

Shaping Music: A Design Story of Audio Culture

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Rewind Remix Replay: Design, Music and Everyday Experience showcases the role that design plays in shaping our experience of music. The devices on which we listen to music, the instruments musicians play, the images of bands and concerts we regularly see and the environments where we buy and listen to music together constitute a material culture of music. To examine how today's music culture has evolved, it is beneficial to understand the processes of design and manufacturing that have shaped music's materiality. Most of the music we listen to today is mediated: it comes to us through radio waves, the Internet, compact discs, MP3 players, amplifiers, speakers, headphones and other devices that mediate sound. The processes and products of music mediation are often created and manipulated by design. Currently enjoying significant media attention, design has captured the imagination of businesses, cultural institutions and the public. Industrial designers, interaction designers and graphic designers who create artifacts for popular mass consumption have become trend-setters and cultural mediators. They have demonstrated that they can play a significant role in fashioning our material landscape and thereby influence patterns of day-to-day living. Posters of rock musicians on bedroom walls have transformed the lives of teenagers; products such as iPods have almost entirely altered how we buy music and where we listen to it; software programs like Napster and Limewire have generated new ways to store and share our tunes.

Rewind Remix Replay brings into focus the role of mediated music in everyday life, starting with one of the more important technological innovations—the long-playing 33 rpm microgroove vinyl record introduced in 1948, and leading to conceptual products such as Yamaha's newest synthesizer, the Tenori-on, that might become

mainstream in the future. These products and images contain the personal stories of our relationship to music, and collectively they illustrate music's recent history. They are iconic examples of design experiments as well as unique demonstrations of engineering ingenuity. They have aided musicians in creating unique new sounds and have given fans and audiophiles access to musical genius. These material things are signifiers of a constantly evolving audio culture—a culture that is visible in the chronicles of their design journeys and narratives of their everyday use. The exhibition considers several themes: transformative technological breakthroughs, such as the vinyl record, transistor, Moog synthesizer, Walkman and MP3 player; the creative practices of users and musicians who modify existing equipment like turntables; the graphic packaging of music, from album art to music videos; the shift from music as a communal experience to an isolated private activity.

Rewind Remix Replay is structured around five key object categories produced after World War II that have played a key role in shaping the way music is produced and consumed: boomboxes, personal stereos, turntables, electric solid body guitars and synthesizers. Two of these, boomboxes and personal stereos, primarily function as playback devices for music consumption; two of them, electric solid body guitars and synthesizers are instruments of music production; and the turntable, which originally was designed as a device for listening to music, operates today as a musical instrument. Each of these objects lives in an ecosystem—a network—that includes a wide range of other objects. The ecosystem of personal portable stereos like the iPod, for example, signifies a network of relationships that includes the earbuds, iTunes software, iPod advertising, the Nike+iPod kit, etc. The network represents a snapshot of these objects at a given moment in time, but evolution is ongoing in response to technological changes, user behaviors, economic pressures, etc.

And while it is important to recognize the significance of artifacts in the creation of music culture, it is also critical to acknowledge that the meanings of these material

goods are socially constructed. New technologies emerge and become a part of everyday life because people adopt them into their daily routines, often modifying them in the process. Music culture is as much a result of creative social practices as it is a result of technological innovations.

Design in Contemporary Society

“The central theme of design is the conception and planning of the artificial.”¹ Design, broadly defined, is the creative process of fashioning things. And the things with which designers populate the world range from the tiniest pushpins to the largest cities. Urban designers and landscape architects create cities and shape terrain; architects and interior designers create buildings and interior spaces; industrial designers develop products; graphic designers develop visual communication systems. Max Bill, director of the legendary German design school Hochschule für Gestaltung in Ulm, once explained that design’s task is “to participate in the making of a new culture—from a spoon to a city.”² In other words, design shapes many of the physical aspects of our living environment, and in this process, contributes in the creation of a material culture. Design also plays a critical role in converting technologies into usable consumer goods. Generally invisible in the domestic sphere, technology enters the everyday lives of people only when it materializes into products. According to Raymond Williams, “a technical invention as such has comparatively little significance. It is only when it is selected for investment towards production, and when it is consciously developed for particular social uses—that is, when it moves from being a technical invention to what can properly be called available technology—that the general significance begins.”³ Design, by giving physical form to technology, plays a key role in its materialization, humanization, and socialization. In addition to its relation to technology, design is also closely tied to commerce. The practice of industrial design occurs within corporations in close conjunction with business divisions to ensure that what is

designed sees the light of day. In other words, it is the role of the marketing and manufacturing divisions of corporations to ensure that design ideas leave the studio, make their way to retail outlets and eventually into people's homes. These processes give tangibility and therefore meanings to things.

Design and production, however, play only a partial role in this process; it is through the cultural activity of consumption that people themselves make sense of the physical world and create a material culture. All things—mundane and extraordinary, simple and complex—are essential components of the culture of everyday life. The cities we live in, the buildings we occupy, the spaces we move through, the things we use and the images we gaze upon mediate our experience of the world. In other words, they have the means of shaping our world. Things themselves have agency, and therefore in addition to being designed by us, things in turn design us. Winston Churchill once said: “we shape our buildings; thereafter they shape us.”⁴ Churchill's observation can easily be extended beyond buildings to all things. People and things configure each other. Derived from Latin *con* (together) and *figurare* (to shape), the word “configure” succinctly encapsulates the reciprocal form of the engagement between people and things. This relationship directly influences how we produce our social structures and cultural forms.

Design's core mission is to fashion things so that we may have meaningful interactions with the material world. But meanings are neither inherent properties of the things themselves, nor do they exist entirely in the human mind; they are suspended in the space between us and all that is around us. Meanings emerge and change continuously as we interact with the things that surround us. For example, the primary meaning of a chair is something in which one sits. However, in a cramped office, the chair may be used to hold books (in this case it takes on the meaning of a shelf); in certain situations it may be propped against a door to prevent someone from coming into a room (it becomes a barricade); or if it is used as a throne by a king or queen, it takes on meanings of power. Meaning is not something

that is found in or “designed into” objects; it arises in daily routines and is constructed as people make sense of the things they use. However, the designer can facilitate certain desired sense-making practices through the object’s form, color, texture, materials and surface qualities. Designers of the objects, graphics, software, interfaces and environments used in the production and consumption of music are active agents in the creation of a music culture. Audiophiles and music fans, too, through their use of these iconic and innovative products, are passionate participants in this process.

Popular Music in Everyday Life

“Whether ancient or modern, music culture is a microcosm of the larger socio-culture.”⁵ Popular recorded music is omnipresent: it exists in almost all forms of common entertainment. As Shepherd and Wicke remark, “music is an activity central rather than peripheral to people and society.”⁶ This presence manifests itself at work and at home, in public and private spaces, as foreground and as background in such locations as bars, cars, malls, elevators, living rooms, airports, etc. Radio, television, film and the Internet are capable of feeding a steady, endless stream of music into our lives. This ubiquity reveals that music is a significant contributor in the formulation of cultural practices and therefore invaluable in understanding everyday life. Popular music exists within a clustered network of consumers, corporations and commodities. This network is fluid, and subject to changes attributed to technological advances, economic conditions, governmental regulations, professional organizations, etc. It is through this network, which is active in retail and media spaces (such as malls, clubs, Internet) and manifests itself in such products as portable stereos, CDs, turntables, laptop computers, etc. that music enters everyday life.

Objects Used in the Production and Consumption of Music

“Music technology—any technology—is not simply an artifact or a collection of artifacts; it is rather bound up in a social system, a ‘seamless web,’ as is often described.”⁷ Technologies are experienced through their material and social dimensions, and in most cases, it is the experience rather than the technology that the user seeks. These experiences include the production of music (its making and marketing), its consumption (buying and listening to it), its distribution (online or in stores) and its storage (in analog and digital formats). All that we employ in performing these myriad functions are part of a “product milieu...the aggregate of material and immaterial products, including objects, images, systems, and services, that fill the lifeworld.”⁸ The co-existence of material and immaterial forms is particularly relevant in context of the rapid digitalization of electromechanical technologies and the explosive growth of peer-to-peer file sharing on the Internet. The product milieu of music has been morphing steadily as software is replacing hardware, as touch screen interfaces are supplanting physical knobs and buttons, and as laptop computers and smart phones are rapidly expanding their capabilities through clever applications.

Technological Evolution, or Format Obsolescence

The evolution of personal, portable stereos offers a classic case for the examination of technological obsolescence. Introduced in 1979, the Sony Walkman was the first such device that allowed people to listen to recorded music while on the run. It was quickly adopted, largely by youth, and became a substantial market success. Several variations later, it was pushed aside by the compact disc player, the Sony Discman, which signaled a shift away from analog to digital music. This device was followed by a brief interlude of the relatively unsuccessful mini disc player, the Sony MD Walkman. By this time, a large number of major electronics manufacturers had entered the market and Sony no longer had its competitive edge. Finally, the version we know today, the MP3 player, appeared in 1998 and is now manufactured by over 75 different companies, in hundreds of different designs. All these devices operate

on a variety of different technological platforms, and have spawned several software and hardware solutions to allow interoperability among them. As emerging technologies appear through new products and are popularly adopted, they displace older technologies and products. However, it is important to recognize that these earlier technologies do not entirely die off; they continue to have an afterlife in some form within specific groups of people. As new products are introduced, the material landscape undergoes gradual mutation. The new and the old often co-exist during the transition phases, and with greater and greater disconnect as the newer technologies diffuse and become central to everyday life. As the devices used in the consumption of music slip away from popular use, so do the media associated with them. The first long-playing records (LPs) were pressed in 1948, cassettes were introduced in 1964, compact discs in 1982 and the MP3 format for digital audio in 1987. Though the ubiquity of MP3 players may suggest otherwise, all formats are still being actively produced and consumed. It is not entirely unusual to find music lovers who own and maintain certain sections of their collection in vinyl, CD, and MP3 formats simultaneously, though they may routinely use only one media type. In many cases, certain media forms have lost some of their use-value, but in the process have acquired much more symbolic and nostalgic value. ““Vinyl records are just a small scratch on the surface when it comes to total album sales—only about 0.2%, compared to 10% for digital downloads and 89.7% for CDs,’ according to Nielsen SoundScan—but these numbers may underrepresent the vinyl trend since they don't always include sales at smaller indie shops where vinyl does best.”⁹ Can vinyl be declared obsolete when it continues to be used, albeit in significantly lesser quantities and in niche markets? According to the Recording Industry Association of America (RIAA) statistics, vinyl LPs constituted 9.2% of the total United States music sales in 1989, and 0.6% in 2006. Similarly, full-length cassettes for the same time period made up 54.8% in 1989 and 0.8% in 2006. However, the RIAA also reports that “vinyl continued to stage a comeback as the format more than doubled year-over-year to \$57 million, the highest level since 1990. A favorite product of audiophiles and devout fans, shipments of vinyl were bolstered by the roll out of both

new release and catalog material.”¹⁰ When, therefore, can things be declared obsolete? Though large quantities of products are discarded as they fall out of use, it is not unusual to find a few samples handed down to others, stored in garages for nostalgic value, re-purposed for other applications, or displayed in museums. Their quantities, however, are too insignificant to have substantial impact on the durable goods economy or the environment. Though many of these products may be declared technologically obsolete, they are by no means culturally obsolete.

Defining Moments of 1948

The exhibition *Rewind Remix Replay: Design, Music & Everyday Experience* starts with two of the more significant events of 1948, the release of the 12-inch (30 cm) Long Play (LP) 33 $\frac{1}{3}$ rpm stereo microgroove record by Columbia Records and the announcement by Bell Labs of the invention of the transistor. Both inventions played a significant role in the evolution of playback devices. The 78 rpm record existed prior to the 33 rpm record, and the 45 rpm record was released in 1949 by RCA in response to Columbia’s format. Eventually, the 78 rpm record was phased out, and after a brief period of uncertainty between 1949 and 1950 about which of the two, 33 or 45 rpm speeds would prevail, the 33 rpm record emerged as the more popular format. However, by then both formats had established their own niche markets and they continue to coexist today. In addition to the unique markets for these record types, by the 1950s, the record players people used in their homes were designed to handle all the speeds so that consumers did not have to choose between formats. The transistor, developed in replacement of the vacuum triode, allowed for tremendous miniaturization. Transistors were smaller and used less power, while the large vacuum tubes were more fragile and tended to heat up. The pocket radio, the Walkman and all other portable devices that followed used transistors. More importantly, they led to the development of integrated circuits, central to all electronic products today.

The Changing Nature of Music Consumption

The evolution of recording formats from the vinyl record, the cassette, the CD and the MP3 is a demonstration of miniaturization. While the vinyl record is a tangible object, a dense 12-inch black disc, the MP3 is intangible computer-readable data—it has no body. “It is now a commonplace observation (to the point of weary cliché) that the explosive combination of tiny, inexpensive electronic devices, increasingly ubiquitous digital networking, and the world’s rapidly growing stock of digital information is dramatically changing our daily lives.”¹¹ One of the results of this digital revolution has been the definite and steady miniaturization and dematerialization (also referred to as demassification) of objects. In the case of music, the advent of digital technologies triggered the shift from analog to digital signal and had a significant impact on patterns of production and distribution. However, consumption of popular music changed with the stellar rise of the MP3 file format. These audio files are much smaller in size, making them immensely portable. The quick proliferation of these files was aided by a growing number of fast Ethernet connections in households, dormitory rooms, computer laboratories at universities, and at business locations, as well as cheaper and better computing equipment. “From the time that computer makers began including CD drives in personal computers (augmented later with good quality audio speakers) the music listening habits of many white-collar workers, students and others who use personal computers on a daily basis have undergone significant change.”¹² The MP3 file is as versatile as it is portable, because it can be “ripped” from and “burnt” onto a compact disc, it can be saved on any device that has a hard drive, it can be easily transported over the Internet and it can be swapped between people who have never met. And, it is invisible. It is ephemeral not corporeal, it cannot be seen or touched but it can be heard. As a digital file it never degrades, and it has eroded the difference between original and copy, as each subsequent reproduction of the file sounds just like the first one.

As recording and storage technologies changed, new products (such as reel-to-reel players, 8-track boomboxes, cassette decks, CD players, MP3 devices, etc.) were designed so as to make these formats available to consumers of music, and gradually new forms of consumption appeared. Before digital compression of sound into audio files and prior to the availability of online shopping, the primary location where people bought music was the record store. However, since the emergence and adoption of these two technologies, patterns of consumption have changed in a variety of industry sectors. In the music industry, large retailers with brick-and-mortar stores such as Tower Records, Virgin Records and Sam Goody's have either downsized, disappeared or been swallowed by other institutions. Today, a good amount of the music is bought online at stores such as Amazon, or at retail outlets like Best Buy or Walmart, or downloaded through sites like iTunes, Napster, etc. Fortunately and interestingly, in spite of these developments, and in spite of a struggling global economy, several independent record stores have been doing well. According to Kimber Lanning of the Phoenix record store Stinkweeds: "while media beats the drums of the collapse of independent stores and the complete shift of music buying to downloading, I can say that Stinkweeds has been doing well. I am selling more CDs and vinyl records than ever before, and I can name several other independent store across the nation who are in a similar situation."¹³

The downloading of music is a private experience that one can engage in at any place and any time, while buying music from a store requires public engagement. While one is almost entirely virtual and accomplished with a few clicks of a mouse, the latter involves the physical handling of CD jewel cases and record sleeves; the first is a detached and isolated event, the second a tangible, communal event. In a recently published statistical accounting of music sales in the United States, *The New York Times* reports that vinyl sales peaked in 1978, cassettes sales in 1988 and CD sales in 1999.¹⁴ The total sales volume figures are incredibly revealing: between 1973 and 2008 vinyl sales add up to \$8.1 billion, cassette sales to \$6.1

billion, CD sales \$19.4 billion, while downloads to \$1.8 billion total. In other words, the compact disc format continues to dominate the market to date.

Five Object Ecosystems

The five objects—the personal portable stereos, boomboxes, turntables, electric solid body guitars and synthesizers—serve as examples of how music culture has evolved over time.

The Personal Portable Stereo

The pocket radio, a device that could be that small because of the invention of the transistor, can be called the first truly portable music-playing device. The Regency TR-1, developed by I.D.E.A (Industrial Development Engineering Associates) of Indianapolis and introduced in 1954 for \$49.95, was the first such product to make it to the market. It was followed closely by Sony's (the company was then called Tokyo Tsushin Kogyo) "pocketable" TR-63, which was a significant commercial success. However, the small speaker and earphone had poor sound quality, and it was Sony's Walkman with its high-fidelity stereo headphones that transformed the world of personal listening. While several other transistor radios and portable cassette players were manufactured in the 1960s and 1970s, none were small enough to be truly portable or had decent sound quality to make them popular. Introduced in 1979, the Walkman created a new standard in portable sound and was almost instantaneously a worldwide market success. While other portable record players, cassette players and 8-track playback devices had existed prior to the Walkman, none of them acquired quite the popularity of the Walkman. The Walkman had much superior sound, it was significantly smaller (partly because it did not have recording capability) and it was marketed heavily by Sony. Several corporations such as Panasonic, Aiwa, Philips, RCA and others started making portable cassette players following the success of Sony's Walkman. As technology

changed and newer formats developed, Sony introduced the Discman to play compact discs, and later followed with MP3 players. Considering the popularity and success of portable music players like the Walkman and Discman, the debut of a mobile MP3 player was imminent. The first portable MP3 player to be released in the United States was the Rio, from Diamond Multimedia, in 1998. Since then, many more have showed up on the market, and Apple's MP3 player, the iPod, was first announced at a news conference in Cupertino, California, on October 23, 2001. Its sales have risen astronomically since its introduction, and the company sold 10.2 million units during the fourth quarter of 2009 that ended on September 26. A crucial product in the emerging landscape of digital music, the iPod has become fetishized rather quickly. Described as a cult object, it has become a cultural commodity that has changed how music is shared, transported, distributed, stored and consumed. The iPod is the winner of several design awards and its ubiquity despite its high price suggests that the product reflects the styles, attitudes and new patterns of behavior of consumers across the age and economic spectrum.

These personal, portable stereos, from the pocket radios to the latest MP3 players, have popularized a private form of musical enjoyment. Once the headphones are put on and plugged in, listeners effectively recede from the landscape in which they exist and tune into an inner world that is inspired by the playlist on their stereos. Michael Bull, author of *Sounding Out the City: Personal Stereos and the Management of Everyday Life*,¹⁵ in his study of the Walkman, investigates the nature and role of the "mobile auditory experience" and lists several reasons for the popular use of these devices in urban environments. He suggests that personal stereos offer means by which undesirable and loud city sounds can be replaced by personal soundscapes. The activity of privatized listening allows people to withdraw into themselves from the discomfort they may feel in the presence of the oppressive city crowds. However, not all listening is an act of shunning the environment. Sometimes, personal stereos and the music played on them provide an aesthetic experience that suits the outside

surroundings, making their journeys more engaging through music-inspired sensations and memories.

The private environment the iPod creates around its user is often seen as a barrier between the individual and the society, but it cannot be read entirely as a rejection of society and community. In fact, it has led to the birth and growth of several virtual communities such as electronic forums and web logs. As contact in the public domain erodes, it grows with incredible speed in a virtual one, creating a new kind of shared space. iPodLounge is such a space. It promotes the individual narrative within the context of a mutually agreeable social structure. www.iPodLounge.com was born within a month after the iPod was released in 2001. Conceived by Dennis Lloyd, Dennis Martin and Jason Meade, this is a website “dedicated to the iPod enthusiast.” Serving as a community, the site features news, reviews, forums for discussions, technical advice, etc. “for all things iPod.” This website may be seen as an alternative to shared physical space, a kind of a hybrid environment that gives new meanings to the words “private” and “public.”

The Boombox

The boombox, also known as the jam box, boogie box and the ghetto blaster, like the Walkman is a portable audio device, but its use is much more public and communal rather than individual and private. In *Reading Matter*, media studies scholar Arthur Asa Berger compares the ghetto blaster to the Walkman. “The sphere of the ghetto blaster is public; the psychological imperatives at work are sociability (the kindest reading) and a desire to dominate and make oneself heard or one’s presence known (the least kind reading). The Walkman type of stereo radio is the polar opposite of the ghetto blaster. People who use these stereos essentially seal themselves off from the world and attempt to attain a state of pure acoustic sensation.... If ghetto blaster users are anomic, and disregard the rules of conduct and codes of civility relating to being quiet in public places, Walkman users are alienated and antisocial.

Walkmen users do not bother people the way ghetto blaster users do, but they do something even worse—they reject them.”¹⁶ Boomboxes, which started appearing in the mid-1970s, were reasonably priced and therefore affordable to inner city youth who would carry them everywhere.

Most of the boomboxes had an AM/FM radio; two cassette players to dub tapes; two or more large speakers for volume, battery and AC capability; and several auxiliary connections to plug in other equipment like microphones or turntables. They were designed to be highly conspicuous, aurally and visually, and therefore had imposing speaker grills, large buttons and flashing lights, and most created big sounds. A unique subcultural style emerged around the rituals that were associated with the boombox. The sounds of hip-hop and rap, the writing of graffiti, Adidas shoes, cassette tapes, turntables, etc. served as the signifying props of a unique aesthetic expression. “The objects, ‘the gear’ used to assemble a new subcultural style must not only already exist, but must also carry meanings organised into a system coherent enough for their re-location and transformation to be understood as a transformation.”¹⁷ In other words, boomboxes had existed since the late 1970s, but when they were adopted by the youth in inner cities they took on new meanings and became icons of an era’s music culture. Subcultures arise in resistance to dominant cultures and therefore their stylistic adaptations are often viewed in popular, mainstream consciousness as confrontational and offensive. Berger’s analysis hints at some of the antagonistic rituals of boombox use. Lyle Owerko, photographer and boombox collector, who calls them “gargantuan conglomerations of electronics, lights and chrome-plated gadgetry,” thinks of boomboxes as “symbols of rebellion.”¹⁸ The popularity of the boombox was reflected in movies, music videos and the content of the songs as well, and manufacturers such as Clairtone, Sony, Panasonic, Lasonic, Marantz and others, in order to feed and capitalize on this culture, produced a staggering variety of boxes in an assortment of styles, sizes, colors and features. This popularity started waning toward the end of the 1980s, triggered partly by the rising popularity of the Walkman and also due to new noise ordinances. Today,

boomboxes are found in collectors' homes, in books and on websites rather than in streets.

The Turntable

“At the dead center of the spiraling galaxy of hip-hop culture is the turntable. This is where everything starts: on the grooved surface of a record spinning on the wheels of steel,” says DJ Dusk in talking about the musical significance of the turntable.¹⁹ The phonograph, the gramophone, the record player and the turntable all refer more or less to the same technology: they are mechanical devices for the reproduction of music, and they all play records. But their functions, forms and patterns of use have changed significantly over time and therefore their intended meanings have changed as well. What was initially a playback device is today a musical instrument. The origins of the turntable can be traced back to two key inventions from the late nineteenth century: Thomas Edison's phonograph from 1877, which captured sound on a wax cylinder; and Emil Berliner's gramophone from 1887, which performed the same function but on a flat round disc. Edison's phonograph used tin foil wrapped around a cylinder to record the sound, while Berliner's gramophone used a beeswax disc dipped in zinc. Both these media existed for a few years eventually marked by one of the earliest “format wars” (later followed by the war between the 33 rpm and 45 rpm records, the cassette and the CD, and so on). Berliner's disc emerged as the standard and cylinders disappeared. This disc led to the development of the 78 rpm shellac record, which was eventually replaced by the thinner and easier-to-manufacture vinyl (polyvinyl chloride or PVC) record. While scientists had created PVC in labs in the late 1800s and had been experimenting with it ever since, it found significant and widespread use during World War II, because it proved an excellent substitute for natural rubber. Postwar experiments led to formulations of PVC that were transparent, colored, flexible and rigid, and the material found multiple applications for records, wires, etc., in music and a host of other industries.

The very early application for the phonograph was voice-recording, so they were designed for and sold to businesses as replacements for stenographers. However, once its potential for recording and playing music was realized, it entered the domestic sphere, and by the 1920s had started replacing pianos and player pianos. “By 1920, recorded sound had become increasingly commonplace in the American home, delivered through a still relatively new presence in domestic space: the phonograph. But to gain acceptance in the home, it had to blend into the existing context; it had to become furniture.”²⁰ Because its technology was perceived to be ugly, the phonograph was disguised and concealed behind elaborate wooden cabinetry in Louis XVI, Chippendale, Queen Anne and other styles. Many of the early phonograph manufacturers such as Paramount Records of Wisconsin and Brunswick Records of Chicago either had close ties to the furniture industry or were furniture manufacturers themselves. Though the financial crash of the 1930s drastically slowed down record sales, the industry bounced back after the end of World War II. During the 1950s and 1960s, the record player (along with LPs) had become the centerpiece of hi-fi home stereo systems. According to the *Historical Dictionary of the 1950s*, “consumers bought 830,000 new record players in 1950, 1.2 million in 1951, and 1.5 million in 1952. They hit 3 million in 1959.”²¹ By 1958, stereophonic records were widely available, a large variety of record players were manufactured, amplifier and speaker technologies improved and the hi-fi system became a standard fixture of many homes. As several new portable record players came onto the market and as rock ‘n’ roll gained popularity, teenagers moved the music from the living room into their bedrooms. While hi-fi systems continued to be manufactured, there was widespread consumption of smaller portable devices that signified freedom and independence. As cassette tapes and compact discs emerged and gained popularity, LPs and record players started losing customers. LPs had their highest sales figures in 1978 (along with 8-track tapes), cassette tapes in 1988 and CDs in 1999. As music downloading has gained momentum, all formats have declined, except for, interestingly, the vinyl record. Record and

turntable sales are up again, but they have come back as transformed objects with an entirely new range of meanings.

While originally designed to reproduce sounds, “the rise of the hip hop and dance music DJ... redefined the function of the turntable: no longer simply a reproductive device, it became a productive one as well.”²² Disc jockeys have been spinning records at parties for over three decades, creating continuous streams of music for people to dance to. Legendary DJs such as Francis Grasso, Kool Herc and Grand Wizard Theodore not only perfected the craft, but pushed their equipment to generate sounds and effects never heard before (like slip-cuing, mixing, the break and scratching). Using two turntables, lots of records, a mixer, headphones and a microphone, they created a new culture of electronic dance music. Such innovative and unusual usage required sturdy turntables. The Technics SL 1200, first manufactured in 1972, continues to be most favored by DJs because its robust engineering can withstand the constant back and forth movements of the records, pitch changes and other purposeful mishandling. In the deft hands of DJs, turntables have emerged as musical instruments. Technics and other companies such as Numark, Vestax and Stanton manufacture models specifically designed for turntablists. Today, club and hip-hop DJs may use two or more vinyl turntables, CD turntables, MP3 players, mixers, headphones, records, laptop computers and other gear to create music.

When the phonograph became ubiquitous in living rooms, it created new forms of private listening and was blamed for reducing public engagement around music: one could listen to records at home and not have to go to a concert. However, as Taylor explains, while the record player did have a role in modifying the way people listened to music, in turn, people have modified the turntable to create new communities. “Technology as a structure in the form of the gramophone/turntable might have actively changed people’s behavior with respect to music, but people also changed the turntable and in part retrieved what had been lost.”²³ In a circular rhythm of

production and consumption, design and use, manufacturers developed turntables to listen to records, DJs started using them to create new genres of music and manufacturers, in response, designed new turntables to promote these practices. As Marshall McLuhan said, similar to an earlier observation by Winston Churchill: “We become what we behold. We shape our tools, and thereafter they shape us.”²⁴

The Solid Body Electric Guitar

Referred to as “instruments of desire” by music scholar Steve Waksman, electric guitars are the defining icons of rock ’n’ roll culture. While they are primarily used and understood as musical instruments, guitars are often as revered as musicians, and have become highly valuable collectors’ items. The invention of the solid body electric guitar is a story of multiple origins, and while names like Adolph Rickenbacker, Leo Fender and Les Paul are often mentioned, it is not clear whether any one person can be identified as the inventor. It is clear, however, that the innovations surrounding the solid body electric guitar—from its first embodiment to its variations and accessories like pedals—have transformed music significantly over the past fifty years. At the root of the electric guitar lies the notion of amplification. The desire to create a bolder and louder sound than acoustic guitars could make led to the experiments in pick-up technologies, new materials and shapes that eventually brought forth the solid body electric guitar.

“In music, the instrument often predates the expression it authorizes...it contributes, through the possibilities it offers, to the birth of a new music, a renewed syntax. It makes possible a new system of combination, creating an open field for a whole new exploration of the possible expressions of musical usage. Thus Beethoven’s Sonata no. 106, the first piece written for the piano, would have been unthinkable on any other instrument. Likewise, the work of Jimi Hendrix is meaningless without the electric guitar, the use of which he perfected.”²⁵ In other words, the music and the musician emerge from the instrument. This in no way means that the agency of

production lies entirely with the instrument; musicians are the creators of the sounds but the instrument affords and encourages unique practices. “The musician, the instrument and the music are tied together in creating new music and new cultural forms. The major forms of American vernacular music that flourished from after World War II through the 1970s—urban blues, country music rock ’n’ roll, and rhythm and blues (R&B)—all depended on the electric guitar for their sound and much of their popularity.”²⁶ The sounds that define these forms of music, individual musicians and bands emerged from the solid body electric.

For popular music theorists Kevin Dawe and Andy Bennett, the term “guitar culture” refers to the “guitar makers, guitar players and audiences who imbue guitar music and the instrument itself with a range of values and meanings through which it assumes its place as a cultural icon.”²⁷ Guitar makers (Gibson, Fender, Taylor and so forth) play a critical role in how music culture is created, and have themselves become industry legends. Of the several past designs that are made today, a few have acquired ultimate stardom. Fender’s Stratocaster, first introduced in 1954, is one such guitar, played by the likes of Buddy Holly, Jimi Hendrix, Eric Clapton, Jeff Beck, Stevie Ray Vaughn and Bonnie Raitt. The Stratocaster followed Fender’s Telecaster, introduced in 1950, but was quite different. Its wooden body was not stained but painted in a shiny dark-bordered sunburst finish. To allow access to the entire fretboard, it had deep cutouts in the body at the base of the neck. Instead of the standard single pick-up, it had three, and a tremolo bar that created a vibrato effect. The Stratocaster also had some radical ergonomic features that made it much more user-friendly. Leo Fender, an early proponent of user-centered design, worked closely with musicians and often built several prototypes for them to test. The solid bodies were also contoured, made thinner and their corners beveled and rounded to “fit like a shirt.” These ergonomic design principles brought the guitar close to their bodies and allowed rock ’n’ roll musicians to jump around during their highly active performances. For easy access, the controls were placed closer to the hands and the tuning pegs were lined up in a row on top rather than being split on the top and

bottom. Following the success of Fender's Telecaster, the Gibson company sought the assistance of musician Les Paul to develop their solid body electric. Paul had already built a simple solid body guitar on a 4-by-4-inch log of wood—a guitar he called The Log. The guitar that Gibson developed with him was called the Les Paul, an instrument with an arched top and a glossy black or gold finish. Several updated versions as well as reissues of the vintage Stratocaster and the Les Paul exist today.

Experiments in guitar design are continuing. The Wave Guitar created by industrial designer Ravi Sawhney of RKS Guitars uses a wooden body with a polymer core, a unique composite material that emits a resonant sound. The guitar has an entirely new form and offers multiple options of color and graphics for customization. Moog Music's Moog Guitar is a hybrid new instrument that is part guitar and part synthesizer, with features that never existed in guitars before. Though it looks like a traditional solid body, it has new capabilities like an infinite sustain, shifting harmonics and unique new sounds created by the Moog filter. Such instruments of desire inspire musicians to create new forms of music and manufacturers to continue their attempts to generate newer and stranger sounds.

The Synthesizer

Born out of the minds of electronics tinkerers with an avid interest in music, the synthesizer is a unique musical instrument that exists in an infinite range of forms and shapes. At its very root, a synthesizer is simply a device with all the components necessary to create and modify sounds electronically. While electronic sound-making machines have existed for a long time, they remained fringe instruments used in experimental music; only after World War II were they heavily incorporated into all forms of popular music. The Singing Arc, invented by William Duddell in 1899, is often considered the first electronic instrument. While by no means sophisticated, it used the ability of the carbon arc (which existed at that time in the new electric street lights) to generate notes, and Duddell connected it to a keyboard to play tunes.

Further technological developments like thermionic valves and later transistors, in the hands of tinkerers, revolutionized the electronic music scene. One of the earliest, best-known electronic instruments is the theremin, invented in 1919 by the Russian Leon Theremin. It continues to be manufactured by companies like Moog Music with its Etherwave product line. The theremin's fascinating quality is that it is played without being touched. Two antennas emerge from this unusual device—one to control pitch and the other to control volume. The musician can increase or decrease the pitch by moving one hand closer to or farther from one of the antennas; volume is controlled similarly through the other antenna. The eerie, wailing sound produced made the theremin popular for science fiction and horror films such as Alfred Hitchcock's *Spellbound* and Robert Wise's *The Day The Earth Stood Still*.

It was Robert Moog's ingenuity as experimenter, engineer and entrepreneur that took synthesizers to a new level. In their book *Analog Days: The Invention and Impact of the Moog Synthesizer*, Trevor Pinch and Frank Trocco provide a fascinating story of Moog's work with synthesized sounds. "The synthesizer is the only innovation that can stand alongside the electric guitar as a great new instrument of the age of electricity. Both led to new forms of music, and both had massive popular appeal. In the long run the synthesizer may turn out to be the more radical innovation, because, rather than applying electricity to a pre-existing instrument, it uses a genuinely new source of sound—electronics. It is the radicalness of the instrument that has allowed the synthesizer to evolve into the digital age."²⁸ While there were other electronics experts developing synthesizers, what separated Moog's efforts was his inclusion of the keyboard as a control device. It was a format musicians were familiar with, and Moog worked tirelessly with them in the development of his synthesizers. Like some of the pioneers of the electric guitar, he engaged musicians in his design process, built prototypes for them to test, and kept on tinkering to create newer, richer sounds. The early Moog prototypes were developed in 1964; in 1968, Wendy Carlos with her album *Switched on Bach*, hugely popularized the instrument. By 1970, Moog had designed and built a Minimoog, one of the first portable

synthesizers. Though one of the earliest successful albums involved classical music and a whole new way to play Bach, Moog's early instruments gained widespread use when they entered the realm of popular music and were used by musicians such as Keith Emerson of ELP and Mick Jagger of the Rolling Stones. In 1975 and 1977, Giorgio Moroder, an Italian arranger/producer, worked with Donna Summer in creating two breakthrough songs, "Love to Love You Baby" and "I Feel Love," that put the Moog synthesizer on the map in disco music. Both songs involved Summer's highly sexualized, orgasmic vocals backed up by the Moog. While the former reached the second spot on American charts, "even more landmark was 1977's 'I Feel Love,' which had more fake-orgasm vocals from Summer set against an entirely synthesized background. Introducing both the syn-drum and the galloping Moog baseline that would come to categorize the strain of disco called hi-NRG [high energy], 'I Feel Love' was a masterpiece of mechano-eroticism."²⁹

The 1983 Yamaha DX7 was the first commercially viable digital synthesizer that used software instead of hard wires and analog circuits (central to the Moogs). This marked a huge shift from analog to digital means of making sound. The DX7 was programmable, but the difficulty of programming led to musicians using the included pre-set sounds rather than creating their own. Several other companies, notably Roland and Korg, introduced a range of new synthesizers for general use. These devices sounded more like musical instruments and gained quick popularity. Today, synthesizers are available in a variety of forms and are no longer driven by the keyboard. New products such as Yamaha's latest Tenori-on, Patten Studio's Audiopad and the Reactable from Reactable Systems signal new directions for musical instruments of the future.

Music Culture

The musical instruments and playback devices discussed here represent just a few of the physical products that influence how we make music and how we listen to it. A large range of other objects from handbills and sneakers to laptop computers and iPhones plays an equally important role. In addition to these material things, economic conditions, political systems and social factors are powerful forces that determine how music becomes a part of our everyday experiences. It is the dynamic network of people, products and practices—simultaneously and in interaction with each other—that has shaped our music culture of the past and will continue to do so in the future.

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