their ability to replicate instrument sounds, it also became difficult to resist the economic imperatives of the music business. Certainly there has been, from the outset, much concern expressed over the loss of jobs among session musicians (for example, see Doerschuk 1983), but it should also be noted that much of the protest has often come from the ranks of orchestral string players and others who, as Faulkner's study of Hollywood musicians revealed during the 1960s, have traditionally been among the most alienated members of the pop/rock studio community (1971: 156-160; 190).

But another reason that has often been obscured by the concern over the plight of session musicians is the fact that, as producers in the music industry have become increasingly concerned with creating new and unique "sounds" with which to sell new artists and to define particular genres of music, the ability of digital instruments to both create new timbres and to reproduce older ones has made them an indispensable tool in the studio. In the age of electronic reproduction, with recordings and radio (and perhaps to a lesser extent, because of its emphasis on image, music television) disseminating and reinforcing "sound" as one of the identifying marks of musical style in contemporary music-making, individual "sounds" have come to carry the same commercial and aesthetic weight as the melody or the lyric in pop songs. Canadian singer-songwriter, Jane Siberry

> works with her keyboard player Anne Bourne in generating sounds she thinks will tweak the listener's mind. "We always try to get things that become hooks themselves...As soon as you hear that sound you think of that song. You have to use everything that way, creating hooks on every level. (*Music Technology* 2 (11), June 1988, p. 32)

Once associated with the song in this way however, the "sound hook" begins to exert a force of its own, virtually demanding that any "authentic" rendition of the song be performed with the same or an equivalent sound. It has long been recognised that the dominance of the recording medium in popular music culture has placed considerable pressure on performing musicians, in the case of local "cover" groups, to try and match the sound of hit songs in their live performances, or in the case of the original pop or rock act itself, to reproduce the sound of their own recordings while on tour (Bennett 1983, 1990). Digital technology has proven to be a powerful tool in this regard and even guitar-based rock groups have turned to synthesizers and samplers as a means of reproducing studio arrangements of their songs that could not otherwise be played live without a large number of backing musicians. When the Rolling Stones embarked on their "Steel Wheels" tour in 1989, they hired the services of two keyboard players, Matt Clifford and Chuck Leavell, to help with the task of preforming and reproducing the sound of songs they had recorded as much as 25 years earlier:

> Chuck is working mainly as part of the rhythm section, and I supply the melodic lines and the orchestration...
> I spend a large part of my time being a horn section...
> In terms of synthesis, what I'm doing is largely imitative. As far as sampling is concerned, I do a few acoustic guitar parts. For example, I play a 12-string guitar sound on 'One Hit to the Body'...I also supply the cello for 'Ruby Tuesday', and things like recorders and strings.
> I'm putting what was there on the recordings into the live performance, rather than adding outlandish electronic noises. People tend to forget the lovely arrangements, which are very much a part of the Stones sound, especially in the early days...and that's the sort of sound that I can put back in.

> (Matt Clifford, quoted in *Music Technology* 4 (6), February 1990, pp. 40-41)

The grammatical anomaly present in this last statement (that these sounds from the "early days," "*are* very much a part of the Stones sound") is perhaps significant: once established, it is difficult for even the originators of a given "sound" to change it; the nostalgia for "Golden Oldies" in pop culture demands "authentic" reproduction (I will return to this point later). The search for authenticity can reach absurd proportions: Clifford describes in detail how, for one song, he recreated the sound of a Mellotron (a keyboard instrument introduced in the 1960s that used pre-recorded sounds on loops of magnetic tape much like a sampler uses digital recordings today); the process became what I would call a form of "second-order simulation," where a digital device was called upon to simulate the sound of an analog device reproducing the sound of an acoutic instrument.

However, perhaps nowhere has the link between "sound" and musical genre been so intensely formed as in Rap and various forms of dance music during the 1980s. In the high-fashion world of the dance club, dance styles, fashion statements, musical genres and sub-genres abound; and new sounds and rhythms (often created with little more than a sampler and a drum machine) have come to play a large role in defining the unique sound of each new genre or sub-genre before it exceeds its brief half-life in the seasonal upheavals that seem to characterize the highly volatile club scene. For example, one particular drum machine, Roland's TR-808 (released in 1980), has been singled out for its contribution to the sound and style of Rap music as it moved from its early stages as street and club music, during the 1970s, to mainstream prominence, in the '80s:

> drum machines--the easiest and cheapest source of drum sounds--were the seminal rap axe. By general consensus, the Roland TR-808 was the instrument of choice, mainly because of its bass drum. "The 808 is great because of the bass drum," Kurtis Blow reports. "You can detune it and get this low-frequency hum. It's a car speaker destroyer.

> That's what we try to do as rap producers--break car speakers and house speakers and boom boxes. And the 808 does it. It's African music!" (*Keyboard* 14 (11), November 1988, p. 34)

The continued popularity of the 808 bass sound led Roland, when it developed a new line of drum machines in the late 1980s (the R8 Human Rhythm Composer and the Boss Dr. Rhythm DR-550, among others), to make available a set of digital samples of the original 808 sounds--another instance of "second-order simulation"--as part of the newer instruments' sound data (some Rap producers claim that they appreciate having access to these sounds but complain that the samples are "too clean"; Rap aesthetics demand that they work at making them "dirty" like the 808 originals). The digital "repackaging" of musical style goes even further however: Roland, and other companies such as Casio, have included the sound of turntable "scratching" in their drum machines and synthesizers in order to facilitate the imitation of a Rap "sound" without recourse to its specific techniques or content.[4]

But quite apart from the sound capabilities of drum machines such as the TR-808, the characteristics of the instrument's operating system also appears to have had a direct influence on the musical style of Rap during this period: Tom Silverman of Tommy Boy Records has stated that

> The 808 forced you to program in a hiphop style...You couldn't program in real time...you had to drop the beats into a certain framework. Everything sounded ultra-

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[4] At the consumer end of the market spectrum, Radio Shack, riding on the popularity of Rap acts among pre-teens in the late '80s, introduced a small, portable children's keyboard called, "Rap-Master," that included preset rhythm patterns, an electronic "scratch platter," a built in microphone and sound effects processor for $129.95. Not only Rap "sounds" but all of Rap style and fashion were similarly packaged: for an additional $19.95, one could obtain a Rap "lyric book," instructional cassette, and a pair of sunglasses.

> mechanical. That's partly how the hiphop sound originated (Ibid.).[5]

In the previous chapter it was suggested that musical style can be influenced by both the characteristics of musical instruments as well as the particular ways in which they are played in the context of any given genre of music. But because of a combination of factors--the novelty and unfamiliar nature of digital technology, the inherent limitations of the technology at various stages of its development during the 1970s and '80s (e.g., later drum machine designs did allow for "real time" programming), and the relative lack of musical training among some users--there is a sense in which digital musical instruments themselves have had a more determining influence on sound-making activity throughout the 1980s than they might have otherwise had.

Beyond these factors however, there is a sense in which the vast array of sounds produced by these instruments has also had a more general and subtle influence on pop musicians and their approach to music-making. Part of the reason for this is the unique, pre-formed character of the sounds themselves:

> Sounds really make you play a certain way. If you have a little, dry, ticky-type sound, you might not take the soaring solo that you would with a different sound...I really think that sounds inspire you. (Keyboard player Starr Parodi, quoted in *Music Technology* 4 (6), February 1990, p. 66)

There is a striking difference in approach between Sudnow's account of "aiming" for particular sounds (as discussed in the previous chapter) and that of <u>responding</u> to them in the manner suggested here by Parodi--Parodi's comment seems to support Marcus Miller's view (already quoted above) that "If you get a keyboard that has an interesting sound, you

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[5] Similar observations have been made concerning the influence of early sequencers on the rigid, mechanical aesthetic associated with much electro-pop and new wave music during the late 1970s.

don't have to play a lot of notes on it. The sound takes over." Sudnow's practice suggests a form of subjective, internal listening that precedes and guides the act of sound-making whereas this more recent form of practice suggests the opposite: an external form of listening where the objective character of the pre-existing sound strongly influences the manner in which it should be played.

The subtle impact of this influence has been felt by many musicians and, in some cases they feel that they have to work against it in order to get back to some other "essence" of music. Composer/performance artist Laurie Anderson, for example, claims that when she writes music she usually calls up a standard piano "patch" on her synthesizers rather than allow "sounds" to distract her:

> I just don't want to be too distracted by color. When I decided to write the songs on *Strange Angels*, I thought, "Well, if I just sit down at a piano and play them and sing them, then they'll work." I decided to take that approach rather than immediately getting distracted--"Oh, I have this great Akai sample that I just have to use, and even though it doesn't have too much to do with what I think the tempo of the song is, we'll, uh, work around that."
>
> Writing with piano sounds makes me pay closer attention to the real structure of the song. It strips the song down to the most plain kind of version. (quoted in *Keyboard* 15 (12), December 1989, p. 78)

The idea that piano sounds themselves are somehow "neutral" is curious: ethnomusicologist John Blacking has argued that the physical experience of playing an instrument (and not just the sounds that it produces) can have a strong influence on the character and conceptualization of music, and that we can gain different kinds of insight into musical structures when we know that, say, Hector Berlioz composed at the guitar and Beethoven at the piano (1973: 12-21, 109-112). The apparent neutrality of the piano sound is perhaps the result of, on the one hand, its long-standing cultural heritage, its basic familiarity and

acceptance as a tool of composition and, on the other, the physical/structural "fit" between bodily gesture and the resulting sound.

The more or less direct relationship between physical gesture and sound that is characteristic of most traditional musical instruments is completely severed with electronic devices: for example, despite its conventional appearance, the keyboard of a synthesizer or sampler is an "interface," little more than an elaborate switching device; thus, the relationship between gesture and resulting sound (i.e., the manner and the degree to which a sound responds to the body through touch, breath, etc.) becomes entirely arbitrary, something to be rationally planned as part of the overall characteristics of the sound program. To a certain extent, the technical separation of the physical interface from the sound producing mechanism in electronic instruments may account, in part, for the apparent autonomy and uncommon power that "sounds" have in determining how one plays them.

But this relationship between the "sounds" produced by new technology and the sources of musical "inspiration" has become even more pervasive and extends beyond the use of prefabricated sounds in drum machines, synthesizers and samplers. Even the complex special effects (e.g., multiple delays, phasing, gating, and the like) available in digital signal processors and applied to virtually any acoustic sound that can be recorded, have been cited as offering new ideas to musicians who regularly use these technologies in musical production: "just listening to one of these effects immediately gives you compositional ideas...you only conceive of it because they occur and you notice them" (film composer William Goldstein, quoted in Karlin & Wright 1990: 411). Again, the prior existence of the sound is a key factor: these effects are "discovered," almost as if by accident, as much as created by the individual user. Thus, decisions made by engineering teams at the early design stages of a processing device can have a profound impact not only on the user's ability to make use of the device but also on their musical/compositional practices and concepts.

It seems to me that this general phenomenon has had a significant influence on the character of popular music production since the 1980s: in effect, musical production has become closely allied to a form of consumer practice, where the process of selecting the "right" pre-fabricated sounds and effects for a given musical context has become as important as "making" music in the first place. In this way, musicians have not simply become consumers of new technologies but their entire approach to music-making has been transformed into one where consumption--the exercise of taste and choice--has become implicated in their musical practices at the most fundamental level.

And it is here that the market context of digital instrument manufacture, including the "software" side of the industry, can be seen to have a direct influence on musical practice. As noted earlier in the dissertation, the past decade has been witness to the growth of so-called "sound libraries" for digital synthesizers, samplers and drum machines: each instrument comes with a collection (often numbering in the hundreds) of relatively standard instrument sounds--pianos, basses, saxophones, drums, brass and strings--in its memory banks; on most models, additional sounds can be obtained on cartridges, cards, diskettes or CD-ROMS and added to this basic repertoire. The sounds are usually tailored for specific styles of music and, as discussed in Chapter 4, a small cottage industry has developed in order to maintain a steady supply of new sounds to keep up with changing tastes and musical styles.

In many ways, high-tech music production has become not only a practice where musicians are increasingly engaged in choosing the right sounds for a given musical context but also one where layering and combining several pre-fabricated (or pre-recorded) sounds becomes one of the most direct means of achieving new instrumental effects. Thus, as in other areas of consumer culture, more is always better and musicians' magazines in the '80s were filled with descriptions of recording sessions where, for

example, a Rap artist might layer several sounds from different drum machines or from sampled records in order to create a single instrumental part:

> Drum programming in rap is incredibly complex. These kids will have six tracks of drum programs, all at the same time. This is where sampling gets kind of crazy. You may get a kid who puts a kick from one record on one track, a kick from another record on another track, a Linn kick on a third track, and a TR-808 kick on a fourth--all to make one kick! (Bill Stephney, Def Jam records, quoted in *Keyboard* 14 (11), November 1988, p. 36)

Such practices are based on the assumption of a virtually unlimited access to sound material and, along with the standard repertoire of Western orchestral and pop sounds, it has also become commonplace for digital instruments to include a set of musical instrument and percussion sounds from different parts of the world (often simply labeled generically as "Ethnic" sounds).[6] The ubiquitous sound of the Shakuhachi (a Japanese bamboo flute) in television advertising, films and popular music during the 1980s is an example of the shifting musical contexts in which sampled instrument sounds can be found; and it goes without saying that few of these contexts or the manner in which the sounds are played has anything to do with the cultural context or the musical stylistic traits appropriate to the instruments. During the early 1990s, following on the international popularity of "World Music," the American company E-mu released an addition to their Proteus series of sample playback modules subtitled, "World," containing the sounds of close to 200 different traditional instruments from around the world: including an Australian Aboriginal didjeridu, Indonesian Gamelan, and the like. New technology has thus become an important factor in the internationalization of musical sound and what Wallis and Malm have referred to as

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[6] It is ironic that while the dominant manufacturers of synthesizers are Japanese, the standard repertoire of sound programs are of Western origin; with few exceptions, instruments associated with Oriental cultures are labeled as "ethnic" in drum machine, synthesizer and sampler libraries.

"transculturation" (1984: 269-311). Contemporary music-making demands that any instrument sound be as available as any other; technological reproduction guarantees that availability and, in so doing, contributes to the increasing commodification of culture.

Of course, digital musical instruments, especially samplers, not only make use of instrument sounds but <u>any</u> sound that can be recorded (even drum machines often include a number of sound effects--breaking glass, gun shots, screeching tires--as part of their memory banks). In this sense, the commodification of sound is perhaps the logical extension of the modernist desire to make use of all possible sound phenomena in musical composition. First expressed by the Italian Futurist, Luigi Russolo, and then taken up later by Edgard Varèse and the *musique concrète* school of composition in France of the 1950s, the desire to control and regulate natural sounds for musical purposes was an almost literal expression of the scientific philosophy of "domination of nature" and of the subjection of the entire natural world to the order of production which is characteristic of modern instrumental reason (see Leiss 1972; Théberge 1987).

In some ways, popular uses of samplers today exhibit a certain continuity with these modernist ideals and may be an example of the absorption of modernism into popular culture that has been cited by many as a characteristic of the postmodern era. Certainly, since the early 1980s, groups like the The Art of Noise (who took their name from the title of Russolo's manifesto of 1913) have taken up modernist techniques and processed them through a pop aesthetic; their music has even been described as something approaching *musique concrète* with a beat. But a major component of the modernist aesthetic of *musique concrète* composers, such as Pierre Schaeffer, was the manipulation of natural sound in order to render it abstract: Schaeffer's notion of the *objet sonore* is a conceptual, technical and quasi-scientific programme for the objectification of sound materials in order to render them more useful as abstract elements of art.

Much pop music, on the other hand, has tended to retain the sense of identity that sounds carry with them--their ability to act as a kind of referent for the object which is the source of the sound–thus leading to an aesthetic fundamentally based in collage and ironic juxtaposition. Furthermore, the tendency in pop to draw its sound materials from other media texts represents a predilection for that which is already cultural over that which is natural.

In this regard, recent technologies not only change our relationship to the world but also to the past, to our sense of social and cultural history. During the 1980s, many pop musicians (especially in dance genres such as Hip-hop) made use of samplers to collage together bits and pieces of rock, soul and funk records from the 1960s and '70s. Some of the samples were recognizable, others not: samples of single drum sounds that could then be programmed into new rhythmic patterns or entire segments of a rhythmic groove (the "beats" or "breaks"), electric basses, guitars or James Brown's vocal pyrotechnics. Pop acts like M/A/R/R/S, Bomb The Bass, and others leaned towards the recognizable, adding snatches of cartoon music, radio broadcasts, classical music recordings and the like; and Canadian John Oswald's "Plunderphonics" recordings made use of entire pop songs (referring to them as "macrosamples") and subjected them to various treatments and manipulations--here again, mass recognition of the quoted material was essential. Strangely, the most technically innovative forms of pop music in the 1980s had become obsessed with self-referentiality, with the reproduction of pop culture's past (Goodwin 1988).

These practices have been regarded variously by a number of commentators as a form of paying tribute (Hebdige 1987) or a form of irony (Goodwin 1988). But in the case of some Hip-hop I think it can be argued that there is also a kind of ritual transferral of power (which is not fetishistic in any way but quite positive in character) where one takes technical control of sounds which themselves have, in the past, exerted a certain powerful

effect on the individual. Again, these practices are not confined to musical materials alone: Hip-hoppers and Rappers have sampled recordings of the voices of past Black leaders, such as Martin Luther King and Malcom X, and mixed them in with their rhythmic "grooves." By attempting in this way to make a connection with a past from which they have been physically, and most often violently severed, Rappers use sampling as a form of political practice and empowerment.

What is essential about all these practices however is that, firstly, they operate entirely within the realm of electronic reproducibility (these are not "cover" versions of a song but uses of the actual recordings themselves); and secondly, they reflect a particular type of memory and subectivity--a form of "technological imagination" (Huyssen 1986: 9-10) that is the result of the experience of technology and everyday life within the matrix of mass media and consumer culture. In this sense, sampling practices need to be understood within the broader context of dominant modes of music consumption within a mass media context.

In this regard, Jonathan Crane (1986) has singled out Top 40 radio for its particular, "post-modern" configuration of media texts: through constant repetition, Top 40 radio ensures that our listening experience takes place in a state of constant recontextualization, fostering a sense of "interpretive instability," multiple readings, and an endless awareness of the present (listening to tapes on a "Walkman" can have similar effects). Crane argues that despite the media rhetoric of "Golden Oldies," the airing of past hits ultimately makes us even more aware of our affective place in the present: even recent covers of old pop hits do not place us in the past, but rather, "They operate by pretending to mimic older material while technologically recontextualizing the past in the present" (Ibid.: 68).

Sampling from old records and media texts, Top 40 radio formats, covers, and even industry profit strategies that led to CD-reissues of old recordings (classical, jazz and pop) during the '80s, are all different facets of an overall sonic environment that empha-

sizes the present while giving an unprecedented access to the music of the past. The obsessive concentration on the present has been cited by Jameson (1984) as the hallmark of a schizophrenic subjectivity--a form of subjectivity which he, and others such as Crane and Harvey, take to be emblemmatic of the postmodern experience.

While I do not agree that one need necessarily be drawn to this particular conclusion regarding contemporary subjectivity, it is clear that technology has had a powerful influence on both popular musicians and the listener. With sampling in its most extreme forms, the pop song becomes akin to a "container" within which a large number of references to other music and sounds of the past and present are made: the musical "work" opens up, loses its autonomy and its "aura" (its distance, its unapproachability, its uniqeness; Benjamin 1969) completely and becomes, in a sense, invaded by the music of the past and present and the sounds of everyday life. When confronted with such a work, the listener is immediately struck by a number of radical shifts: the feeling of a fluctuating, multiple temporality; a difference in the perceived relationship between past and present; the nature of one's own subject position as a listener; and the apparent dispersal of the unified subject, or persona, of the composer/songwriter embodied in the work itself (on the notion of the composer's persona in music, see Cone 1974). The artistic practices of collage, assemblage and montage, used here in popular music in such a way as to virtually destroy the organic integrity of "the work" (i.e., the "song"), are not unlike the strategies of various avantgarde movements described by Andreas Huyssen (1986: 9-15; Huyssen makes a clear distinction between the avantgarde and modernism as such, especially as regards their relationship to technology and popular culture). These practices bear the mark of a "technological imagination": they are the result of the transformation of everyday life by the technologies of mass production and reproduction.

To the extent that digital musical instruments and recording devices are no longer *separate* technologies--indeed, for all intents and purposes a sampler <u>is</u> a recording device

(Oswald 1986)[7]--sound reproduction has become a central element of musical practice. This fact, among others cited above, has changed the most fundamental relationships of popular musicians to the sounds they make, and to the way in which they listen to, experience, and interact with the world around them.

This meta-level of musical, technical and cultural analysis however, can be given greater specificity if one examines, in greater detail, the musical concepts employed by musicians in their day-to-day activities in the sound studio. Indeed, further evidence of the fusion of musical practice with electronic technologies of production/reproduction can be found in the language musicians characteristically use to describe the sounds they make. There has always been a great variety of specialized terms and slang associated with popular music but what often goes unrecognised is the degree to which they function as meaningful "style statements":

> Linguistic shorthands like the terms "groove," "sound," or "beat," significantly code an unspecifiable but ordered sense of something...that is sustained in a distinctive, regular and attractive way, working to draw a listener in. Terms like these say that the perception of style is empirically real, but that it is also necessarily general, vague, and physical. (Feld 1988: 76)

As Feld suggests, speech about music is always metaphoric and somewhat vague in nature but what I want to argue here is that it can also be quite precise and systematic.

In fact, musicians and studio engineers have developed a virtual "theory" of sound through the deployment of a series of metaphoric expressions and binary oppositions that first, define their experience of sound in meaningful ways and, second, help to organize

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[7] The more advanced samplers introduced at the end of the 1980s, such as the Akai S1100, could even function as the "front end" of a full digital recording system. The ability of an instrument to function in this way had been a feature of "high-end" systems such as the Synclavier for a number of years; in the case of the average professional and semi-professional sampler however, the limitations of the technology did not allow for such flexibility until the late 1980s and early '90s.

their sound-making activities. For example, studio devices such as dynamic expanders are commonly referred to as "gates": the term offers a precise visual metaphor for the opening and closing of the signal path. Similarly, loud, aggressive drum sounds are often referred to as "rude" (the term is also specifically coded to refer to particular genres of music); an instrument sound or a music mix that puts great emphasis on the low-frequency, bass register is "heavy"; and a synthesizer "pad" is a sustained type of sound (a string, brass, or even a piano sound) often used for soft, background accompaniments, the original attack portion of the sound is slowed down (i.e., "softened") and its natural sustain is "looped" and/or "chorused" so as to artificially expand the durational and spatial characteristics of the sound (the "chorusing" technique will be described in greater detail below).

But perhaps more significant in this regard is the vast array of paired terms, such as fat/thin, warm/cold, wet/dry, clean/dirty, organic/processed, that are used to describe fundamental aesthetic values through which sounds in a given context are assessed and, ultimately, judged to be acceptable or not (other oppositions of this type will be taken up in the following chapter). Significantly, the majority of these metaphors are physical in character, linking the experience of musical sound directly to bodily sensations. Furthermore, there is often a curious reversal of the conventional social expectations concerning the value relationships attributed to any given pair of terms: for example, a "fat" synthesizer sound is considerably more desirably than a "thin" one; and while sound engineers typically prefer "clean" recordings to "dirty" ones, rock guitarists often go to great lengths to "dirty-up" their sounds (i.e., find ways create large amounts of mid-range distortion). Sociologically, such reversals of conventional meaning could be regarded as one way in which pop musicians affirm (if only to themselves) their position as "outsiders" to mainstream culture (in a similar vein, see Hebdige's account of the word "punk"; 1979: 112, 162-3n).

But what interests me here, firstly, is the manner in which these terms articulate certain value positions vis-à-vis music itself, not only among musicians but also within popular culture at large. As Andrew Goodwin (1988: 41-42) has demonstrated, some of these distinctions can be quite complex and subject to change and revision over time. Goodwin discusses how the warm/cold distinction was mobilized during the 1980s as a value statement about analog (warm and human sounding) vs. digital (cold and inhuman) sounds (the distinction applied equally to recordings, LPs vs. CDs, and to synthesizers). But what Goodwin finds curious in this situation is the fact that during the 1970s analog synthesizers had originally been labeled as "cold" and "inhuman" by rock musicians and fans of the day; by the 1980s however, a new generation of musicians and listeners had come to regard analog synthesizers as the very sign of human "feel" and "authentic" expression (Ibid.). Indeed, I would argue that such attitudes have undergone a further, even more subtle change in recent years: while the warm/cold distinction still operates, the gradual acceptance of digital synthesizers during the past decade has resulted in an appreciation for their increasing ability to mimic the "warmth" of analog instruments while, at the same time, offering the clarity of digital textures; in this context, the term "icy" has actually taken on positive connotations when used to describe a certain type of sound quality only available on digital instruments.

Secondly, following the research model of ethnomusicology advocated by Merriam (and discussed briefly in the previous chapter), it is important to observe how musical sound, concept and behaviour are linked in significant ways in musical practice. In this regard, it is interesting to look closely at how differential metaphors such as warm/cold or fat/thin, influence the activities of musicians engaged in the production of music. The search for a "fat" sound, for example, has long been a preoccupation among popular musicians who make use of synthesizers. The origins and precise meanings of the term are obscure but it appears to have been a part of the musicians' and engineers' vocabulary at

least since the mid-1970s (if not earlier) when synthesizers came into widespread use in popular music; because of its popular origins and its slang character, it is not a generally accepted term (or even necessarily a sonic goal) among most university-based composers of electronic music.

In pop music, the term is most closely associated with the desire to create a sound which has the acoustic complexity and richness of a large ensemble playing together:

> Most groups can't get (or can't afford to get) enough performers to get a really "fat" sound, and this means that they have to rely on a synthesizer player to fill in a wide variety of sounds, that otherwise would not be possible. (Marty Golden, Canadian instrument distributor, quoted in *Music Market Canada* 1 (9), October 1977, p. 8)

But while this commentator implies that the term "fat" may describe an attempt to create the effect of a diverse range of instruments, it is most often employed in a more precise fashion to describe the sound of several instruments of the same type playing together: for example, as with a string or brass section of a symphony orchestra (or a choir of voices). When several instruments play together in unison, tiny discrepencies in timing, loudness and intonation on the part of the players and, to a lesser extent, differences in the arrival time of the sounds at the listener's ears, create an acoustic effect that is subtle yet vibrant and seems to account, in large part, for the unique impression that ensemble playing has upon the listener.

An attempt on the part of sound engineers to give more fullness to the sound of a single voice or instrument led, by the late-1960s, to the development of various types of delay units which could duplicate a sound at an interval of a few milliseconds; when mixed with the original sound, the delayed signals gave the impression of multiple parts playing in unison. While this "doubling" effect (which can be described as a "spreading out" of the sound in the temporal domain) could be useful in certain recording situations, it was too

simple and regular to give the impression of a true ensemble. Gradually, a more sophisticated device, known as a "chorus," was developed; the name describes the intended effect but the device is used on a wide range of instruments--guitars, electric pianos, string synthesizers, etc.--not just voices. In a "chorus" device, various controls are added which allow the delay times to be modulated and/or fed back into the unit in a regular or random fashion to create a more complex sound; in some chorus units, the amplitude (loudness) and/or the pitch of the signal can also be modulated in the same way. Later, stereo chorus devices were developed that added a spatial, left-right "spread" to the delayed sounds enhancing the overall effect even more.

A "fat" sound then can be defined as a sound that is the result of this "spreading out" or expansion of the audio signal in one or more domains: temporal, spatial, amplitude and/or frequency. Thus, as electronic technology has become increasingly integrated with popular music production, there appears to have been an evolving, dialectical relationship between the concepts of musical sound and the various possibilities offered by the technology. Furthermore, the transformation of these musical concepts or statements of aesthetic value into material form (i.e., sound) has become entirely dependent upon electronic technology and on sound reproduction as the primary medium and context of music-making and this has had an impact on both the behaviour of musicians and on the development of new technologies as well.

In the case of synthesizers, for example, it has been suggested by a number of observers that a predilection for "fat" sounds may have come about as the result of the limitations of early synthesizer technology rather than its more "positive" attributes (e.g., see Kaplan 1989: 612-614). As mentioned in Chapter 3, analog oscillators had an inherent tendency to drift out of tune and musicians soon discovered that the combined sound of two or more slightly out of tune oscillators actually had a fullness and an animated quality (caused by a slight beating effect resulting from the pitch discrepencies) that was more

interesting than the sound of a single oscillator. Musicians began to develop a practice where they would purposefully detune the oscillators on their synthesizers as a means of enhancing this effect and thereby "fattening up" the sound.

Initially, the greater stability of digital oscillators appeared to be a positive advancement over analog designs but it was soon found that they did not meet the sonic expectations of musicians: digital synthesizers, for a variety of reasons, sounded "thin" to the ears of analog synthesizer enthusiasts. Keyboard manufacturers subsequently developed a variety of techniques to add calculated, "random" fluctuations to the output of the oscillators and to give musicians more precise control over oscillator (de)tuning (Ibid.: 613). Ironically, the ultimate test of the new digital technology was not simply whether it offered substantial improvements over older designs, but whether it could successfully imitate the technical inadequacies (and the "sound") of the previous technology. For musicians, a practice that had once been spontaneous and intuitive, involving little more than the twist of a knob while playing, now became the object of rational calculation: the precise detuning of the oscillators (usually calculated in "cents"--hundreths of a semi-tone--on most digital synthesizers) had to be determined in advance, programmed, and stored as part of the synthesizer sound "patch."

Equally important, the "chorus-like" effect produced in this manner is no longer conceived as a separate operation applied to a sound but rather, the effect becomes an inherent characteristic of the sound itself. This tendency has become increasingly prevalent in the design and use of synthesizers throughout the 1980s: "effects" such as delays, flangers, reverbs, and the like, have come to be thought of as inherent properties of a sound (and this is as true for guitar players, who process their guitar sounds through an array of footpedals and special effects devices, as it is for synthesizer players) and virtually all contemporary keyboards now contain sophisticated digital effects units built directly into the instrument. With samplers (and sample-based instruments such as drum machines)

there has also been a trend towards recording effects or natural acoustic ambience as part of the basic sampled sound; here again, the character of the sampler as a recording/reproduction device allows for this option where conventional synthesizers do not:

> I couldn't imagine that any kind of synthetic reproduction would be able to give you the type of nuance that you get out of a sample...You see, with samples, not only are you getting the sound of the instrument, you're getting the ability to capture the instrument in different types of air spaces. For example, we have both dry and ambient room sound percussion noises, and dry and ambient wind. Even with the classical guitar, different types of environments make a big difference. (musician Frank Zappa, quoted in *Keyboard* 13 (2), February 1987, p. 61)

The multitude of variables associated with recording or sampling acoustic sounds, programming synthesizers and drum machines, and taking special effects into consideration as part of the basic characteristics of a sound, has led to an increasing complexity in the programming structure of digital musical instruments requiring, on the part of the user, a substantial amount of technical and theoretical knowledge that is quite different from the types of knowledge associated with conventional musical language and performance practice. This can be illustrated through a consideration of the synthesizer "patch" diagram itself as an indicator of increasing abstraction in the design and use of synthesizers.

The term "patch" is derived from the old system of modular, analog synthesizers of the 1960s and '70s, where individual oscillators, envelope generators and other devices were "patched" together with an audio cable in such a way as to create a particular flow of audio and control signals; the configuration of this flow and the settings on the individual devices created the sound that the musician was after. While it certainly helped to have a good knowledge of the theory of sound synthesis, many musicians and engineers were able to learn how to program analog synthesizers, at least at a basic, practical level, through

an intuitive process aided by the similarity between the design of synthesizers and other, more familiar audio components.

Because the early synthesizers had no microprocessors or RAM where these configurations could be stored, "patch diagrams" were developed as a means of recording and remembering specific patches. The patch diagram was not unlike a form of tablature (discussed briefly in Chapter 8): the diagram was little more than a template of the physical layout of the synthesizer's front panel, its knobs, settings, and connections via the patch cords. In the same way that a guitarist can read tablature without having a thorough knowledge of music theory, simply by following the tablature like a road map to the finger board of the guitar, any individual could reconstruct a synthesizer patch simply by following the diagram; no theoretical knowledge of synthesis or even the functioning of the specific devices themselves was required.

With digital synthesizers and samplers however, the various devices and functions of synthesis are merely <u>represented</u> in computer hardware and software; the musician has no direct access to the various "modules" at all. Much like the organ-like keyboard itself, the front panel of a digital synthesizer is an "interface" that acts as a new kind of mediation between the user and the object. As Dick Hebdige has noted in regards to the transition from the motorcycle to the motorscooter: "The 'sheathing' of machine parts placed the user in a new relationship to the object--one which was more remote and less 'physical'" (1981: 51). But while Hebdige argues that this led, in the case of the motor scooter to a relationship of "ease" with regards to the mechanical nature of the machine; in the case of the synthesizer, it has led to one based on near-total abstraction.

Because microprocessors can only deal effectively with numbers (i.e., quantified data), a typical "patch chart" for a digital synthesizer or sampler consists of little more than a large table of numbers which, again, <u>represent</u> various synthesizer parameters and states. To interpret these tables one requires a much greater knowledge of both the internal

architecture of the synthesizer in question and a more general understanding of the theory of the synthesis model that it employs. This knowledge is by its very nature, more abstract, formal, and quasi-mathematical than the "practical logics" (Bourdieu 1990)--visual, aural, tactile--formerly associated with analog synthesis and music-making more generally.

The level of complexity and abstraction inherent in this new relationship between the musician and their chosen instruments of musical production is generally accepted to be one of the reasons for the rise of an industry dedicated to the marketing of pre-fabricated sound programs created by specialists[8] and sound editing software for computers (software which at least gives the musician a graphic, visual representation of the data required in sound programming). But here again, this situation merely reinforces the position of the musician as a "consumer" of new technologies. As Peter Lyman has pointed out in his discussion of computer word processing:

> A computer is both a machine and a social relation. Computer "hardware" can only be used with computer "software," and software is essentially a technical culture which defines the practical techniques necessary to operate the machine, as well as an implicit theory of knowledge (information theory or cybernetics) and implicit social relationships as well (the consumer as "user," the computer as provider, and others). One must be an expert to consume the hardware without the software; few experts could do so. (1984: 76-77)

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[8] It is interesting to note that the problem of specifying sounds through an abstract process of defining "functions" in numerical form has plagued computer synthesis from the outset. Even among university researchers who attempted to use early computer synthesis programs, such as those developed by Max Mathews at Bell Labs, there was a need to have at hand a relatively predictable set of known sounds with which to compose. For this purpose, "instrument catalogs" were developed for the MUSIC 5 program (see Truax 1976). These sound archives could be thought of as precursors to the commercial sound "libraries" common today. And not unlike the case of pop musicians who state that sounds can sometimes influence how they play music, there has been some concern that the instrument catalogs of MUSIC 5 could potentially influence the compositional logics of those who used the program (Ibid.).

Conclusion

Ever since the development of notation in Western art music, musical sound has become a problematic entity, a necessary though sometimes unwanted distraction from the beauty of the perfect order embodied in the musical score. In popular music, the ultimate reproducibility of sound through synthesis and sampling has likewise come to be regarded as problematic, again with regards to the structure of music, but also, in relation to the values of musical performance.

Such dichotomies are misleading, however, because the reproduction of sound has actually made it a more vital component in the recognition of musical genres; indeed, in the age of electronic reproduction, the achievement of a unique "sound" has become one of the means through which new musical genres are created in the first place. This has been true in the recording studio and, especially so, since the rise of digital musical instruments. Digital instruments have become the means for both the production of new sounds and for the reproduction of old ones--the perfect vehicle for a music industry based simultaneously in fashion and nostalgia. And as I have argued in this chapter, as musicians have developed an aesthetics of "sound," a set of techniques and a vocabulary to describe them appears to have evolved as well (interestingly, even musicians who reject digital technology use the same vocabulary of fat and thin, warm and cold, that betrays their preoccupation with technologically reproduced sound; for example, see Jackson 1992: 28).

But what is most important for the purposes of the thesis at hand, is the manner in which musicians have come to rely on outside sources for the sounds that they use in musical production. On the one hand, this is related to the difficulty in acquiring the knowledge and skills required to program new sounds and, on the other, by an aesthetic that demands that all sounds (domestic and foreign, musical and natural) be made available

for musical purposes. In this regard, playing the new instruments has indeed become a process of simultaneous production and consumption.

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Chapter 9:

'Live' and Recorded:

MIDI Sequencing, the Home Studio, and Copyright

> During the Digicon digital arts conference in Vancouver in Aug.'83, Ralph Dyck ended his demonstration of an IBM-PC equipped with a MIDI interface by playing a disk of a MIDIed [Oscar] Peterson electronic piano performance... Dyck fed that data into a Roland electronic piano on the stage, and we all heard Peterson play 'live.' It seemed that the essence of Peterson's performance was captured more convincingly in that MIDI data stream than it would have been in a normal audio recording. (Moog 1985: 48)

One of the myths of the "digital revolution" in the field of music recording (as with the earlier transitions from acoustic to electro-mechanical and, later, to magnetic recording) has been that the attendant increase in audio "fidelity" has somehow brought the listener "closer" to the original moment of performance: listening to a CD is, supposedly, like "being there." But with sequencing (the recording of MIDI data) something quite different has occurred: on the one hand, certain uses of sequencing have been associated with the most rigid, mechanical and inhuman sounding performances and, on the other, the distinction between "live" and "recorded" seems to have completely dissolved. Indeed, with regard to the latter, it would appear that for some listeners (as the comment quoted above clearly indicates), MIDI sequencing virtually returns the "aura" (Benjamin 1969) of live musical performance to the medium of digital reproduction.

At one level, these attitudes would appear to be little more than the most recent expression of the same contradictory feelings of shock and fascination that greeted the mechanical reproduction of music on the phonograph and the player piano at the turn of the

century. But at a deeper level, the particular use of the notion of "live" performance found in the statement quoted above, together with a whole series of controversies surrounding the changing status of the "live" in popular music during the past decade, have been the signs of a more fundamental shift in the mode of musical production brought on by recent uses of electronic and digital technologies. And here again, to paraphrase Craig H. Roell's observations concerning the debates that raged over music and machines at the turn of the century (1989: 31): the digitization of music is essentially a story of values, not inventions.

In this chapter, I would like to look more closely at the process of multitrack recording in popular music, giving special attention to the use of computers and MIDI technology within the multitrack studio environment. In many ways, the developments that will be discussed here are closely related to the issues of "sound" discussed in the previous chapter and a certain amount of overlap in the content of these two chapters is inevitable. However, what interests me most in the present context is the manner in which not only the "sound" of musical instruments has become the object of rational calculation and commercial interest, but also, how the "feel" of a "live" musical performance itself has also become the object of a similar kind of rationality.

I also want to consider the rise of the "home studio" as a particular outgrowth of the "democratization" of musical technology. The home studio has become both the site of significant musical activity at every level, from professional to amateur music-making, and the focal point of the consumer market for electronic musical instrument suppliers. However, despite the utopian rhetorics found in many magazine articles and in advertising, this broad-based activity has not necessarily led to a breaking down of barriers between amateur and professional: indeed, as the home has increasingly become a technically viable site of production, conflicts between the professional and the amateur worlds of music-making have come to the fore. Furthermore, the rise of the home studio also represents a

shift in values concerning the organization of domestic space, an issue that has considerable implications as regards gender and family life.

Finally, I want to discuss a number of issues related to musical copyright that tie together some of the concerns found in both the previous chapter and the present one. These issues touch upon the problematic status of sound recordings (as opposed to musical scores) as objects in copyright law, the increasing commodification of "sounds" and the desire for legal protections from sampling and other digital technologies, and the problems of defining musical *processes*, such as certain styles of composition and performance, as meaningful forms of musical practice.

Multitrack Sound Recording as a Medium of 'Composition'

During the 1960s the production of popular music was completely transformed by the establishment of multitrack tape recording as the norm in studio production. Multitrack technology allowed for the sound of individual instruments to be recorded separately from one another in a process known as "overdubbing"; later, the various lines of music (the recorded "tracks") could be combined, electronically enhanced and balanced during the "mixdown" session. As a result, the process of group performance, and the social/musical exchange between musicians on which it was based, became rationalized and fragmented--both spatially and temporally--and control over the overall musical texture was increasingly given over to the sound engineer and producer (Théberge 1989). Pop songs were no longer simply composed, performed, and then recorded; more and more, the studio came to be regarded as a compositional tool in its own right.

This was certainly not the case prior to the introduction of the tape medium in sound recording. In the early days of recording, "The accent was on the performance and the recording was a more or less perfect transmitter of that" (musician/producer Brian Eno

1983: 56). But with multitrack recording individual performances became less important than the manipulation of the individual strands of recorded sound material. With multitrack technology

> two things happened: you got an additive approach to recording, the idea that composition is the process of adding more...; it also gave rise to...in-studio composition, where you no longer come to the studio with a conception of the finished piece. Instead, you come with actually rather a bare skeleton of the piece, or perhaps with nothing at all...Once you become familiar with studio facilities...you can begin to compose in relation to those facilities. You can begin to think in terms of putting something on, putting something else on, trying this on top of it, and so on, then taking some of the original things off, or taking a mixture of things off, and seeing what you're left with--actually constructing a piece in the studio. (Ibid.: 57)

Eno's description is interesting in the present context in that it defines this new form of "composition" through the medium of multitrack sound recording as essentially a process of layering (an "additive approach"). The tendency for synthesizer players, as discussed in the previous chapter, to layer sounds is thus not simply a matter of searching for a means of creating a "fat" sound; but rather, it should be understood as a fundamental part of an emerging technique and aesthetic of pop music production since the 1960s.

More important however, Eno's comments point out the degree to which the technology of sound recording has become *productive*, not simply reproductive. H. Stith Bennett has likened sound recording to a form of musical "notation" for pop musicians who, for the most part, do not read conventional scores: sound recording allows the musicians to distance themselves from the act of performance and to create "impossible music," i.e., music that could not otherwise be conceived or performed. For Bennett, the creation of "impossible music" is one of the signs of a musical practice that has been influenced by the creative possibilities and pressures of a notational system (1983: 228-230); he cites guitarist Les Paul, who created a number of unperformable experiments (and

hit records) using overdubbing and speed changes during the early 1950s, as the first historical sign of such a development (Ibid.: 230-31).[1]

In fact, although I agree with the general outlines of Bennett's thesis, I would argue that the idea of layering sounds and individual performances, as a specific compositional process, has little to do with traditional composition using notational means.[2] Indeed, the impulse towards such layering techniques appears to have historical precedents that antedate multitrack recording by many years. For example, on a "one-man band" recording released in 1941, jazz reed player Sidney Bechet is said to have overdubbed (through a process of sound-on-sound recording not unlike that used in Les Paul's own early experiments) the saxophones, clarinet, bass, drum and piano parts of the music.[3] And, earlier still, between 1917 and 1927, composer Igor Stravinsky created a series of pianola transcriptions of his orchestral music, several of which were written as four-hand piano scores; he performed each of the parts in synchronization with himself on previously recorded rolls (Craft 1957: 35). Thus, the idea of overdubbing separate performances by a single (or multiple) individuals appears to be rooted in the technology of mechanical reproduction itself (i.e., once a sound is made repeatable through mechanical reproduction, it lends itself to being experimentally combined with other sounds in an empirical manner that is not possible, at least not in the same way, through notation) and may well be

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[1] Les Paul is credited with having invented the 8-track tape recorder (one was made for him during the 1950s by the Ampex corporation); for details concerning his early experiments with sound-on-sound techniques and multitracking, see Sievert 1978.

[2] It should be noted that Bennett uses the term "notation" in a very broad, almost metaphorical style: musical sound itself and words used to describe music are all considered forms of "notation" within his typology of "sound-noticing" systems.

[3] The recording in question was of the song, "The Sheik of Araby," and was originally released by RCA Victor (VIC 27485); the song has recently been re-released on an album entitled *The Legendary Sidney Bechet*, Bluebird records #6590-1-RB, 1988. I want to thank Keir Keightley for bringing this recording to my attention.

considered as an inherent possibility of reproductive technologies that was not fully exploited (for technical as well as aesthetic reasons) until the second half of the twentieth century.

But the multitrack tape recorder was not simply a new device for the recording or layering of sound, or even for the composition of music: it was part of a larger "social technology" (Frederickson 1989) and, as such, played a role in the entire reorganization of production in popular music. In the studio, the architecture of the recording space was redesigned in order to allow for greater separation and control over reverberant sound; sound engineers developed novel microphone, signal processing, and mixing techniques and became full-fledged members of the musical process (Kealy 1974, 1979); performers had to adapt to the conditions of temporal and spatial separation; and, at a level beyond the studio itself, entrepreneurial producers became increasingly responsible for musical production within the overall economic organization of the record industry (Peterson & Berger 1971). Initially then, the prerogative of "composing" with the new medium was not given equally to all who participated in the multitrack enterprise: it was the producer, more than anyone else, whose judgement prevailed within the studio environment. And, indeed, it is the status of the producer that is valorized in copyright law: as far as mechanical rights to the recording are concerned, it is the producer who holds all rights of reproduction (this point will be taken up again later).

Antoine Hennion has described the role of the producer as that of an "intermediary" between the recording artist and the marketplace. Although the producer is often not a musician or engineer by training, Hennion stresses that their role is never passive:

> L'intermédiaire n'est pas le fonctionnaire passif qui applique des lois (musicales, économiques, culturelles), il produit les mondes qu'il veut faire travailler pour lui. Il force, il arrache il soude; il a des outils et des techniques pour isoler, mesurer, essayer. Rien ne lui est acquis d'avance.
> (Hennion 1983: 460)

In Hennion's view (not unlike that of Eno and Bennett), the studio becomes the "laboratory" of the producer: a site where experiments--a trial-and-error process of tests, operations and evaluations--in sound take place. And here, the insulated studio acoustics, the isolation of the musicians from one another in the studio, and the separation of their sounds on multitrack tape, finds a necessary correlation in the insulation/isolation of the studio from the outside world:

> L'*isolement* est aussi important que l'*isolation*: nous ne sommes pas devant un problème d'acoustique, mais devant les plans d'un microcosme idéal de la creation...
> ...découpé, isolé et vidé de son contenu un volume dont les parois deviennent les limites d'un univers artificiel... (Ibid.: 464)

It is perhaps no accident then that during the 1970s recording facilities like Le Studio in Morin Heights, Québec, sought the refuge of isolated rural settings for their musical "experiments." The rise of the "home studio" during the 1980s must also be seen as part of this general trend: in the case of the home studio, the privacy of domestic space comes to be regarded as the ideal site of musical expression and inspiration rather than the more public realms of night club and stage.

As intermediary, and despite the ill-defined nature of their skills, much rests on the shoulders of the producer:

> ce magicien qui arrive les mains dans les poches, mais dont le flair est la clé du succès: il faut montrer qu'aucun ne porte avec lui de réseau plus réaliste, qu'aucun n'opère une construction aussi matérielle de l'écoute, qu'aucun n'agit moins à distance. (Ibid.: 460)

In essence, their authority is based on the assumption that they are able to deliver hits because they listen with the ears of the consumer. The success of the producer is thus

dependent on their ability to completely identify with the public: "A song-object is not produced first and consumed later; rather a *simultaneous production-consumption* process takes place first inside the studio, and the impact on those present must be repeated later on outside the studio" (Hennion 1990: 203; emphasis in the original).

In a certain sense, this process of listening puts the producer in the same position as the consumer:

> The producer is not a calculator. His knowledge of the pop music scene and his experience of the public are of value only when he has integrated them within an "immediate" sensitivity; only then do they mutely guarantee the genuineness of his taste...He can forget the criteria that he has interiorized and allow himself to give in to his feelings, to react to what he perceives as purely physical sensations. (Ibid.: 201)

Hennion's observations suggest that Blacking's theory of musical competence (discussed in Chapter 7) is central to the production of popular music: it is not musical "skill," in the traditional sense of the term, that defines the role of the producer; rather, it is their ability to listen, to feel what is "right" for the given musical context that is the focus of their role in the studio (I will return to this point below).

In part, because of the increasing importance of producers in the recording of popular music, there has been a tendency throughout the 1970s and '80s for producers to become as well known as the stars they record. This has been true throughout mainstream pop but especially so in early Disco and in many subsequent genres of dance music: during the 1970s, for example, producers such as Giorgio Moroder and Freddie Perren became well known for their work with Disco artists Donna Summer and Gloria Gaynor. And in the '80s an increasing number of producers, representing a much wider range of mainstream musical genres, became known to the public: e.g., Quincy Jones, Nile Rodgers,

Brian Eno; and among Canadians with international reputations, David Foster and Daniel Lanois.

But if the producer as consumer represents the "dictatorship of the public" in studio production, then it should come as no surprise that musicians and engineers, in some genres of music, have long attempted to reassert their own control over the production process. It is not that these studio collaborators are not equally concerned with success in the marketplace, but simply that their values and their definition of success may be different from the producer's. In large part, it was a desire for greater control and artistic freedom that led to the rise of the early artist-owned studios of the 1970s; and this was the first, and perhaps the most decisive step towards the idea of the "home studio" of the '80s.

Edward R. Kealy (1974, 1979, 1982) has described in detail the changing patterns of collaboration that came about in the recording of rock music during the period between 1965 and 1975. According to Kealy, an "art mode" of production evolved during this period where the recording artist themselves were responsible for aesthetic decision-making in the studio. In this, they relied heavily on the technical expertise and growing artistic contributions of recording engineers with whom they had developed an understanding relationship. Often, successful artists invested tens of thousands of dollars in constructing their own studios where they could experiment freely without the pressures of paying for studio time at hourly rates.

What was essential about this process was that as musicians became more comfortable with the studio apparatus, they acquired new forms of knowledge (and as discussed in the previous chapter, new concepts of musical "sound") that were quite unlike traditional forms of knowledge and practice associated with musical theory, performance and composition: in order to work creatively in the studio, musicians and engineers had to acquire both a basic theoretical and a practical knowledge of acoustics, microphone characteristics, electronic signal processing, and a variety of other technical processes. In

Bourdieu's terms, the shifts in the physical and temporal relationship to the production of musical sound inherent in these activities results in a kind of objectification that is entirely different in character from the "urgency" of conventional performance practice: there is a kind of "disincarnation" of musical production and a subjection of recorded sound to rational processes that is not unlike that which stems from the use of notation in the production of musical scores (1990: 73). Furthermore, and in part following from this objectivist position, pop musicians have increasingly taken on the more detached, evaluative role of the producer in attempting to assess the commercial potential of their material. By the 1980s, it was not uncommon to find, on record liner notes, artists listed as producer on their own albums: the songwriter-producer had arrived.

In part, as a result of their own need to become familiar with the disciplines necessary to work in the multitrack studio, because of the growing, do-it-yourself, independent recording movement of the '70s, and because of the image of star performers' unconstrained access to these powerful technologies of creation, semi-professional and amateur musicians began to look for ways in which they too could construct their own studios. At about the same time that professional formats were expanding from 8-, to 16-, to 24-track capability during the late 1960s and early '70s, consumer multitrack recorders began to appear on the market: at first this took the form of modifications to existing tape decks, but by 1972, the first 4-track tape recorder expressly designed for amateur and semi-professional use (the TEAC 3340) had been introduced (TEAC had already brought out a budget line of mixers around 1970).

According to Steve Jones, as the enthusiasm for the new consumer technology grew, so did the industry and in 1977 the first Multi-track Expo was held in Los Angeles with workshops dedicated to "The Musician's Home Studio' (1992: 139). Suddenly, as Jones puts it, the meaning of "paying your dues" in the music business took on a new meaning among pop musicians: instead of struggling with a band year after year perform-

ing in bars and night clubs, the purchase of suitable recording equipment seemed like a more viable route to a successful career in pop music; "paying your dues" now came to mean making payments on your gear (Ibid.: 140). The impetous behind this movement became even stronger during the early 1980s with the arrival of inexpensive cassette multitrack recorder/mixers and MIDI, on the one hand, and fluctuations in the availability of public venues for live performance, on the other.[4]

But what is interesting about this development is the manner in which the acquisition of new knowledge and skills, the acceptance of new definitions of what it means to be a "musician," and the mobilization of the domestic space as a production environment, all take place simultaneously. The first two aspects of this phenomenon are underscored by the emergence of what has been referred to as the "hyphenated musician": the singer-songwriter-producer-engineer-musician-sound designer. What is striking here is the assumption that a single person can perform each of these roles equally well. In the professional studio, music production had always been a collective project: for example, for the producer to perform their job in the studio, it was necessary to have a team of skilled collaborators--recording artists, session musicians and recording engineers--who did much of the "work" associated with musical production; even in artist-owned studios, "one-man band" recordings such as those occasionally released during the early 1970s by artists such as Stevie Wonder were extremely rare (and even these recordings usually

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[4] It is extremely difficult to find any reliable data on the availability of performance venues (especially small ones) and, in addition, there appears to be a considerable amount of regional variation in availability and variation over time. A recent article in the *Montreal Gazette*, described the closure of two of the city's venues as a reorganization of the local music scene and suggested that it has become increasingly difficult to stage live music without the economic support of corporate sponsors (playing prerecorded music, it would appear, is cheaper and more profitable than live music). This argument supports observations made by Will Straw and Jody Berland (and supported by information derived from Statistics Canada) that live performance is seldom a profitable enterprise. Even in the world of stadium rock, the profitability of large-scale concert touring has become dependent on the converging interests (and economic investments) of venue owners, major league sports enterprises, and large corporations (1992: 909).

involved the cooperation of at least a few technical assistants). The particular notion of independent, solitary production that comes into play with the rise of the home studio, however, is related not only to the rise of consumer multitrack equipment, but also to the availability of (and reliance on) digital synthesizers, sequencers and drum machines: only with the aid of these technologies was it possible for an individual to perform all the roles necessary to make a successful recording.

From Multitrack Tape to MIDI Sequencing

Sequencers allow musicians to store, manipulate and reproduce digital information relating to performance gestures (e.g., such as playing notes on a keyboard instrument or drum pad) without reference to the actual sounds produced by the instrument at the time of recording. Thus, not unlike a musical score, sequencers store information such as pitches, note durations, dynamics, etc., but can record the information in "real time" much like a tape recorder; unlike a tape recorder however, they do not store sounds. This ability follows from the fact (as mentioned in the previous chapter) that the playing mechanism of electronic instruments is simply an "interface"; as such, it is completely separate from the sound producing hardware of the instrument. Sequencers can be found in a variety of forms: as a basic component within drum machines and in many keyboards, as stand-alone hardware devices, and in computer software form with elaborate, graphical representations of the MIDI data.

To a certain extent, sequencers reproduce the divisions defined in traditional musical notation: the "language" of music is kept separate from its manifestation in sound. This reproduction of a conceptual and practical distinction in Western musical thought has been evident from the first applications of computer technology in music synthesis: beginning in the late 1950s, for example, Max Mathews developed a series of computer

programs (MUSIC 4 and MUSIC 5 being the most sophisticated and most well known) at Bell Telephone Laboratories that made use of two different kinds of input data based on an analogy between the "score" (note data) and the "orchestra" (function data for sound synthesis).[5]

But whereas with traditional notation it was still necessary to have trained performers who could reproduce the score; sequencers store performances themselves (or simulations of them) and reproduce them electronically. In this regard, sequencers have often been compared to the early player piano whose rolls stored the physical gestures of a pianist's performance in such a way that they could later be reproduced mechanically on a similarly equipped piano. The piano lent itself to this type of treatment because of the basic mechanical nature of its design but with synthesis and sampling, virtually any instrument sound can become the object of the MIDI sequencing process:

> I used to write arrangements with different players in mind. In the past few months I've been able to go into the studio alone or with one other musician ...sometimes I can do the whole thing myself--all the synthesizers, rhythms, drum machines, bass and guitar.
> There's nothing like actually playing the parts, but it seems like programming and sequencing are really taking over. (Producer, Arthur Wright, quoted in *Mix* 9 (2), February 1985, p. 74)

However, once the gestural input has been separated and defined as simple information, the necessary data can be input in any of a number of ways provided that it can be recognized by the sound generating hardware. The earliest sequencers used in popular music production were developed for use with analog synthesizers during the early 1970s; they were monophonic (much like the instruments which they were designed to control) and could store only a limited number of notes. One of the first polyphonic digital

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[5] For a detailed discussion of a derivative of these programs, MUSIC 4BF, and the division of tasks that follows from the score/orchestra analogy, see Howe 1975: 175-248).

sequencers introduced in the commercial market, the Roland MC-8 (introduced in 1977 and followed later by an even more popular version of the device, the MC-4), was based on a design by a Vancouver musician, Ralph Dyck: involved in a variety of musical projects, including film, record and jingle production, Dyck wanted to be able to control his analog synthesizers with something that offered more precision than a conventional organ-type keyboard; his prototype sequencer used a numeric key pad (like that found on a calculator) to enter data that would control the various synthesizer components.[6] As a result, precise data concerning every aspect of the sound could be entered in "steps" rather than as part of an integral performance. While Dyck's initial design was monophonic, he developed a method for synchronization with multitrack tape; Roland improved the basic design for commercial release and made the sequencer polyphonic (i.e., it could play several virtual "tracks" of information) and, with 16k of RAM, the instrument could store over 5,000 notes (Vail 1990; Anderton 1988: 45-46).

The two essential features of the MC-8 were its numerical, step-entry mode of programming and its multi-channel capability. The latter feature placed sequencing firmly within the dominant modes of recording studio production practices, a factor which should not be underestimated (I will return to this point below). But the step-entry mode of operation is also significant in terms of both its immediate and its more long-term influence. In the short term, step-entry programming led to the same kind of mechanical precision as was noted (in the previous chapter) in the case of the TR-808 drum machine and hip-hop music. Much of the music associated with electronic technology during the late '70s and early '80s--mostly the dance music of producers such as Giorgio Moroder, or the electro-pop styles of bands such as Devo and Human League--had a similar rhythmic insistence,

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[6] The origins of the MC-8 design in Dyck's own technical experiments and production practices is perhaps another example of how the functional source of technical innovation can come from users rather than industry.

an almost robotic feel of hyper-precision stemming from the extensive use of synthesizers and sequencers. And here, once again, the peculiarities and limitations of a particular technology can be seen to contribute, in a positive way, to the aesthetic predilections of entire genre of music.

But in a curious kind of reversal, the type of precision available through the definition of a musical note as a set of independent, stepped data, has become the source of a new rationalization of performance practice. By the mid 1980s many drum machines and sequencers allowed data to be entered in "real time" thus preserving the "feel" of a live performance. But while sequencers have often been used for this very purpose, it appears that there has been a simultaneous attempt to use sequencers as a means of quantifying "feel":

> When I was producing, I would endeavor to pick the take with the best feel...on each take the notes played were essentially the same; yet there were differences between takes--differences in the *feel* the players gave the music.
> In the control booth, trying to get the feel I wanted, I used to tell my artists that there was no "feel" button on the console. But in a way, now there is. Thanks to computer-aided music, we have been able to explore and quantify these effects a bit more precisely than in the past. (Stewart 1987: 58)

Continuing, the author attempts to define various subjective rhythmic terms such as "groove," "heavy," and "driving" in terms of millisecond delays or anticipations in the relationship between beats in a drum pattern. The aim of this exercise is to establish the basis for "predictable effects that you can use with predictable results" (Ibid.: 60). In recent years, the manufacturers of drum machines have attempted to introduce design modifications that will facilitate the programming of virtually every nuance of drum technique, including not only variations in the rhythmic placement of individual beats but in their pitch and timbral shading as well; and several sophisticated sequencer programs now

have the ability to abstract the "groove" from a performance and store it as a kind of template for later analysis and/or use with other instrumental parts in the musical texture or in completely different musical contexts.

As noted above however, the quantification of performance variables does not end with rhythm alone: within the MIDI specification, a numerical value is assigned to each aspect of a note--its pitch, its precise location in time, its duration, its loudness (a function of on-set velocity), and several continuous variables such as key pressure, pitch bend, etc. With regards to dynamics, traditional notation can only indicate about eight discrete levels of loudness (from *ppp* to *fff*); the precise loudness of any given note within a musical passage is determined by the performer within this relative framework and in keeping with the style of music in question; individual notes may be somewhat louder or softer (intentionally or within an overall scheme of accents and phrasing) without disrupting the overall sense of a single dynamic level. With MIDI however, it becomes possible (even necessary) to specify the precise dynamic level, within a range of 128 values (the maximum number of values available given the size of a MIDI byte), if these subtle nuances of musical performance are to be achieved; even when a performance is recorded into a sequencer in "real time" from a velocity-sensitive keyboard, any editing that is required in the material takes place along this same scale of numerical values.

The tendency towards a rational, calculated approach to the nuances of performance as represented in the MIDI data stream is, in part, a result of the quantitative nature of the data itself. And in this way, MIDI can be understood as an extension of the shifting complexities of traditional musical notation and the general, historical trend towards greater notational specificity discussed in Chapter 7. But whereas traditional notation uses a cluster of symbols (indicating pitch, duration, dynamics and articulation) around each individual note, the data contained in the MIDI sequencer is often presented to the user in the form of separate lists of numbers or in the form of graphical representations limited to

one or more of the characteristics of the note at any given time. In this way, the various elements of gesture and performance undergo a kind of fragmentation far greater than that associated with conventional notation.[7]

Of course, attempting to introduce performance nuances through the manipulation of several streams of digital data for each note can be extremely complex and time-consuming. This has led to a search for more efficient ways of dealing with the numerical data: one solution offered by software programmers has been to supply editing features that randomize the data within boundaries that can be set by the user. For example, in the case of data that has been entered in step mode (or where timing values have been auto-corrected through a process called "quantization"), the timing of a note can be randomized by extremely small amounts (as small as a 1/1920th note on some sequencers) in order to give the impression of a less machine-like performance; the practice is often referred to as "humanizing" the data.

But what is interesting here is the manner in which the "human" has been defined, primarily within technical culture, as "random" in the first place. Certainly, human beings do not perform music with the same precision as a machine but the nuances of performance cannot be reduced to simple randomness: they are as much intentional as they are random, as much the result of phrasing and the dynamic flow of the music as performed in "real time" as the result of error or human frailty. Both these elements--phrasing and dynamic flow--place individual notes within a performance or interpretive <u>context</u>, a meta-level of organization and intentionality beyond that of the isolated, individual sound; what Sudnow might refer to as "aiming" for the sounds within a particular course of action. Peter

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[7] This fragmentation of performance data runs parallel to a similar kind of fragmentation that is characteristic of the models of sound generation that have dominated digital synthesis from its earliest days; only recently have some members of the academic computer synthesis community begun to address the problem of constructing more complex models that allow for various kinds of inter-relations between sound parameters (Truax 1991: 30).

Lyman's comment, quoted in the previous chapter, seems particularly appropriate in this instance: the idea of "humanizing" musical data through the use of random deviation is derived from the "implicit theory of knowledge"--statistical, information-oriented--that guides software design within computer culture; as such, it may offer an efficient means for producing a particular result but has relatively little to do with traditional forms of musical knowledge or performance practice *per se*.

In this regard, while such techniques do appear to have been adopted by many musicians who use sequencers or drum machines on a regular basis, at least some have recognised that there is a certain irony in the calculated application of randomizing techniques in the interests of achieving the spontaneous "feel" of live performance:

> It is possible to program a considerable degree of feel into these machines [Roland's R8 and R5 drum machines], but you're going to have to get to know them inside out if that feel is to be recognized as *human*. Myself, I can't help feeling there is a basic paradox involved in the premeditated insertion of random elements into a rhythm. (Nigel Lord, product review in *Rhythm* 5 (5), November 1989, 57)

Indeed, while various forms of randomness, probability and chance operations have been a feature of avant-garde composition at least since the experiments of John Cage, Iannis Xenakis, and others during the 1950s (and have been especially prominent in academic electronic music), pop musicians have been rather reluctant to pursue the path of random generation or manipulation of musical material for its own sake as, for example, in the case of so-called "algorithmic" composition programs:[8] most appear to be "put off by the

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[8] Algorithmic programs use computational logic (e.g., such as the use of "Markov chains" to define transitions from one state to another) as means of defining a set of compositional "rules" that can automate certain aspects of composition and sound production; users experiment or "interact" with the output of such programs in order to compose music. Several programs of this type were released commercially during the mid-1980s but had only limited success among popular musicians. Detailed articles describing these programs have appeared in *Electronic Musician* 3 (8), August 1987, 36-52; *Computer Music Journal* 11(4) Winter 1987, 13-29; and *Keyboard* 16 (10) October 1990, 55-63.

complexity of the process and unconvinced by the randomness of the product" (musician/writer Carter Scholz in *Keyboard* 15 (6), June 1989, 12). This fact has been something of a disappointment to those who have felt that the new technologies would lead to radical musical and stylistic change:

> One of the things that's been a disappointment to me personally is that there seems to be a relatively small community of people who are interested in taking this stuff further than traditionally composed domains. It seems like most of our customers are doing some kind of pop music or soundtrack work...they try to do something that sounds like what they're used to listening to, instead of taking one of the multiple infinities of paradigms that MIDI provides you and doing something new. I think because of that, it's harder and harder for a software company to justify pushing the limits in terms of algorithmic composition and whatnot. (founder & president of Dr. T's Music Software, Emile Tobenfeld, quoted in *Keyboard* 19 (2), February 1993, 83-84)

But such discontent stems, in part, from a modernist ideology that assumed that once the avant-garde had led the way, the popular masses would follow. But in fact, the uses of technology in popular culture have followed their own form of logic and, to the extent that multitrack recording had become the dominant process through which popular music was produced from the 1960s onward, it should come as no surprise that the designers of software-based sequencers have, since the mid 1980s, used the multitrack tape recorder as both a model of composition and as the prime metaphor for the program's user interface.[9] Today, most computer sequencers are based on the same idea of linear tracks and layers as the multitrack tape recorder; on-screen, there are even "buttons" correspon-

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[9] With some sequencers a looping process similar to that used in drum machines is used instead of the multitrack metaphor. However, the two compositional processes are not mutually exclusive and many programs allow for a combination of looped and linear recording techniques.

ding to tape recorder functions such as play, rewind and fast forward (even though there is no physical tape or transport mechanism to control).

The tendency to adopt the multitrack metaphor has been regarded by some as a simple expedient--little more than a marketing decision calculated to overcome the inhibitions of musicians concerning the use of computers. Such an attitude disregards, as I have argued above, the degree to which the successive layering process involved in multitracking has become a true mode of composition among popular musicians. This fact is not without its consequences: for example, because a computer screen can only display a limited amount of information at any given moment, most sequencers allow the user to gain detailed access to the note information contained on only one track at a time. In this way, the kinds of precise editing described above can be performed within a given track but gaining access to the same information across tracks is usually more difficult to achieve. This situation is quite different from that encountered in a full musical score where each individual part is arranged vertically on the page and detailed comparisons between each part can be readily made.[10] The sequencer "windows" that appear on the computer screen, as the basic units of electronic text, thus have a very different set of implications as regards compositional method than does the page of a score, as the basic unit of printed musical text (cf. Lyman 1984: 79): the sequencer draws the user's attention to selected aspects of the music-making process and does so in a fragmented and disjunct way.

Thus, in a curious fashion, the temporal and spatial separation between performers in the multitrack studio is reproduced in the separation of information related to individual tracks on the sequencer. Furthermore, this fragmentation of the ensemble information is paralleled by the fragmentation of MIDI parameters for each individual note as already

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[10] To carry the analogy further, editing a sequence is sometimes not unlike trying to edit the individual instrumental parts of a symphony without having access to the conductor's score.

discussed above. In this way, virtually everything within the organization of data in the MIDI sequencer tends to reinforce a method of working where the recording and editing of material takes place as a series of successive passes, each largely independent of the other.

MIDI sequencing also has an impact on working methods that is more directly related to the computer as a form of technology. Unlike the multitrack tape recorder, which is a linear medium, computers allow for the random access of material stored in memory, thus facilitating the block, "cut and paste" style of editing familiar to wordprocessing and other kinds of computer applications. During the 1970s, the practice of creating separate mixes of a song for radio or dance club use had already become commonplace; mulitrack tape made this process possible by making the music available in the form of a set of raw unmixed tracks. With computer sequencing however (and the use of sampling to reproduce parts of vocal and acoustic instrument tracks), cut and paste operations could be performed in such a way as to not only remix a song, but to create entirely different arrangements of the song material. In this way, a three-minute song could easily be transformed into an extended version of the song (with a duration of two or more times that of the original) for dance clubs and other purposes.

While such practices fit clearly within the economic imperatives of the industry--i.e., the profit potential of every song must be exploited to its fullest (Tankel 1990)--they also have a subtle influence on the status of the song as an "authoritative" artistic statement (c.f., Lyman 1984: 78). In this sense, the infinite maleability of the sequenced data mitigates against the idea of a single, finished product: indeed, many musicians complain that in the studio it is difficult to know when to stop working and rearranging the sequenced material. Unlike a performance that has been committed to multitrack tape and is therefore relatively fixed in character, sequencing allows for a continuous modification and reorchestration of the basic tracks even after they have been "recorded."

At another level, this maleability lends a spontaneous character to the sequenced material that has, in part, led to a blurring of the distinction between what is "live" and "recorded" in studio production. The conceptual shift that has occurred is subtle, at times only half conscious it would seem, but is manifest in the speech of musicians who engage in MIDI sequencing. My first encounter with this phenomenon occurred during an on-site observation of a recording session where a number of young musicians were recording a demo tape. The musicians had brought to the studio a set of sequenced tracks on diskette which were loaded into a computer and used to trigger a combination of sounds from their own synthesizers and the studio's sampler. The computer was then synchronized to a multitrack tape recorder where vocals and guitar tracks were to be recorded.

During the playback after one of the initial takes, the engineer said to the group: "Listen...there's a problem in one of the live tracks that we've got to fix." The taped and sequenced tracks were played back again and everyone in the room listened intently for the mistake; several of the musicians offered suggestions on what was to be done. Then the engineer repeated, this time in a somewhat frustrated tone of voice: "No, no, listen again to the live tracks." During the discussions following the third playback, it soon became clear to me that when the engineer spoke of the "live" tracks, he was actually referring to the sequenced material; the musicians, on the other hand, had instinctively listened to the vocal and guitar tracks (i.e., the tracks that had been performed "live" at the session). This confusion continued for several minutes until each party realized that they were not in fact listening to the same things.

For the engineer, the sequenced tracks were "live," firstly because the computer was, in effect, "playing" the MIDI instruments in "real time" while the other tracks were simply being "reproduced" on the tape recorder. Secondly, the sequenced tracks, stored in RAM, were still in a relatively volatile state and could be manipulated at will (for example, throughout the session, a variety of adjustments were made to the drum tracks and several

snare drum samples were tried out at different times in an effort to maintain both the right "feel," and "sound," as each new track was added to the basic texture); by comparison, the "recorded" tracks (i.e., the vocals and guitar tracks) seemed fixed and unchangable. Finally, when it came time for the mixdown, the MIDI instruments were again "played" by the computer and recorded directly to the stereo master without the slight noise and sonic degradation that is unavoidably introduced into a second-generation analog recording (as was the case with the vocals and guitars which were mixed from the multitrack deck to the master). Thus, sequenced tracks sound like they are being played "live" rather than being mixed from tape.

Since my initial observations at this recording session (which took place in the fall of 1989), I have encountered numerous instances, in magazines and in the everyday speech of musicians that I have met, of this same typification of sequenced vs. recorded sounds. Some, as in the case of Bob Moog quoted at the beginning of this chapter, date back to the early days of MIDI and computer sequencing. For example:

> on a recent production the multitrack contained only two vocal tracks and a sync code, whilst the desk had a further 22 channels of 'live' sound from the assorted keyboards, samplers, drums and effects. The only people involved in the production were a singer/songwriter and the programmer. (Producer, Roger Jackson, in *Studio Sound* 28 (8), August 1986, 20)

Musically speaking, the use of the term "live" in such instances must be regarded as a statement of fundamental import because it reflects a new perception of the role of technology in musical practice and a redefinition of the distinctions between production and reproduction.

And in broader cultural terms, the significance of this peculiar reversal of linguistic expectations should also not be underestimated. Throughout the 1970s and '80s popular electronic musicians suffered the abuse of unions, critics, and other, more conventional

musicians and fans who opposed the increasing use of new technology in both studio production and in live performance: e.g., a feature article in *Rolling Stone* in 1985 referred disparagingly to the new music as "push-button rock" (#461, Nov. 21, p. 89). Even more important, the Milli Vanilli lip-synching scandal of 1990 must be seen as the culmination of nearly a decade of concern over the status and legitimacy of live performance in an era of sequencers, samplers, and backing tapes. For the critics, the problem was not simply that musicians were trying to sound like their recordings when performing on stage (this had long been a preoccupation among pop musicians), but that concerts had indeed *become* recordings (Handelman 1990: 15). In this context, the use of the term "live" to refer to sounds produced by machines should perhaps be regarded as strategic--as a reappropriation of the very qualities that critics had denied were possible in machine music.

Home, Sweet Home in the Studio

I have thus far mentioned the idea of the "home studio" on several occasions but I would like to look more closely at this phenomenon, if only to make a few brief comments and observations. From the late 1960s onward, as the multitrack recording studio became increasingly used not only for the recording of music but also as a tool in its very conception and construction, the costs of producing an album quickly skyrocketed. It became obvious that one of the advantages of recording at home, as opposed to at a commercial studio, was that one's ability to experiment and create would be relatively unfettered by the constraints of time and money. For some musicians, even the ability to simply record over and over, in a relaxed atmosphere, until they got the right "take," was well worth the cost of setting up a private studio. As mentioned earlier, home studios began to appear during the 1970s: first, in the homes of star performers who could afford to assemble a wide range of professional quality equipment that often rivalled that of the commercial studios; and

later, as inexpensive consumer multitrack equipment became available and easier to use, in the homes of semi-professional and even amateur musicians.[11]

But in the case of the latter, the semi-professional and amateur studios were seldom thought to be able to function as autonomous production centres where a finished product could be turned out for commercial release. The number of available tracks, the quality of the equipment (including not only the tape decks but also the microphones, mixing console, and external signal processors), and the character of the recording environment itself, left much to be desired. For most musicians, the home studio was a place to experiment with musical ideas that would only later be realized, if finances permitted, in a more professional recording facility.

There have of course been notable exceptions to this rule: much of the Punk and early New Wave music of the late 1970s made use of consumer recording equipment as the vehicle for a do-it-yourself industry of independent record production and distribution. On rare occasions, even big-name performers released recordings produced on low-cost equipment when they felt that the recordings captured the raw spontaneity of a particular performance in a way that could not be reproduced in a commercial studio: Bruce Springsteen's album, *Nebraska*, released in 1982 (CBS Records TCX 38358), was one such recording produced initially on 4-track cassette. Any apparent losses in sound quality were more than made up for by the cachet of "authenticity" that the recordings carried with them. Nevertheless, despite such exceptions, the majority of home studios were never used to produce more than the roughest of demo tapes.

But with MIDI, the nature of the home studio began to change: as described in the previous section of this chapter, with digital sequencing only MIDI data is actually recorded

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[11] The creation of a market for semi-professional recording equipment for the home was perhaps not unlike the creation of a market for home computers during the 1980s; regarding the latter, see Haddon 1988.

and, when reproduced on a synthesizer or sampler, there is no loss of audio fidelity. In genres of music that rely heavily on electronically generated sounds, it became possible to do a great deal of pre-production sequencing in the home studio (no matter how modest the quality of the synthesizer set-up) and then simply carry the work on diskette to a more professional facility where "finishing" work could be performed in a reasonably short amount of time.

What was significant about this shift in the nature of home recording was that there appeared to be an evolution towards a greater integration of the home and the professional studio. Some magazines began to refer to this possibility as the "Mothership Scenario" (and here again, the future-oriented and gendered character of this expression should not be ignored): within the scenario, the professional studios, forced by competition to invest heavily in the latest, most expensive equipment, had become the "motherships"; and the low-cost home studios, where every creative whim could be pursued free from time and financial constraints, had become the "satellites" (Gary Helmers, Editorial, in *Home & Studio Recording* 1 (2), November 1987, p. 2). And indeed, to a large degree, much of this has come true: during the late 1980s many professional studios began to construct special, small recording rooms in order to accommodate such projects at a reasonable cost to the home producer. Often, the spatial configuration of these MIDI studios was the reverse of earlier recording studio designs: in the MIDI studio, the control room (where much of the work of electronically orchestrating and mixing the sequences would be done) was often larger than the room used to record vocals or extra instruments (c.f., Jones 1992: 157-8).

But while this ideal of the fully integrated system of home and professional studios still possesses a considerable amount of popular appeal (and the marketing and promotional strategies behind the Alesis ADAT, described in the introduction of the thesis, attest to this fact), it is clear that the relationship between these two levels of production is no longer as

amicable as was originally thought. As home studios became increasingly sophisticated (and commercially oriented in their operations) they came to be regarded as competitors rather than clients in the professional studio scene: indeed, the 24-track studio--the backbone of the recording industry during the 1970s and early '80s--has become something of an endangered species, squeezed, on one side, by the high-end digital studios and, on the other, by the low-end home recording phenomenon (Daley 1990).

Nowhere has this squeeze been more acutely felt than in some of the largest recording centers such as New York and Los Angeles. In L.A., the problem had become so pronounced that an organization known as the Hollywood Association of Recording Professionals (HARP) was formed during the late '80s in order to challenge the right of home recordists to take on commercial work. They based their claim against the home studios on the fact that they often existed in residentially zoned neighborhoods, paid no commercial taxes, violated building codes, etc. (see *Mix*, November 1989, 19-24; *Music Technology* December 1989, pp. 58-62). By 1992, it was reported that over thirty home studios had been shut down for violations of one kind or another. The real issue however, was the increasing technical quality (often rivalling that of commercial operations) of the products offered by the home studios: without the range of sounds and recording flexibility offered by digital synthesizers and sequencers, few home studios would have ever been able to compete in the first place.

As noted earlier, with the advent of the home multitrack studio, the idea of "paying your dues" in the music industry had changed; but with the rise of MIDI technology during the mid 1980s, the cost of membership in the world of popular music had risen again. Young musicians were no longer content with the idea of owning a keyboard and a tape recorder: it seemed like a home studio was not complete without several synthesizers, signal processors, and a computer. As the home studio became an important new market for the manufacturers of microprocessor-based technologies, there was an increasing

pressure on musicians to surround themselves with and ever-expanding array of consumer goods; it was perhaps inevitable that many musicians would turn to commercial work in order to finance the acquisition of even more equipment.

But what has often been ignored in this scenario of the home studio is the manner in which the domestic space has been transformed into a production environment. The magazines often make use of clichés such as the arrival of the "information age" and Alvin Toffler's (1980) notion of the "electronic cottage" to explain the existence of the home studio. But it seems to me that there is something else that is quite striking about this particular manifestation of music-making in the home that is very different from previous uses of music as home entertainment: that is, the degree to which the home studio is an isolated form of activity, separate from family life in almost every way.

The home studio is, above all, a private space: studios tend to be located in bedrooms, dens, or basement rec rooms, far from the main traffic of everyday life. Magazines have offered feature articles on headphones suitable for the demands of working and mixing in the home or the apartment:

> Today, the home recordist utilizes headphones as an instrument of isolation. Few apartment dwellers can blast drum machines or sampled industrial noise into the wee hours. Headphones allow the home recordist the luxury of laying tracks at any time without risking eviction. (Michael Molenda in *Electronic Musician* 8 (2), February 1992, p. 57)

The home studio is thus, by design, a private space within a private dwelling.

The significance of this private act of music-making can perhaps be further understood through a comparison. If one compares the home studio to the role of the parlour piano a century ago (a comparison which, granted, is perhaps unwarranted but nevertheless revealing), one notes immediately the importance of the piano as a piece of home furnishing; the tangle of wires, racks and devices typical of the home studio (far

more obtrusive than any hi-fi set-up) could hardly be designed for any room that might be visited by strangers. But more important, the location of the piano in the main living rooms of the house or apartment made it a center of family life and entertainment in the home.

The incompatibility of these two modes of domestic production/consumption was made apparent to me in a discussion that I had with a young musician. He was telling me about his studio which was located in the basement of his parents' home. He had often wished that he could make use of the family piano (which, significantly enough, was only played by his mother) in his recording sessions but, because of its location in a busy part of the house, found it virtually impossible to set up his equipment and make a quiet recording. As a result, he had no alternative but to use commercially-produced piano samples in his recording projects. Thus, even where both these technologies exist within close proximity to one another, the nature of their conventional location and usage in the home precludes any easy reconciliation between them at the level of their social/musical function.

Copyright

Before leaving this section of the thesis on musical practice, I would like to return to the problem of copyright. Much like the legal instruments used by HARP against home recordists (briefly outlined above), copyright has become a powerful tool used by well-known artists, and the music industry itself, in order to inhibit certain applications of new technology that threaten their traditional sources of income. In addressing this issue, I hope to demonstrate again that institutional pressures can have a direct and profound impact not only on specific musical practices, but on the very concept of what music is and can be.

Drafted in 1921 and enacted into law in 1924, the *Copyright Act* established performing rights in musical works in Canada. While government studies and discussions concerning revisions to the Act have been ongoing at least since the mid 1950s, the Act

remained substantially unchanged (with the exception of a few important amendments that will be taken up below) until 1988 when Parliament passed Bill C-60, the first of a series of promised amendment packages.

As in other areas of Canadian law, the original Act of 1924 was heavily influenced by previous legislation in Britain. This has not been without its pitfalls: for example, the definition of a "musical work" contained in the Act--which restricts music to "any combination of melody and harmony, or either of them, printed, reduced to writing, or otherwise graphically produced or reproduced"--is unnecessarily limiting both with respect to its exclusion of rhythm, timbre, and other essential elements of music and to the requirement of fixation in the form of a musical score (Mosher 1989). The definition itself was drawn from a previous British law that had already been abandoned by Britain in 1911 (Ibid., p. 69). From the outset then, the Canadian *Copyright Act* was not only derivative but also out of date.

Music is the only type of artistic work to be specifically defined by the *Copyright Act*; other types of artistic work are described through examples and illustrations, which allows for greater flexibility in the application of the law. With regard to music, this leaves copyright overly committed to a "strategy of forms" (Ibid.). Even with the 1988 amendments to the Act, parts of the original definitions remain intact and the graphical fixation requirement was used as a kind of legal red herring as recently as 1990 by cable television networks in a bid to stall tariff payments to music copyright owners (*Probe* April 1991).

The *Copyright Act* of 1924 also recognized a copyright in sound recordings, piano rolls and other mechanical devices "as if such contrivances were musical, literary or dramatic works" (again, the wording of this section was almost identical to that of the British Act). But this recognition has posed a number of problems: firstly, the law makes a conceptual distinction between mechanical reproductions themselves and the underlying musical (or other) work contained therein (this distinction has more recently become the

basis for the arguments of broadcasters that their signals--their "broadcast day"--attract copyright protection independent of the content itself). As musicians have come to rely on technology as an integral part of their musical practice however, such distinctions have become increasingly problematic.

Secondly, copyright in mechanical reproductions was vested in the owner of the original plate. In Canada, this is usually held to be the record company but, depending on contractual agreements, may also be the artist themselves or an independent producer (recent recommendations for revision of the law have argued that the author of a sound recording should be "the person principally responsible for the arrangements undertaken for its making," i.e., the producer). In either case, there is a fundamental problem in the manner in which the claim of authorship is made: in the case of a musical work, an artist is conceived of as an individual and their claim is based on having made the work (they may assign their economic rights to another party but the actual claim of authorship is relatively straight forward); in the case of a sound recording (a work resulting from a collective process), it is the contractual agreement between the producer or record company, on the one hand, and the musicians, arrangers and engineers, on the other, that sets one party off as employer/copyright owner and the other as employee/wage labourer. In cases of sampling, the compatibility of interests between these two parties, or a lack thereof, has a direct bearing on the degree of protection offered to musicians (Desjardins 1990: 140-141).

Thirdly, all copyrights are not created equal and, although the original law would appear to have given sound recordings equal status with other works of art, the possibility of exercising performance rights in sound recordings (often referred to as "neighbouring rights") was never actually taken seriously in Canada until 1968. By that time, the issue of neighbouring rights was firmly on the international agenda: a number of countries, including Britain, had long been collecting performance and broadcast fees for recordings and had already formulated a set of international agreements--the Rome Convention of 1961.

But in Canada, where 90% of the records manufactured during this period were of foreign origin, it was feared that substantial royalties would soon be pouring out of the country. On the recommendations of a report by the Economic Council,[12] the government amended the *Copyright Act* in 1971 to restrict the copyright in sound recordings to a simple reproduction right (as was the case, for example, in the United States), thus preventing the exploitation of sound recordings as generators of income from performances and broadcasts and, in the process, creating a legal imbalance in the quality of protection afforded two forms of music media--print and recording. Music publishing continues to be valorized over sound recording in the copyright law of many countries despite the fact that its role in musical culture has been drastically reduced since the rise of the record industry (see Fabbri 1991: 110). Furthermore, the legal treatment of sound recordings in the amendment created a basic inconsistency in Canadian copyright law insofar as other forms of mechanically reproduced work, such as film, continued to enjoy a full regime of protections.

The introduction of digital technologies in music production during the past decade has resulted in the development of new kinds of creative activity that have, on the one hand, exacerbated already existing problems in the conceptualization of music as a form of artistic expression and, on the other, demanded that even further distinctions be made in copyright legislation. Here again, technical possibilities are closely linked to economic opportunities: for example, prior to the introduction of digital synthesizers and samplers, no real market existed for individual sounds but now that there is such a market, issues of

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12 Subsequent government studies criticized the report for placing economic issues rather than creative rights at the centre of copyright policy. But the recommendations should perhaps be understood in the context of other nationalist policy initiatives of the same period: such as the Canadian Content regulations which set quotas for Canadian material broadcast on radio and television. In this sense, the Economic Council Report could be interpreted as placing copyright within the purview of broader issues of cultural policy rather than the narrow, legal focus of individual property rights (other countries have developed a similar point of view, see Wallis and Malm 1984, Chapter 6).

economic and artistic rights have come to the fore.[13] As regards these problems, Canada, with its lack of neighbouring rights legislation, has more in common with U.S. than British law.

Throughout these debates there have been a number of recurring issues that touch on basic problems in the conceptualization of music as form, expression and sound. For example, under the present law a musician's sound can in no way be considered as equivalent to a musical "work"; and as mentioned above, musicians seldom own the copyright in their recorded performances because of the contractual agreements made with producers and record companies. Thus, issues of the appropriateness of granting copyright protection to musicians' sounds and the question of actual ownership have been raised by a number of authors.

But even if Canada were to bring neighbouring rights in musicians' performances into legislation, it is doubtful whether they could be used to protect musicians from certain uses of sampling. Samplers allow one to make digital recordings of acoustic sounds or prerecorded sounds, manipulate them in various ways, and then play them from a keyboard, a computer or other device; typically, only a few milliseconds of sound might be recorded and, once incorporated into the rhythm, melody or harmony of a musical work, the precise origins of the sound may be difficult to identify. Proof of ownership and violation of the neighbouring right would thus, in many cases, become almost impossible. In conventional cases of infringement of musical works, it has often been the role of the so-called "expert witness" to establish whether copying has taken place (Der Manuelian 1988).

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[13] Perhaps it is precisely because such a large gap presently exists between new technology, musical practices and market conditions, on the one hand, and Canadian and American law, on the other, that a considerable body of comment and opinion has already appeared in recent years, both in the popular and industry press (e.g., Barry 1987, Bateman 1988, Christgau 1986, Considine 1990, DeCurtis 1986, Dupler 1986, Giffen 1985, Oswald 1986, 1988, Pareles 1986, Ressner 1990, Rosenbluth 1989, Tomlyn 1986, Torchia 1987) and in the pages of respected law journals as well (Desjardins 1990, Keyt 1988, McGiverin 1987, McGraw 1989, Mosher 1989).

In cases of sampling however, where the recording process is so complex and the possiblities for manipulation so great, musician Frank Zappa (who spends a great deal of time creating, and customizing his own samples and doesn't want to see them lifted from his records) has suggested that computer analysis may be the only means of establishing similarity between a sound and its copy (Torchia 1987). But even when ownership can be established, the duration of most samples raises the question of whether the actual amount of material copied is substantial enough to support a claim of infringement.

Similar problems exist with synthesizer programs as well: because it is possible, in theory, for almost anyone to stumble upon the same set of parameters for a synthesizer sound, conclusive proof of copying may only be possible when bugs or other mistakes present in the originals also turn up in the copies (see Tomlyn 1986). In such contexts, ownership becomes defined in negative terms rather than positive attributes. And given that computer software packages designed for editing synthesizer sounds often contain utilities that allow for the random generation of new sounds, the concept of "originality" in this domain can sometimes appear virtually meaningless.

But in the case of sampling, the critical questions are not merely technical ones concerning whether or not the identity or originality of a sound can be established; indeed, in many cases, well known performers have been sampled precisely because their sounds are so unique and recognizable. In infringement cases involving musical works it has always been necessary to prove "substantial similarity"--usually taken to mean a certain quantitative or qualitative amount of musical material--between an original and a copy. But in using a recognizable sample, no matter how brief (for example, the use of less than a second of James Brown's scream in the middle of a Rap record), quantitative criteria become more or less irrelevant. McGraw (1989: 161-165) refers to the concept of "fragmented literal similarity" (perhaps one of the most succinct descriptions, legal or otherwise, of this use of sampling technology) in describing such instances where

similarity is both evident and intended. When recognition is intended, the most relevant question becomes the degree to which unauthorized appropriation constitutes improper use; and to date, there have been no cases that firmly establish either the boundaries of what might be considered as "fair use," or the monetary value of a sampled fragment of sound.

In most discussions, the tendency has been to give vocalists a special status denied instrumental performers: because the human voice has such immediately recognizable tonal qualities, it has often been regarded as the carrier of individuality, personality and identity; vocalists are thus considered by many as having a special moral right in their sounds that instrumentalists do not enjoy to nearly the same extent (Porcello 1991: 77-78). But to consider the voice in such existential terms rather than legal ones risks mistaking mere physical attribute for artistic creativity. And in this regard it is significant that the main arguments for the protection of musicians from unauthorized digital sampling has not been in terms of copyright (which protects only specific artistic creations) but in relation to common law rights of publicity. These laws guarantee individuals the right to exploit their personality, image or name for commercial purposes (as in the case of product endorsements by entertainers and sports figures) and a number of American states and several Canadian provinces permit such exclusive marketing rights (McGiverin 1987, Desjardins 1990). This line of argument clearly places the issue of sound rights outside of the realm of creativity *per se* and into the sphere of notoriety and entrepreneurship.

The problem for instrumentalists is that they are recognized as much by their phrasing as by their sound (McGiverin 1987: 1740)--a quality that is seldom captured by the brevity of most sampling techniques. The distinction is not a trivial one because it really concerns how the law should define value in the recording of musical performances. Some argue that the creation of new, interesting sounds (such as Phil Collins' trade mark snare drum sound) has become so important in the music business today that individual sounds should be protected under copyright law (e.g., McGiverin 1987). Others argue that

the individual object is less important than the musical context in which it is placed (Keyt 1988).

But what may appear to be simply a difference of aesthetics could have important implications. It seems to me that the debate over the uses and abuses of sampling has created an inflated value in sounds as objects of exchange and has obscured other, equally essential aspects of performance as a form of musical practice. As discussed earlier in this chapter, digital sequencers allow musicians to record virtually every nuance of their performances on digital keyboards, drum machines and other devices without actually having to record the sounds produced on the specific instruments themselves; MIDI data generated by the performance can then be edited, arranged and reorchestrated at a later time. Thus, the underlying character of a performance can be fixed in a technical form without any reference to sound at all.

A market for popular songs, arranged and performed by session musicians and stored in the form of digital sequences, has already begun to develop. Furthermore, performances stored in sound recordings can also be translated into digital data and it has become quite commonplace for remix engineers to use recorded performances in conjunction with sequencers to simply trigger synthesized or sampled sounds; in this way, the style and phrasing (the sense of timing and the "feel" of a live drum track for example) can be retained while the sounds are changed in such a way that they bear little, if any, resemblance to the original recording. Again, even if Canadian law supported neighbouring rights in performances, these two uses of sequenced data pose significant problems: conventional neighbouring rights are conceived of in terms of recorded sounds and the protection of performance gestures that have been translated into digital form might require yet another layer of definition regarding this type of fixation; and even once this was in place, the burden of proving ownership, originality, the act of copying, and improper use in cases of infringement in this domain would indeed be formidable.

But in another sense, these new technical capabilities pose a dilemma that remains far beyond the horizon of most present-day copyright concerns: the problem lies at the root of the conception of music as a set of fixed forms--scores, recorded sounds, or even digital sequences--rather than a specific kind of creative activity with its own particular modes of expression. If understood in this way, copyright legislators might become less concerned with concepts of originality and the ownership of cultural goods and develop a more flexible attitude towards different kinds of musical activity--including not only composition but also performance, digital sampling and sound recording--and the various relationships that exist between creation, convention and norm.

Conclusion

The need for a reevaluation of music--as concept, as form, and as performance practice--that is evidenced in the antiquated categories and strategies of copyright law is the direct outcome of a century of changes in the technologies of sound reproduction and their use by both musicians and consumers. The fact that this reevaluation is long overdue is testimony to the enduring character of certain institutions and their involvement with the centres of economic and political power.

In musical practice however, the changes wrought by the employment of new technologies have been swift and far reaching. In the multitrack studio, ensemble musical performance has come to be simulated through a process of layering and synchronizing a series of independently recorded tracks. The process, detached and objective in character, has as much to do with composition as it does with any traditional form of musical performance. Musicians are encouraged to adopt an evaluative position vis-à-vis their work that is akin to that of the producer--a position where, as Hennion suggests--consumption and taste play a significant role.

In adopting the multitrack metaphor as part of its operational characteristics, MIDI sequencing has extended the idea of recording, layering and mixing, but also added a new level of rationalization to the overall process of recording. Musicians who make use of sequencing are drawn to a level of detailed calculation never before realized in musical composition; ironically, this attention is focussed on an attempt to create the impression of the "feel" of a "live" performance. But in the process, the very notion of what is "live" in music becomes increasingly problematic:

> You get so many sounds out of the keyboards now it's incredible, and you want to use all those sounds. You can layer things now, and it still sounds live. I do stuff now in my home studio, and you can't tell it's not live. I can take a sampled drum track and quantize it so you can't tell it's not a live drummer. (Art Neville quoted in Jackson 1992: 29)

The "live" has become little more than a "sound" produced and consumed in private. And the domestic space itself has become one of the primary sites of these new technological practices--a private and increasingly isolated site of musical production and consumption.

Given the profound nature of some of these changes in musical practice, it is perhaps not surprising that copyright law has been overly focussed on the most spectacular cases of sampling; but it has done so at the expense of a more thorough-going analysis of the nature of musical practice and its own commitments to specific forms of musical reproduction.

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Chapter 10:

Towards a New Model of Musical Production and Consumption

> So much time can be wasted investigating every instantly available sound and treatment that the really interesting possibilities of very limited options are forgotten...Having a limited palette is much more of a spur to creativity than having an endless choice of predetermined material. What has become interesting is the idea that artists are people who specialize in judgement rather than skill. And this of course, reopens the question of who can use that job description.
> (musician/producer, Brian Eno quoted in *Mix* 16 (6), June 1992, p. 30)

Digital synthesizers, samplers, drum machines and sequencers offer musicians a vastly expanded range of options with which they may create new sounds and music; this much, it would seem, is indisputable. But, unlike the musicians' press, with its obsession with options, product features, technical "specs," and the like, many musicians, even those such as Brian Eno (quoted above) who make constant use of electronic technology in their creative work, regard the new generation of musical instruments as a mixed blessing: mere "options," no matter how extensive, do not a work of art make. Taken on its own however, this can hardly be regarded as a radical statement: music periodicals are constantly reassuring their readers that, despite the power of their new-found tools and the wealth of available sound material, it is they, the musicians, who are the creative masters of the "home studio"; indeed, by comparison, Eno's emphasis on the creative virtue of limited options appears not so much profound as puritanical.

Eno's second statement is more provocative: the endless availability of prefabricated materials has created the conditions for a new kind of musical practice where the

exercise of taste and choice is as important as traditional musical skills. However, this not only reopens the question of who may now lay claim to the title of "artist" or "musician," as Eno suggests. It changes, in a fundamental way I would argue, the very nature of contemporary music-making: a new kind of consumer practice now lies at the very heart of musical production in the digital studio; indeed, with the introduction of digital technologies and their attendant uses, the distinction between production and consumption has become increasingly blurred and, to a large degree, meaningless.

As I have attempted to demonstrate throughout the dissertation, this overall movement has taken place within a cultural formation that is complex, composed of a diverse set of institutions, pressures, mediations, and individual interests. Furthermore, the imbrication of production and consumption, at every level of the cultural formation, has resulted in a curious mixture of creative energy, economic opportunity, and associational complexity, on the one hand, and an assortment of musical, technical and economic dependencies, on the other.

The dynamic forces at play within this interweaving of production and consumption can be seen, firstly, within the synthesizer industry itself, in part, as a result of the shift to microprocessor-based technology during the 1970s and '80s. As described in Part I of the dissertation, these forces exerted themselves in a variety of ways. In terms of the design of the instruments themselves, many manufacturers have adopted a product development strategy that makes use of a combination of custom chip design and standard microprocessor components. In itself, this hardly seems unique: all industries consume (raw materials, parts and components from outside suppliers, labor power, etc.) as much as they produce; and as described in Chapter 2, by the turn of the century, an entire sector of the piano trade had been built around the ready availability of prefabricated parts from a growing piano supply industry. But what is different about the digital musical instrument industry is the degree to which technical innovation within the field has become dependent

upon the general level of sophistication and the market success of technologies originating within the computer industry. Furthermore, developments in the industrial sector are strongly linked to musicians as a market: the strategy of continuous innovation has created the need for continuous consumption. This in turn has placed considerable pressure on the manufacturers to place an increasing emphasis on market criteria even at the initial stages of instrument design; the limitations of MIDI as a technical specification are the outcome of such pressures and criteria.

In part, as a result of the increased complexity of the new instruments and because of their reproductive capabilities a small cottage industry dedicated to supplying new sounds for digital instruments has grown. This in itself has created the basis for an entire set of dependencies: on the one hand, musicians have come to rely on manufacturers and third-party suppliers for new and interesting sounds; and on the other, the cottage industry itself has become dependent on decisions made by the larger manufacturers, the general success of their instruments in the marketplace, and on their promotional and distributional resources.

As regards the musicians' magazine industry, this area of the cultural formation is equally complex. Magazines have played a key role in the division of musicians into discreet market segments; this allows them to act as a more efficient promotional vehicle for advertisers and, increasingly, as a source of marketing information as well. Furthermore, they have come to act as a surrogate "community" for some musicians, adopting the conventional rituals of musicians interaction and offering a dubious form of career exposure.

Musicians magazines have played an important role not only in promoting the new technologies but in creating a more general climate where the values of consumption could flourish; linked to the creation of this general climate is the simultaneous valorization of the notion of "progress" in musical instrument design. Finally, the mobilization of the home

as a site of production was encouraged by the magazines; the specific contours of this phenomenon, in terms of gender and family interaction, stands in marked contrast to earlier constructions of home music-making in the music press.

Computer networks and user groups have also been an important factor in the growth and dissemination of technical knowledge among some musicians. Patterned after similar kinds of associations within computer culture, these groups of synthesizer enthusiasts also display a certain continuity with the (largely male) radio hobbyists of the early twentieth century: in particular, in their obsession with the idea of communication, in their interest in technology for its own sake, and in their democratic idealism expressed as an emphasis on self-realization through technology. In the case of the early days of the International MIDI Association, this combination of characteristics proved to be disasterous in the face of pressure from the musical instrument industry. But equally important, these groups fostered an even more highly intensified form of identification between individuals and the objects of consumption (and the manufacturers that produce them) than did the magazines. This too, has been a characteristic trait of computer culture during the past decade.

With the introduction of electronic and digital technologies, musicians themselves have had to rethink their musical practices. In the recording studio they have adopted a distanced and objectified view of sound making (the view of the producer) and, with MIDI, an even more rationalized and calculated form of control over sound production has developed. These shifts in musical practice have been marked by an expanding set of sophisticated techniques and an emerging vocabulary (albeit vague and metaphoric in nature) that directs the attention of the musician and the listener to selected aspects of the music-making process. In this context, the redefinition of familiar terms such as "sound" and "live" mark an even more significant shift in the conceptualization of musical practice

in relation to sound recording as the dominant mode of production in contemporary musical culture.

At the same time musicians have found themselves increasingly drawn towards a particular mode of consumption in order to supply themselves with not only instruments and recording devices but with the very sounds that they need to produce music. This consumer behavior has manifest itself along several different dimensions. Firstly, there has been an expansion in the range of technology deemed necessary for contemporary pop production: musicians no longer find it adequate to simply own a guitar, or a keyboard, and an amplifier; the average home studio is potentially filled with musical gear, including multiple synthesizers, samplers and drum machines, computers and software, mixers, signal processors, and tape decks. Even a modest studio can cost several thousand dollars.

Secondly, there is a new temporal dimension that has been added to the musicians' purchasing patterns. Whereas a musical instrument was once understood to last for years, the increasing pace of technical innovations within the microprocessor-based musical instrument industry during the 1980s suggests that an investment in high technology will likely become obsolete within one or two brief product cycles. The increased frequency of instrument purchases is attested to by the large used instrument market for keyboards, signal processors, and the like.

Thirdly, there now exists what might be referred to as an increase in the depth of the music market. The buying and selling or prefabricated sounds for digital instruments has become a new area of the market that exists somewhere below the level of the instrument itself, in essence, forming a new sub-level of cultural commodification. These three dimensions--the increased number and diversity of products, the frequency of purchase, and the increasing depth of commodity relations--have come to characterize the pattern of consumption among many musicians since the early 1980s. But as I have argued throughout the dissertation, the significance of this pattern does not lie simply in the fact that musi-

cians appear to consume more now than in the past; but rather, a pattern of consumption has become a an integral aspect of their musical production practices and this suggests that a more fundamental shift in the conceptualization of music-making overall has occurred.

There is a sense, however, in which the developments that I have described here within this particular cultural formation are part of a much larger shift in the nature of cultural production and consumption in the late twentieth century that is perhaps, in structural terms, not unlike that which occurred nearly a century ago. As discussed in Chapter Two of the dissertation, Craig H. Roell (1989) has interpreted changes within the piano industry at the turn of the century (in particular, the rise of the automatic player piano) as part of a set of larger pressures within capitalism leading to the creation of a broad-based consumer culture. Among those pressures was the development of powerful new technologies of mechanical reproduction: not only the player piano, but more characteristically, the phonograph and the cinema. In contrast to the cultural values of the previous Victorian era, with its "producer ethic"--its notions of creativity, and personal achievement—the consumer culture associated with the new technologies was characterized by its apparent "passivity"--its emphasis on effortless recreation, leisure, and instant gratification (Ibid.: 156-159). Of course, much recent scholarship has attempted to overcome the legacy of early twentieth-century theories of "passive" consumption; within Roell's overall discussion, the issue concerning production and consumption is as much one of describing a shift in cultural values as it is an evaluation of the actual character of early twentieth-century consumption *per se*. What I want to argue here however, is that in the late twentieth century, electronic and digital technologies have come to be associated with a new kind of consumer practice that is quite different from both those associated with the piano, during the nineteenth century, and those with mechanical reproduction, during the early part of the twentieth.

The contours of such an emerging pattern of consumption (I hesitate to call it an "ethic") can be observed in a number of areas in popular musical culture: for example, the trend towards the adoption of a kind of consumer practice within musical production that I have described in the dissertation appears to have been complemented by a new kind of active engagement with recorded material on the part of consumers, thus constituting a kind of production practice within consumption. One instance of this phenomenon, can be found in the form of *Karaoke*, a practice, originating in Japan but becoming increasingly popular in the West as well, where consumers are invited to not simply sing along with their favorite songs, but to actually take on the role of lead vocalist performing with pre-recorded arrangements of popular hits.[1] In a panel discussion at the conference of the International Association for the Study of Popular Music held in Berlin in 1991, Japanese scholar Toru Mitsui described this practice as a form of "participatory consumption" and argued that it should be regarded as significantly different from older patterns of consumption with which we have become accustomed. Similarly, ethnomusicologist Charles Keil has suggested that we need to consider this novel form of "mediated-and-live" performance as a kind of "humanizing or, better still, personalization of mechanical processes" (Keil 1984: 94).

In fact, one might use the idea of "participatory consumption" to describe a wide range of similar activities--such as DJ "talkover" in Reggae "dub" music (Hebdige 1987), the mixing and "scratch" practices of Hip Hop, Rap, and dance music (Langlois 1992), or (outside performance contexts) various cassette distribution/exchange networks (Erlhoff 1984)--that have become common in popular music during the past two decades. It is

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[1] Technically, *Karaoke* resembles the decades-old "Music-Minus-One" recordings--a series of recorded arrangements of popular jazz standards where one of the instrumental part was left out in order that the amateur or student instrumentalist could play along. But as a pedagogical tool for aspiring young musicians, the intent of the recordings is quite different from *Karaoke* where the end product is envisioned, from the outset, as a performance which includes a combination of recorded and live elements.

perhaps ironic that at precisely the same moment in history when professional singers have been exposed for having used electronic technology in order to foist lip-synched performances upon an unsuspecting public, an increasing number of that same public, at home, in dance clubs, and in *Karaoke* bars, have been using technology as a means of reclaiming their own voices.

Elsewhere, manufacturers such as Roland and software developers such as Passport Designs have been developing MIDI technologies for the home computer market in the hope of tapping the amateur musical interests of computer owners. By creating standardized hardware and software formats that allow for both the playback and manipulation of songs in the form of pre-recorded MIDI sequencer files, these technologies appear to grant the listener an unprecedented ability to control their listening experiences and to rearrange popular songs to suit their own tastes. In effect, the listener is invited to act as producer/engineer, to experiment in arranging and re-recording practices with material that is familiar, pre-formed, and yet still in a maleable state.

On the one hand, such strategies, if successsful, would go a long way towards realizing the dreams of unconventional creative artists such as Glenn Gould, who, during the 1960s, advocated the development of technologies that would give the listener greater editorial decision-making power over their listening experience (Gould 1966: 59-60). Interestingly, Gould used an expression not unlike Mitsui's to describe the new consumer once given editorial prerogatives: the "participant listener" (Ibid.) or the "listener-consumer participant" (Ibid.: 61). Gould's call for a new technology gave concrete form to similar (though more abstract) concerns voiced by theorists during the same period: for example, Roland Barthes concern for the loss of a certain "musica practica" that had virtually disappeared at the end of the bourgeois period ("qui joue du piano aujourd'hui?") and his desire for a renewed form of practice "c'est, du moins tendanciellement, *donner à faire*,

non pas donner à entendre, mais donner à écrire" (Barthes 1970: 15, 17; emphasis in the original).

On the other hand, however, such possibilities are clearly limited by the technology itself and the manufacturers' own perception of the needs and interests of this new class of consumers. And in this sense, there is again a parallel with nineteenth-century salon music and the manner in which publishers consciously created a music for the home and the technical competence of its players. Indeed, while there appears with the new technologies to be an increase in the level of freedom and creativity afforded the listener, the consumer relationship (as with the musicians' market described in the dissertation) simply shifts to another level of practice.

And outside of music, consumers have adopted a wide assortment of electronic devices during the 1970s and '80s, ranging from home VCRs to computer games, the use of which challenge conventional notions of "passive" consumption. Indeed, in many cases, an emphasis has been placed on the "interactive" character of the new technologies. The specific notion of "interaction" promoted in these instances however is significant: it speaks of a form of "interaction" between subject and object (i.e., user and machine) rather than a form of interaction between individuals. In this way, the objects themselves become a mediating factor between individuals and, more significantly, between them as consumers and the industry as supplier of new technologies. So, whether or not the demands placed on the consumer to "interact" with the objects of consumption results in a form of self-realization or simply more consumption is still an open question: with each of these new technologies, one finds the same ambiguities as regards empowerment and dependency, creative potential and formal constraints, all of which appear to lead to renewed levels of consumption.

Thus, the blurring of production & consumption within the music industry that has been described in the present dissertation, can perhaps be seen as part of a broader cultural

phenomenon occuring both at the other end of the conventional production/consumption spectrum in music and, outside of music, in a range of other media as well. In becoming "consumers of technology," many musicians have been able to take advantage of the enormous productive potential of new digital technologies; at the same time however, they have witnessed the incursion of capitalist relations upon their creative practices at the most fundamental level and found it necessary to adopt increasingly mediated forms of communication with one another. Within the high-intensity context of technical innovation and capitalist marketing, this tension--between the desire to create, communicate, and consume--has become increasingly problematic, especially for young, amateur musicians and aspiring semi-professionals:

> I could not believe how many possibilities these instruments offered me--particularly the computer and software combination. My only real problem was coming to terms with the continuing march of technology. A couple of great drum machines were released...Samplers, too, improved dramatically and came down in price. I salivated in shops and wondered how I was going to manage without them. (home recording musician, Kofi Busia, quoted in *Electronic Musiican* 4 (7), July 1988, p. 24)

And indeed, as the technologies of electronic and digital reproduction have increasingly become the central mode of production, distribution and consumption in popular music, it is clear that learning "to manage," both with and without new technology, has become one of the essential ways in which many contemporary musicians also learn to define themselves, their relations with others, and the "sound" of their music.

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Canadian Music Trades

Computer Music Journal

Down Beat

Electronic Musician

the IMA Bulletin (Official newsletter of the International MIDI Association)

Keyboard (formally *Contemporary Keyboard*)

Secondary Periodicals Consulted (incomplete holdings)

db, The Sound Engineering Magazine

Recording Engineer/Producer

Home & Studio Recording (US & UK editions)

Music Technology (US & UK editions)

Roland Users Group (Roland Corporation)

The Music Trades

"Transoniq Hacker" (Independent user group newsletter)

Other Musician-oriented, User Group, Consumer & Music Industry Periodicals Surveyed

Bam, LA's Music Magazine; Bass Player; Billboard; Clavier; DJ Times; Electronic Music Educator; EQ; First Reflection (Alesis Corp.); *Guitar Player; Hip-Hop Connection; Home Keyboard Review; Key Issues* (Peavey Electronics Corp.); *Instrumentalist; International Musician and Recording World; MIDI Magazine* (Atari Corp.); *Mix; Mix Mag; Modern Drummer; Modern Keyboard; The Music & Computer Educator; Music & Sound Retailer; Music, Computers & Software; Music Educator's Journal; Music Inc.; Music Market Canada; The Music Paper; Musical Merchandise Review; Musician; New Musical Express; Roland News Link* (Roland Corp. UK); *Rhythm; Rolling Stone; Spin; Stage & Studio; Street Sound; Up Beat Daily.*

APPENDIX

Personal Interviews & Conversations (By telephone & in person)

Musical Instrument Industry

Dave Smith, former President, Sequential Circuits, (designer of the MIDI spec.), 21 Nov. 1988.

Marty Frafu, engineer, Roland (USA) Corporation, 01 Feb. 1989.

Bill Southworth, President, Southworth Music Systems, 03 April 1989.

Jeff Rona, President, MIDI Manufacturers' Association (MMA), 06 April 1989.

Jim Cooper, President, J.L. Cooper Electronics, 18 April 1989.

Karen Pultz, Sales Representative, Korg (Canada), 06 May 1990.

Glenn MacGregor, National Sales Manager, Electronic Musical Instrument Division, Casio (Canada), 06 May 1990.

Lorne Weiner, Sales Representative, Tartini Musical Imports, Richmond Hill, Ontario, 06 May 1990.

Harry Tonogai, National Manager, Advertising & Public Relations, Yamaha (Canada), 07 May 1990.

Al Kowalenko, Executive Secretary & Manager, Music Industries Association of Canada (MIAC), 07 May 1990.

Frank Foster, Director of Specialty Markets, Atari Computers, 17 June 1990.

Mikel Estrin, International Sales Manager, Passport Designs, 17 June 1990.

Thomas A. Sheehan, General Manager, Yamaha Communication Center, New York, 02 Nov. 1990.

Jerry Kovarsky, Director of Marketing, Ensoniq Corporation, 08-09 Nov. 1990.

Albert Charpentier, Vice President of Engineering & Co-Founder, Ensoniq Corp., 08 Nov. 1990.

Bob Yannis, Senior Design Engineer & Co-Founder, Ensoniq Corp., 08 Nov. 1990.

Gary Trapuzzano, Director of Engineering, Ensoniq Corp., 08 Nov. 1990.

Bill Motley, Head of Software Development, Ensoniq Corp., 09 Nov. 1990.

Steve Cascia, Director of Customer Service, Ensoniq Corp., 09 Nov. 1990.

Steve Alexander, Ontario Regional Manager, Roland (Canada) Corporation, 09 May 1991.

Robert Currie, Project Engineer, Digidesign, 18 Oct. 1991.

Magazines, User Groups & Computer Networks

Lachlan Westfall, President, International MIDI Association (IMA), 21 Nov. 1988.

Jim Aiken, Associate Editor, *Keyboard* magazine, 01 Feb. 1989.

Vanessa Else, former Senior Editor, *Electronic Musician*, October 1989.

Perry Leopold, Director, Performing Artists Network (PAN), 03 April 1989.

Jane Talisman, Editor, *Transoniq Hacker*, 05 April 1989.

Kevin Laubach, programmer, Digital Music Service, (former software editorial consultant for *the IMA Bulletin*), 18 April 1989.

Doug Provisor, keyboards manager, The Guitar Center, (former technical editor for *the IMA Bulletin*), 18 April 1989.

Terry Day, President, Music Maker Publications (*Music Technology, Home & Studio Recording, Rhythm*, and others), 08 Nov. 1989.

David Henman, Editor, *Canadian Music Trades, Canadian Musician*, 06 May 1990.

Charles C. Baake, Senior Vice President, Miller Freeman Publications; Group Publisher, The GPI Group (*Guitar Player, Keyboard*, and others), 17 June 1990.

Steve Wigginton, Director of Circulation, ACT III Publishing (*Electronic Musician, Mix*, and others), 17 June 1990.

Robert Brodie, Manager of User Group Services, Atari Computers, 17 June 1990.

Bob O'Donnell, Editor, *Electronic Musician* (former Editor, *Music Technology*, US edition), 18 June 1990.

Steve Oppenheimer, Associate Editor, *Electronic Musician*, 18 June 1990.

John Maher, Publisher, *Down Beat*, 18 June 1990.

Frank Alkyer, Editorial Director, *Down Beat, Music Inc., Up Beat Daily*, 18 June 1990.

Craig Anderton, Freelance Columnist for numerous magazines and user group newsletters (Founding Editor, *Electronic Musician*), 11 July 1990.

Domenic Milano, Editor *Keyboard*, 19 July 1990.

Scott Wilkinson, Editor-in-Chief, *Home & Studio Recording* (former Editor, *Music Technology*), 25 October 1990.

Atari Users Group, Ottawa, October/November 1990.

Musicians, Recording Engineers & Reaserchers

Bruce Pennycook, Composer & Associate Professor, Computer Music, McGill University, Montréal, 15 & 22 Nov. 1988.

Gareth Loy, Software Coordinator, Computer Audio Research Laboratory, University of California, San Diego, 28 Nov. 1988.

Tom Rhea, Musician & Professor, History of Electronic Music, Berklee College of Music, Boston, 09 Feb. 1989.

Callum MacLean, Recording Engineer, Tower Studios, 28 Oct. 1989 & 09 Nov. 1989.

Fish Turn Human, Band, Newcastle, Scotland, 28 Oct. 1989.

Dave Garrett, Recording Engineer, Tower Studios, Glasgow, 04 Nov. 1989.

Another Bendy Window, Band, Edinburg & Glasgow, 04 Nov. 1989.

Eyes of Rita, Band, Glasgow, 09 Nov. 1989

Midnight Crisis, Band, Glasgow, 05 Nov. & 14 Nov. 1989.

Craig Tannock, Producer/Manager/Owner, Tower Studios, Glasgow, 16 Nov. 1989.

Kevin Key, Recording Engineer, Ça Va Studios, Glasgow, 10 Nov. 1989.

Helen Clark, Chief Administrator, Ça Va Studios, Glasgow, 10 Nov. 1989.

Anna McGarrigle, Singer & Instrumentalist, Kate & Anna McGarrigle, numerous conversations during the recording of an album, Winter/Spring 1990.

Pierre Marchand, Record Producer & Sound Engineer, former Keyboardist for the Luba band, 30 Jan. 1990.

Pierre Gauthier, Freelance Musician & Arranger, Montréal, several conversations, Winter 1990.

Diane LeBoeuf, Freelance Sound Engineer/Mixer, Montréal, several conversations, Winter 1990.

Ed Eagan, Musician & Sound Engineer, Twelfth Root Studios, Ottawa, 06 March 1990.

Jim Burgess, Musician & MIDI Specialist, Owner of Saved by Technology, Toronto, 07 May 1990.

Tony McAnany, Musician, Coordinator of Special Projects (Sounds/Videos) Ensoniq Corporation, 09 Nov. 1990.

Michael Nicoletti, Recording Engineer & Yamaha Professional Audio Representative, NYC, 01/02 Nov. 1990.

Ed Wilson, Musician & MIDI Specialist, Saved by Technology, Toronto, 07 Feb. 1991

John Oswald, Musician/Tape Composer, Toronto, 08 February 1991.

Owen Clark, Music Consultant, Clark Productions, Winnipeg, 10 May 1991

Tim Brady, Composer/Electric Guitarist, Montréal, 10 May 1991

Clive Perry, Sound Engineer/Sound Designer for Film & TV, Regional Representative for Digidesign products, Winnipeg, 10/15 May 1991.

Students at Concordia University

Stephen Albanese

Dan Fontaine-O'Connell

Jennifer Gordon

Kier Keightly

Greg Smith

Haig Vartzbedian

Patrice Vermette