

the history of
music
production

richard james burges



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Richard James Burgess

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To my parents for giving me the freedom of mind to pursue my adventures. To my sons Ace and Blaze for always stimulating my thinking, making every day an adventure, and for bringing even more music and words to our house and my life than I ever thought possible.

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PREFACE

My objective in writing this book was to trace the history of music production and much of what has influenced and affected its development. Music production is distinct from, though intertwined with, the music industry, the recording industry, and recording technology. Music production exists because of recording technology; it became a profession because of the recording industry, and is tied in to the wider music industry. Producers interact in a creative, musical, technical, socioeconomic, business-to-business, and business-to-consumer relationship with co-creators, owners, and users of recorded music. In telling this story, and while trying not to diverge too much, I saw it necessary to alternate between these interrelated topics of creativity, technology, business, disseminative media, the interaction with consumers, and more.

I use the term “music production” with its many facets of meaning as described in detail in my companion book *The Art of Music Production: The Theory and Practice, 4th Edition*.¹ I selected key transitions, trends, people, and innovations that have been formative or important in moving from the era before the first recorded sound to music production as we know it today. These encompass technological, creative, business, and social shifts along with their interactions. The book is laid out in a rough chronological order but strict adherence to a timeline would not have allowed exploration of consequential threads and themes. Many of these are parallel, concurrent, or overlapping across decades and I included interpretive analysis to illustrate how they may have advanced the field or, in some instances, held it back. There are isolated facts interspersed chronologically throughout the book. These relate to notable, memorable, or influential innovations that did not warrant further exploration, may have been too much of a divergence, or for which I could not justify the space. It is worth noting that the importance of a period is not reflected in the amount of material listed by decade. This is because I have tried not to unnecessarily repeat information that is grouped thematically or conceptually elsewhere. Even with this brevity, I had to omit innumerable important but incremental advancements.

There are untold creative, musical, technical, and business contributors to the betterment of the art, science, and profession who are not honored here either for lack of space, or because their work remains publicly undocumented. Where I name famous individuals, I am using them primarily as familiar examples of a style, period, or shift and not necessarily because their contributions are more important than those of lesser-known figures. As with *The Art of Music Production*, this is not a technical book although it documents important technical advancements within

the field, and those outside of it that affected its development. Music production, like most other creative arts, requires technical mastery, nonetheless, the ability to record something well is but part of the art of music production.

At various places in the book I have used the word “democratization.” I am not entirely comfortable with this use of the term given the divergence from its long-standing implications as a political system. Nevertheless, it has become a de facto expression of our increasing access to information, technology, and resources. It is in this common use context that I employ it here.

Finally, I began with a couple of overarching questions that I hope to have at least partially answered. They were: Who and what was involved in moving us from millennia of musical evanescence through more than a century of recorded music’s permanence, and how has that shift affected the creation, perception, propagation, and use of music?

Production is, mostly, a collaborative art form and as always there are many others to whom I must give special thanks, including: Ellen Alers, Dan Bullard, Blaze Burgess, Stephanie Christensen, Leonard DeGraaf, Nancy Groce, Todd Harvey, Joanna Kelly, Kip Lornell, Bob Ludwig, Daisy Njoku, Kevin Parme, Kay Peterson, Marlene Plumley, Gina Rappaport, Steve Raymer, Eva Reich, Perry Resnick, Steve Reyer, Deborra Richardson, Alison Rollins, Carlene Stephens, Peter Thoms, Ann Van Camp, Minna Zhou.

Comments, corrections, or casual conversation to Richard James Burgess at rjb@burgessworldco.com; for further information: www.burgessworldco.com.

The History of Music Production

Introduction

The history of music production and producers turns on developments of recording, playback, media, and consumer technologies. However, not every technical development triggers a shift in production techniques. Like organic growth in nature, the evolution of music production is nonlinear. Technologies and techniques coexist for a time, arising and fading in an ever-flowing Darwinian process of development and selection. By this, I do not mean to imply any sense of a qualitative or deterministic progress from worse to better. There are most likely parallel possibilities. Recording technology becomes increasingly sophisticated but inside that inexorable process, superior systems do not always dominate.

Sonic quality has diminished at times and some argue that musical, performance, and social values have too. I make no judgment in this regard. My interest in this history may be best expressed by paraphrasing one of George Orwell's many astute observations as, "who understands the past can understand the future." Within the darker context of the business side of the music industry, Orwell's original statement, "who controls the past . . . controls the future: who controls the present controls the past,"¹ contains considerable sociological truth. This may be worth pondering by producers and artists, especially those who think that the myriad of individual decisions and actions made daily can influence social progress.

Music producers whether by title or by virtue of their actions are composers in sound. They fix creative ideas, not as musical notes and instructions on a page for interpretation by performers, but rather, directly to a medium that also captures subtleties of individual performances and timbral qualities. Music production fuses the composition, arrangement, orchestration, interpretation, improvisations, timbral qualities, and performance or performances into an immutable sonic whole. Despite his initial intentions for the device, Edison's phonograph finally gave us a way to preserve qualities of music that could not be written down. It removed the interpretive step from between the audience and composer and allowed us to begin cataloging the diversity of human expression that occurs in performance. The phonograph opened up a new creative medium that allowed the development of the art of music production. Technology is but one of the means to the end of music production, which has many facets. Recording technology and music production are symbiotic not synonymous. This book delves into the history of music production while my companion book, *The Art of Music Production: The Theory and Practice*, 4th edition, discusses the art form with its supporting craft and business in greater depth.

Beginnings

Understanding Sound

We don't know when humans first made music or what inspired them to do so, although there are many theories. Elements of music—particularly melody and rhythm in the sounds other creatures make, and that we generate—surround us as we move through our environment. And there are other natural sounds such as the wind, waves, thunder, and so forth. Most sounds comprise complex harmonics or overtones and the harmonic series—the order in which these naturally occur—is a mathematical reality, a physical truth or law of the universe. As far back as the sixth century BCE, Pythagoras (ca. 570–495 BCE) had described the mathematical relationship between the length of a stretched string and the period of its vibration when plucked. He determined the simple mathematical ratios that form the octave, perfect fifth, perfect fourth, and the whole tone. From these calculations, he arrived at the circle of fifths that, with a small adjustment known as the Pythagorean comma, gets us to the modern tempered scale. Aristotle (384–322 BCE) understood that “sound is a particular movement of air,”¹ and Greek philosopher Chrysippus (ca. 280–207 BCE) and the Romans Vitruvius (ca. 1st century BCE) and Boethius (ca. 480–524 CE), speculated that sound is a wave phenomenon.²

Two thousand years after Pythagoras's findings, Galileo Galilei (1564–1642), originator of the study of modern acoustics, identified “sympathetic vibration” and the relationship between the frequency and pitch of a sound. In 1636, during the scientific revolution, French Franciscan monk and mathematician Marin Mersenne (1588–1648) published three laws explaining the correlation between the length, tension, and weight of a string, and its vibration. Mersenne was the first European to mathematically define the first six overtones in the harmonic series of vibrating strings, showing that the ratios of just intonation that sound consonant to human ears are a phenomenon of nature.³ Although it would not be applied to music for more than a century and a half, it is worth mentioning here the mathematical discoveries of French military scientist Jean-Baptiste Joseph Fourier (1768–1830). In 1807 he gave a lecture describing “a method to approximate any signal through a combination of trigonometric functions.”⁴ This led to several mathematical processes such as the: Fourier Series, Analysis, Transform, and Synthesis. What Fourier

uncovered was a method to deconstruct complex waveforms into their sinusoidal and cosinusoidal components. The process can be used in reverse to build complex sounds from simple sine waves as it is in additive synthesis. Fascinatingly, Yale professor Richard Coifman described the Fourier Transform as “nature’s way of analyzing data.”⁵ According to Yale structural biologist and biophysicist Professor Peter Moore, “our eyes and ears have subconsciously performed the Fourier transform to interpret sound and light waves for millions of years.”⁶ While nature performs this feat at the speed of light, doing the necessary calculations manually is complex and was difficult to apply until 1965. That year, at IBM’s Watson Research center, two Princeton mathematics professors—James Cooley and John Tukey—developed the Fast Fourier Transform (FFT) algorithm, making Fourier’s principles more practically applicable.⁷ Fourier’s findings among their myriad applications became a critical component of digital recording, sampling, additive synthesis, and pitch-correction software.⁸

Toward Recording

There has long been a fascination with the idea of capturing sound and early attempts included mechanical instruments and music notation. In 1711, English Royal Court trumpeter John Shore invented a simple tool—the tuning fork—that proved invaluable in experiments that helped us better understand sound.

English polymath and scientist Thomas Young (1773–1829) in 1807 described a vibrograph used to measure the frequency of a tuning fork by etching its vibrations into a soot-coated cylinder. The drum rotated in a vertical plane powered by a falling weight on a string.⁹ Frenchman Jean-Marie Constant Duhamel (1797–1872) published an account in 1843 of a similar device that he called a vibroscope. He attached a stylus to one leg of a tuning fork, struck the fork and recorded its vibrations on a horizontally rotating cylinder covered with smoke coated paper. The cylinder moved across the tuning fork on a feed screw. The revolutions of the cylinder could be timed and thus the frequency calculated by counting the waveforms.¹⁰ Although they were very early recording devices, these machines were neither capable of capturing airborne sound nor designed to play back their etchings. They were conceived as scientific measuring devices akin to an oscilloscope.

Then, in a Paris laboratory on April 9, 1860, another important step was taken. Seventeen years before Edison invented the phonograph, a typesetter named Édouard-Léon Scott de Martinville (1817–79) etched the sound of an unknown French soprano singing “Au Clair de la Lune” on soot-blackened paper. This is the first-known recording of an acoustic sound, but Monsieur Scott, as he was known, did not think the sound could be played back. Scott patented his invention in 1857, calling it the “phonautograph” (Figure 1.1). His collecting horn and diaphragm that converted ambient sound to mechanical vibration was a material addition to Young



FIGURE 1.2 Phonautograph, patented in 1857 by Édouard-Léon Scott de Martinville, built by Rudolph Koenig, and purchased in 1866 by Joseph Henry, first secretary of the Smithsonian Institution.

Credit: National Museum of American History, Smithsonian Institution.

The Phonograph

November 29, 1877, was a cold, windy day in New Jersey.¹⁴ Either Thomas Alva Edison or his assistant Charles Batchelor took out a piece of paper and drew a freehand sketch. The spidery drawing contained no dimensions or specifications. Edison signed it as did Batchelor who dated it and in the top left-hand corner wrote, simply, “Phonograph.” Four months earlier, in July, Edison had “conceived the idea of recording and playing back telephone messages.” He experimented with a “diaphragm having an embossing point,”¹⁵ which he held against rapidly moving paraffin paper.¹⁶ Seeing that the sound vibrations “indented nicely,”¹⁷ he thought that he could “store up and reproduce automatically at any future time the human voice perfectly.”¹⁸ Edison played with this idea during the months leading up to the November 29th sketch. Then, the first week of December, in the two-story clapboard house that was Edison’s Menlo Park Laboratory, machinist John Kruesi (who also signed the sketch) set to work fabricating the world’s first sound recording and playback machine.¹⁹ The machine comprised a “grooved cylinder mounted on a long shaft with a screw pitch of ten threads per inch and turned by a hand crank.”²⁰ Edison abandoned paraffined paper in favor of “tin foil wrapped around the cylinder as a recording surface” (Figure 1.3).²¹ The first design had separate recording and playback mechanisms, which were combined on later versions (Figure 1.4).²²

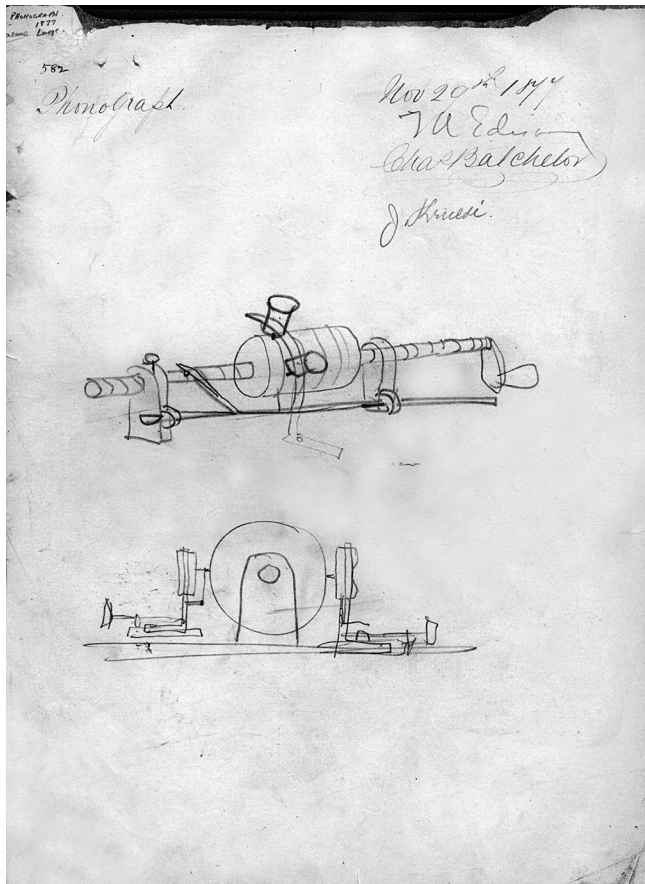


FIGURE 1.3 Edison's sketch of the Tin Foil Phonograph.

Credit: US Dept of the Interior, National Park Service, Thomas Edison National Historical Park.

Kruesi “thought it absurd”²³ when Edison told him the machine would “record and playback speech.”²⁴ When Kruesi finished his work, Edison wrapped the cylinder with tinfoil, cranked the handle, and recorded “Mary Had a Little Lamb.”²⁵ He later said, “[I] adjusted the reproducer and the machine reproduced it perfectly. I never was so taken back in my life. Everybody was astonished. I was always afraid of things that worked the first time.”

On December 7, little more than a week after the sketch was made, Edison unveiled this revolutionary device, “at the New York office of *Scientific American*, the 19th century’s leading technical journal.”²⁶ As reported by the National Park Service at the Edison National Historic Site, “The phonograph astonished the editors who remarked, “no matter how familiar a person may be with modern machinery...it is impossible to listen to the mechanical speech without his experiencing the idea that his senses are deceiving him.”²⁷

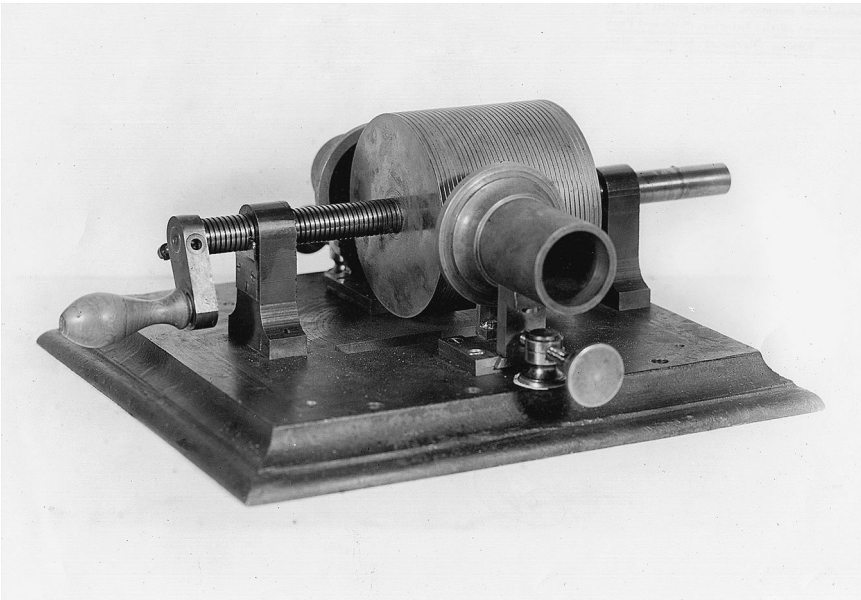


FIGURE 1.4 Edison's first phonograph, 1877.

Credit: US Dept of the Interior, National Park Service, Thomas Edison National Historical Park.

Edison was an assiduous researcher of prior patents and ideas. He has been described as an entrepreneurial inventor, developing previous, perhaps impractical, devices into ones with commercial applications. Most of his 1093 US patents involved “alterations or improvements to earlier patents and inventions by others.”²⁸ This is not to diminish his contribution; many of these ideas and patents, including those to do with sound recording, had languished incomplete for years. Audio historian David Giovannoni reported that Edison was aware of Scott’s phonautograph when he invented the phonograph nearly two decades later.²⁹ Of course, Edison made the critical addition of playback for his first recording of “Mary Had a Little Lamb” (Figure 1.5).

It is, perhaps, ironic that the man who launched the era of recorded sound was “very hard of hearing,” even describing himself as deaf. He once wrote, “I have not heard a bird sing since I was twelve years old.” Nonetheless, Edison did not regard his limited hearing as a disadvantage, once saying that it “helped him concentrate on his work.”³⁰

Before there could be any music producers or a recording industry, the technology needed to develop and its beginnings were slow with several contributors and false starts.

Edison called his machine the phonograph, from the Greek “sound-writer” and he envisaged it as a dictation device. Roland Gelatt relates that, “[Edison] could not or would not countenance the potentialities of the phonograph as a medium for entertainment.”³¹



FIGURE 1.5 Thomas Edison with an early phonograph, April 1878.

Credit: Library of Congress Prints and Photographs Division, Brady-Handy Photograph Collection, <http://www.loc.gov/pictures/item/brh2003000454/PP/>, accessed October 27, 2013.

Immediately after patenting his invention, Edison all but abandoned the phonograph, focusing his attention on his other fascination: electric light and power distribution. As Leslie J. Newville wrote in 1959 while attached to the office of the curator of Science and Technology in the Smithsonian Institution: “The fame of Thomas A. Edison rests most securely on his genius for making practical application of the ideas of others. However, it was Alexander Graham Bell, long a Smithsonian Regent and friend of its third Secretary S. P. Langley, who, with his Volta Laboratory associates made practical the phonograph, which has been called Edison’s most original invention.”³²

According to records deposited at the Smithsonian, Alexander Graham Bell (1847–1922), his cousin³³ Chichester Bell (1848–1924), and Charles Sumner Tainter (1854–1940) “began work . . . on making practical phonograph records . . . in Washington, D. C., in 1879.”³⁴ They established the Volta Laboratory Association in 1881. Chichester Bell and Tainter had realized that Edison’s tinfoil recording medium was a major obstacle to the further development of the phonograph. The

tinfoil would tear easily, was good for only a few playbacks, and—at best—“the reproduction [was] distorted and squeaky.”³⁵ They decided to use a wax compound onto which they could engrave the sound waves directly, patenting this improved version of the phonograph in May 1886 under the name Graphophone. As gleaned by Newville, Alexander Graham Bell did not spend much time in the Volta Laboratory. “The basic graphophone patent (U. S. patent 341214) was issued to C. A. Bell and Tainter. The Tainter material reveals A. G. Bell as the man who suggested the basic lines of research (and furnished the money), and then allowed his associates to get the credit for many of the inventions that resulted.”³⁶

The Volta Graphophone Company of Alexandria, Virginia, was formed in early 1886 and reorganized later as the American Graphophone Company (Figure 1.6). Foreign rights were sold as early as the spring of 1889 to form the International

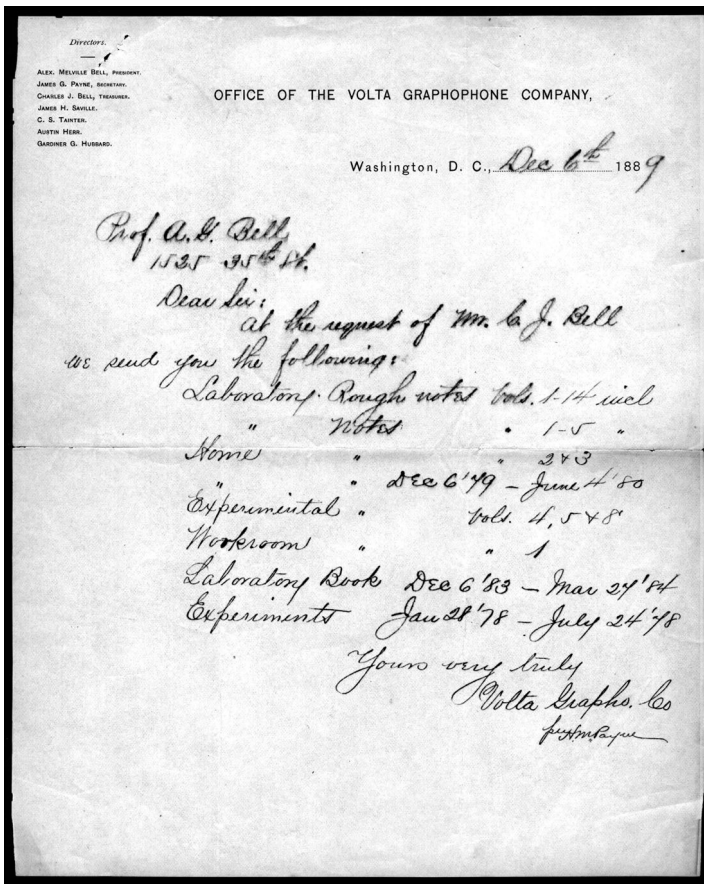


FIGURE 1.6 Letter from Volta Graphophone Company to Alexander Graham Bell, December 6, 1889.

Credit: Library of Congress, Manuscript Division, Alexander Graham Bell family papers, 1834-1974, <http://www.loc.gov/resource/magbell.25000117/>, accessed October 27, 2013.

Graphophone Company and Tainter went to Europe to look after its interests there. He left the company in 1890 and launched a laboratory in Washington, DC, where he continued to improve on the phonograph and patent new inventions.³⁷ Technological limitations, such as a two-minute recording time, a very limited frequency response and dynamic range, the need for a continuous take, and the lack of a system for mass duplication, restricted the early music producer's role.

Progress came rapidly. Initially, recording was on cylinders with vertical (hill and dale) cut grooves. Edison adopted Tainter and Bell's approach by using wax as a recording medium but there were no standards: recording speeds and the size of cylinders varied by company. Recordings from one company did not necessarily play on another company's machines in the late nineteenth and early twentieth centuries. Mass production of cylinders did not become possible until 1901,³⁸ requiring artists to record each copy afresh or in batches by performing in front of multiple recording units.

On May 16, 1888, Washington, DC-based (German-born) inventor Emile Berliner (1851–1929) demonstrated recording and playback on what he called the "gramophone" at the Franklin Institute in Philadelphia. Patented a year earlier, in 1887, Berliner's new machine demonstrated characteristics that have continued through to today, such as flat discs, lateral cut grooves, and a playback-only device. He had grasped many concepts that would become axiomatic to the burgeoning recording industry. He referred to his flat discs as "records," talked of "master discs" for mass-producing copies, hypothesized artists' royalties from sales, and foresaw a business model of proprietary recordings and playback-only machines for consumers. At this juncture, Edison was still promoting the phonograph as a dictation device.³⁹

Berliner had gone back to two principles of the phonoautograph: flat discs and lateral cut grooves. He used one-sided, seven-inch discs and the device was hand cranked at 30 rpm with a two-minute capacity. Berliner was the first to mass-produce hard rubber vulcanite copies from a zinc master disc using the etched master and stamper technique that continues in disc duplication today. In 1894 Emile Berliner's U.S. Gramophone Company made and sold 1000 machines and 25,000 records on seven-inch hard rubber discs. Most of these machines were hand-cranked and some were driven by an electric motor—the spring powered type was not available yet. The Berliner Gramophone Co. incorporated on October 8, 1895, and in 1896, Berliner discovered that shellac from the Duranoid Co. was in many ways superior to hard rubber for the manufacture of records.⁴⁰ Initially, cylinders sounded better than discs and did not suffer from inner groove distortion since the machines' styluses tracked all the way across the cylinder at a constant velocity. With discs, the relative speed of the cutter head and the playback stylus slows down as it moves toward the center of a disc causing a loss of sound quality. Nevertheless, the sonic performance of discs gradually improved. Advantageously, they were more compact to store than cylinders and the blank center area accommodated a label for credits as opposed to the narrow edge of a cylinder, which could not hold much

information. Unlike the phonograph, the gramophone was strictly for playback, but this did not negatively affect its uptake.⁴¹

The Columbia Phonograph Co. was incorporated in 1889 in West Virginia, deriving its name from the District of Columbia where it set up offices at 627 E Street NW to take advantage of the demand for stenographic services. Regardless, its canny founder and president, Edward D. Easton (1856–1915), who was himself a highly paid stenographer, had more success selling music than business machines. In particular, cylinders of the United States Marine Band under John Philip Sousa were popular. Easton published the first record catalog in 1890, a one-page list of Edison and Columbia cylinders. San Francisco's Palais Royal Saloon installed the first coin-operated, nickel-per-play "juke box" in 1890, a cylinder phonograph with four listening tubes that earned more than \$1000 in its first six months.⁴² Despite Edison's vision of the phonograph as a professional stenographic device and his reluctance for it to be used for entertainment, public demand established a market for recorded music.⁴³ Mass production of duplicate wax cylinders eventually began in 1901, allowing the price to drop from fifty cents to thirty-five cents each by 1904.⁴⁴ Bell and Tainter's American Graphophone Company and the Columbia Phonograph Co. formed a coalition that had a catalog of more than a thousand prerecorded cylinders and sold a clockwork powered graphophone for fifty dollars. By Christmas 1897, they were selling a ten-dollar clockwork-powered graphophone that their advertisements said could, "reproduce music as loudly and brilliantly as the highest priced machine"⁴⁵ (Figure 1.7). Low-cost machines from Columbia, Edison, and Berliner boosted sales—mostly of classical music, marches, Tin Pan Alley songs, and reenactments of events on commercial cylinders and discs.

This was a highly competitive environment with many inventions and modifications such as Thomas Lambert's duplication patent No. 645,920, a "method of reproducing phonograph records." The courts upheld Lambert's patent but Edison was aggressive in protecting his business interests and he sued until 1907 when Lambert's company went out of business.

The sale of recorded music had developed into a business, but other developments were underway that would significantly affect this burgeoning industry and its producers. Twenty-two-year-old Guglielmo Marconi (1874–1937), native of Bologna, Italy, filed UK patent application No. 12,039 on June 2, 1896, that would prove pivotal in establishing radio technology.⁴⁶ Although it would take nearly a half century and several other developments for its impact to be felt, it was only two years later, in 1898, that Danish inventor Valdemar Poulsen (1869–1942) patented the first-known magnetic recorder. He used a medium of steel wire and called it the "telegraphone."⁴⁷ In 1906 Lee de Forest (1873–1961) filed a patent for the Audion, a triode vacuum tube described as a detector of sound. This was momentous for audio technology. The Audion, being the first amplifier for electronic signals, paved the way for many further developments in radio, telephony, and, in the longer term, recording technology. The following year, de Forest invented an arc-based radiotelephone transmitter and Audion receiver. He wanted to send music by wireless means,



FIGURE 1.7 Group listening to an Edison phonograph in Salina, Kansas, in the 1890s.

Credit: US Dept of the Interior, National Park Service, Thomas Edison National Historical Park.

improving his Audion as a detector, an amplifier, and transmitter. De Forest started several radio stations that were early broadcasters of music—primarily opera. On January 13, 1910, de Forest broadcast Caruso’s voice live from the Metropolitan Opera in New York City. Radio technology was developing rapidly and in the summer of 1912 Major Edwin H. Armstrong created a regenerative circuit—the first radio amplifier, which became the basis of the continuous-wave transmitter that remains central to radio broadcasting. Armstrong went on to invent other significant telecommunications technologies including wide-band frequency modulation, or FM radio.

The First Producers

The term producer was not used in the early years of recording, but the job of managing the intersection of technology, art, people, and commerce dates back to the invention of recording technology. A couple of terms used were: “director of recording” and “recorder”; today these pioneers are sometimes referred to as “record-ists.” The boundaries separating the creative, musical, business, entrepreneurial,

technical, and talent discovery aspects of the job were as blurred and pliable as they are with today's producers and engineers. The Recording Academy, for the purposes of Grammy qualification, defines the producer as:

The person who has overall creative and technical control of the entire recording project, and the individual recording sessions that are a part of that project. He or she is present in the recording studio or at the location recording and works directly with the artist and engineer. The producer makes creative and aesthetic decisions that realize both the artist's and label's goals in the creation of musical content. Other duties include, but are not limited to: keeping budgets and schedules, adhering to deadlines, hiring musicians, singers, studios and engineers, overseeing other staffing needs, and editing (Classical projects).⁴⁸

Much of what Scott and Edison did coincides with the Academy's definition and so we can think of them as not only the inventors of sound recording but also its first producers.

Music producers by function—using that title or others—are core to the operation of the recorded music industry. Without intermediation of the technical, musical, and financial aspects, combined with an understanding of the end purpose for the recording, there would be no useful product to sell. Frederick (Fred) William Gaisberg (1873–1951) was one of the earliest music producers, although he did not use the term. As a boy in Washington, DC, he met John Phillip Sousa, sang in his choir, and on windy days held and turned Sousa's music at his Saturday afternoon concerts on the White House lawn. At the age of sixteen, while still in school, and just six months after the start-up of The Columbia Phonograph Company, Gaisberg began accompanying whistler John York Atlee on recordings for the company. He recounts: "In the parlor stood an old upright piano and a row of three phonographs lent to him by the Columbia Phonograph Company. Together we would turn out, in threes, countless records of performances."⁴⁹

In this instance, Gaisberg acted as accompanist, recorder, and manufacturer, loading and operating the machines, and creating the final product for sale. When he recorded Sousa's band, the volume was such that he could record to ten cylinder machines simultaneously.

The Columbia Phonograph Company was a licensed franchise of American Graphophone, the company that owned the Bell-Tainter patents. American Graphophone entered into a national sales and distribution relationship with the North American Phonograph Company that, in 1888, bought Edison's patents and exclusive sales rights. Edison continued to make the machines. American retained its Bell-Tainter patents and manufacturing rights, and Columbia kept its rights to sell in the District of Columbia, Delaware, and Virginia. This relationship with North American "also gave Columbia sales rights to the Edison Phonograph in its territory."⁵⁰ North American's founder, Jesse H. Lippincott (1842–94) had decided to lease the machines using the Bell Telephone business model. It is rumored that

the stenographers, feeling threatened, may have been sabotaging the machines.⁵¹ In any event, within three years, by 1891, “Lippincott fell ill and lost control of North American to Edison who was its principal creditor.”⁵² Edison reverted from renting machines to selling them and added more entertainment offerings on cylinder.⁵³

Gaisberg thought that “Columbia seemed headed for liquidation”⁵⁴ but “almost without its knowledge . . . it was saved by a new field of activity.”⁵⁵ He commented:

Showmen and fairs demanded records of songs and instrumental music. Phonographs, each equipped with ten sets of ear tubes through which the sound passed, had been rented to these exhibitors. It was ludicrous in the extreme to see ten people grouped around a phonograph, each with a tube leading from his ears, grinning and laughing at what he heard. It was a fine advertisement for the onlookers waiting their turn. Five cents was collected from each listener, so the showman could afford to pay \$2 or \$3 for a cylinder to exhibit.⁵⁶

These were the glimmerings of a record business and commercial music production as we would come to know them. Despite Gaisberg’s explicit musical contributions to his early recordings, musical ability was not considered necessary to be a recorder. It was viewed as a technical position. When Gaisberg graduated high school in June 1891, he approached Columbia for a full-time job but they were not sure that they needed a musician on staff. They offered him a job on the condition that it involved the technical aspects as well as performing. He trained in their factory at Bridgeport, Connecticut, and after a year was back accompanying performers. All but by title, Gaisberg had been an independent producer for Columbia and was now a staff producer. One of the performers, Dan Donovan, introduced him to the man responsible for many of the recent improvements to Edison’s phonograph: Charles Sumner Tainter of the Volta Laboratory. Tainter had recently developed a more sensitive machine that could record twenty cylinders from one performance. Gaisberg left Columbia and went to work for Tainter. Gaisberg explained his production process and other duties there: “To earn my \$10 a week I had to find the artists, load up each of the twenty units with the paper cylinders, set the recording horns, and play the accompaniments. Our entire repertoire consisted of “Daisy Bell” and “After the Ball was Over,” and sometimes we would perform the latter as many as seventy times a day.”⁵⁷

Gaisberg was now performing what would become known as A&R (Artist and Repertoire—some say Repertory), then referred to as talent scout duties. He was also required to collect money from the slot-controlled phonographs in saloons and beer gardens, which he disliked doing, so he went back to Columbia as a pianist and talent scout.⁵⁸ However, in 1894 Edison plunged the North American Phonograph Company into bankruptcy gaining him back his rights to the phonograph.⁵⁹ During this time of uncertainty, Gaisberg met Emile Berliner, was impressed by the sound of his flat discs and, when the gramophone was ready for its commercial introduction around 1894, Gaisberg went to work for him. His new job involved scouting for talent, playing accompaniments, and washing up the acid tanks. Berliner did

the recording.⁶⁰ Although the tank cleaning would be categorized as manufacturing duties, this is an interesting early example of the division of what we now think of as production and engineering roles. At that time, artists and performers were paid a fee of two or three dollars per side recorded, with no royalties. The songs were recorded on five- or seven-inch discs and typically ran one-and-a-half to two minutes long.⁶¹

The Acoustic Period

Acoustic Recording

A meaningful commercial market for prerecorded music began to grow at the end of the 1880s. The recording process for the first forty-eight years from Edison's invention of the phonograph, until 1925, involved musicians played into an acoustic horn or an array of them. The entire signal path was acoustic and mechanical. Recorders could only control relative levels by asking the performers to play or sing louder and softer or by changing their proximity to the horn(s). Phonographs were hand cranked until 1888 when Edison invented the "Class M" battery-powered, electric motor-driven, phonograph. He launched it commercially in 1890, initially for lease as a dictation machine and later for sale at a price of \$225. This was at a time when the average salary was about forty dollars per month.¹ The electric Class M was not a big success. Other firms started offering the machines with spring motors and eventually, in 1896, Edison commissioned the United States Phonograph Company of Newark, NJ, to manufacture a spring motor for it.²

Nonetheless, the electric Class M's audio chain was still entirely acoustic and mechanical. The collecting horn captured and focused acoustic sound waves onto a diaphragm that vibrated and transmitted those mechanical vibrations to the cutting head, which inscribed the analog grooves into the recording medium. Drums and percussion could overload the system so they were excluded from the sessions, kept right at the back of the studio, or the players were required to modify the parts or their playing styles. Thus, the limitations of technology affected the nature of what was recorded and our documentation of how late nineteenth- and early twentieth-century music really sounded in its natural environment (Figure 2.1).

In an early and detailed report of acoustic recording techniques, entitled "The Experiences of a Recorder" in *Talking Machine News*, T. J. Theobald Noble explained how he positioned the singer nearest the horn with musicians grouped around the artist and focused toward the horn. He mentioned that woodwinds were closer to the recording horn than the brass and that the artist needed to lean away from the horn in the instrumental passages—to allow the accompanists' parts to speak more clearly on the recording. Physical movements toward and away from the horn were also used for individual dynamic control. He said the sound waves



FIGURE 2.1 Recording session at Edison's studio in New York, March 1916. Vocalist: Jacques Urlus. Conductor: Cesare Sodero.

Credit: US Dept of the Interior, National Park Service, Thomas Edison National Historical Park.

traveled: “down the horn, through the special rubber attachment, through the trunnion supporting the diaphragm, on to the diaphragm itself, thereby vibrating the recording glass, which in turn vibrates the sapphire, cutting the indentations of sound waves into the fast revolving disc or cylinder.”³ Noble explained dynamic control: “The recorder has to lightly . . . place his hand on the singer’s shoulder—during the singing, for on a loud note it is sometimes necessary to take the artiste a few inches back from the horn, and on a subdued, or low note, nearer to it.”⁴

He went on to talk about the importance of using the best, most experienced musicians, an early example of the concept of studio or session musicians. He said, “Ordinary musicians are of little use . . . I have known musicians to play for three consecutive hours [to get a satisfactory take].” Similarly, specialized engineering skills were beginning to become a necessity. Noble alludes to the expertise required in operating the recording machine and choosing and placing the horn in order to obtain a “fine round tone.” Different horns and diaphragms introduced their own qualities to the recording and those choices relied on the expertise of the “recorder.” He further commented that the selection of “artistes” is critical: “to secure what may be termed a recording voice. Not all voices are suitable; some of our most popular artistes fail to make a satisfactory commercial record. . . . A voice may be too weak or too nasal and in another the enunciation too bad, and so on.”⁵

Here, Noble makes a clear distinction between the requirements for a successful live performer as opposed to that of a recording artist. If there was a musical director, he or she would find the most suitable key for the artist and orchestrate the piece for the musicians. Choosing recording horns with the most favorable acoustic qualities and positioning the musicians is conceptually no different from choosing and positioning microphones as any engineer or producer will do today. It seems clear that, whilst there was a good deal of technical expertise required to be a successful recorder, there were also varying degrees of creative, musical, A&R, organizational, entrepreneurial, and people skills involved. All of which amounts to what we now think of as production.

International Expansion

Fred Gaisberg was not only the first but may also have been the most successful and famous of the early “producers” or recorders. In 1902 (for the Victor label) he was the first person to record the Italian operatic tenor, Enrico Caruso. His 1904 recording of Caruso singing “Vesti La Giubba” is reputedly the first known million-selling recording.⁶ Gaisberg had moved to the UK, in July 1898, to set up “The Gramophone Company” and a commercial recording studio. He subsequently traveled to many parts of the world to discover talent and make recordings, producing India’s first recordings with the artist Gauhar Jaan on November 2, 1902. Gaisberg was both prolific and influential in the developing field of record production and the nascent music industry. He manifested a mix of musical, technical, and talent-spotting expertise along with administrative and business skills that laid a foundational formula for successful producers ever since.

Russell Hunting (1864–1943) was an actor who enjoyed some success with comedy skits on cylinder in the early 1890s and then moved into the business and recording side of the industry. He was the manager of the Universal Phonograph Company in New York City from 1897 until he moved to England a year later, over some undefined trouble. Hunting worked in the UK for years as director of the Edison Bell Consolidated Phonograph Co., Ltd. In 1904, he co-founded the Sterling Record Company, Ltd, and by 1908, he was Pathé’s chief recording director. Pathé had studios in Paris, London, Milan, Brussels, Amsterdam, St. Petersburg, and elsewhere in Russia. He traveled between the various European studios until 1914. He then opened a recording laboratory (as it was then termed) at 18 West 42nd Street in Manhattan and a pressing plant in Brooklyn for the French organization. He enjoyed a long and successful career—the January 1921 issue of *Talking Machine World* refers to Hunting as “chief recorder” for Pathé in the United States, and he returned to Europe to supervise recordings through the twenties and thirties until just before World War II, when he returned home because of ill health.⁷

Other early twentieth-century recorders were Will Gaisberg (brother of Fred) and William Sinkler Darby, a friend of Will Gaisberg, who went to work for

Berliner in 1895. There was also Edmund Pearse who worked for the Gramophone Company from 1909, and the German brothers, Franz and Max Hampe, along with Fred Tyler, recorded many sides in Central Asia. As quoted in the bulletin of the British Library National Sound Archive, Tyler outlined some of the difficulties of working within these cultures: “To obtain women’s voices it was sometimes necessary to make records in their own quarters, as, being Mohammedans, they could not visit a public caravanserai with propriety. In order, therefore, to avoid scandal, we sometimes packed all our equipment on a cart and set out after dark to set up our studio in the woman’s house.”⁸ The same bulletin reported that Edmund Pearse wrote home during his 1911 recording trip to Bukhara: “In Samarkand we made some records of harem women, a thing that has never been done before. We had to take the machine to the house of the chief magistrate and set up there, who thereupon brought forth the women, and gave them permission to uncover themselves (only their faces however). It was quite romantic, especially as it all had to be done after ten o’ clock at night.”⁹

T. J. Noble’s account also mentions the extensive and sometimes dangerous travel that the “recorders” often undertook to document artists. In one account, he “described...traveling for eight hours on horseback through the Caucasus Mountains to audition a single choir, only to be ambushed and robbed by bandits on the return journey.”¹⁰

By this time, the recording industry had spread internationally. The Odeon label was created in 1904 in Germany by the International Talking Machine Co. Odeon was the first to sell double-faced discs in Europe (based on patent 749,092 by Ademor Petit (1866–1914), filed 1901), which Zonophone had produced for the Brazilian label, Casa Edison, in 1902.¹¹ Odeon also introduced the term “album” in April 1909 when it released the “Nutcracker Suite” by Tchaikovsky on four double-sided discs in a specially designed package.¹²

The Third Major Label

Toward the end of the nineteenth century, the recording industry was dominated by Edison and Columbia. Berliner had set up shop in Philadelphia and was looking for a way to gain meaningful market share. The company that would challenge Edison and evolve into the one of the largest and most enduring major labels had its humble beginnings in New Jersey. After several fits and starts, Eldridge Reeves Johnson designed, built, and patented a clockwork motor for the Berliner Gramophone machines, which he assembled at his Camden, NJ, plant until Berliner went into receivership. At that time, Johnson formed the Victor Talking Machine Company, which incorporated on October 3, 1901. Johnson’s manufacturing firm had enhanced Berliner’s gramophone with not only a motor, but also an upgraded sound box and a practical process for recording on wax discs. Brothers Harry, Raymond, and Charles Sooy worked as machinists for Johnson.

The three Sooy brothers, working-class descendants of eighteenth century Dutch Huguenot immigrants, would spend their lives working for the same organization, eventually becoming recorders for Johnson's Victor Talking Machine Company. Fred Gaisberg pursued highbrow artists whereas the Sooy brothers recorded whomever Victor sent to their studio—spoken word, comedy, jazz, and even Caruso—the full range of the company's catalog.¹³

Victor reinvested its income in improving its products and in 1905 sold more than a million dollars worth of records. Johnson then designed Victrolas—with the acoustical horn enclosed by the cabinet. Demand boomed after the Great War and by the twenties, the vertically integrated company, supplying both hardware and recorded music, was a leader in the industry, at home and abroad.

The Sooy Brothers

The Sooy's involvement began when Harry O. Sooy at the age of twenty-three, in 1898, reported for work as a lathe hand at the machine shop of Eldridge R. Johnson. Later that year, Johnson sent him to England to work on experimental machines, and within twelve months, Johnson asked Sooy if he would like to learn recording. Sooy was assigned to the Recording Department under Messrs. Bentley Rinehart and William H. Nafey prior to the patenting of Johnson's recording processes and the incorporation of the Victor Talking Machine Company. Sooy explained:

We used...an Edison machine, converted to make disc records. The arm to which the horns were connected traveled across the record, away from the artist, and we found the records weak at the center. This machine, which was electrically driven, regulated very badly. We then got to work and built a machine of Mr. Johnson's type, called the "Barn Door Roller Machine," with stationary horn connections. It was built large enough to use for making ten-inch records. This machine was electrically driven and regulated very unsatisfactorily.¹⁴

This was 1900 and Sooy, a machine hand with no high school diploma, became a fully fledged "recorder" by October.¹⁵ The Berliner Company went into receivership and Johnson hired Calvin G. Child to handle Artists and Repertoire (A&R) and serve as manager of the recording laboratory. Fred Gaisberg, Raymond Gletzer, and James W. Owen came over as well. Recording, at this time, took place in a utilitarian room with no stage or audience, just the large megaphone-like recording horn(s). The process and environment could be daunting for the performers. Recorders arranged vocalists and accompanists so the recording horn(s) would capture all the sounds while foregrounding the most important parts. Physical positioning of the players and singers was often uncomfortable with little or no eye contact between them.¹⁶ Raymond Sooy recalled: "No two artists ever face the recording instrument quite alike; some are nervous; some confident; some cannot

make records with a spectator in the studio, while others must have someone standing by constantly.”¹⁷

He provided a fascinating and detailed description of the recording process in his unpublished memoirs:

We have used as many as twelve recording horns at one time with good results. This made it very difficult because the more horns used, the less volume you would get in the records, consequently a very sensitive diaphragm had to be used for this purpose; then again, we were forced to use Stroh violins. These violins were made with a horn attached to them so that they could throw the music in one direction, but the tone quality was not so good. It was also necessary to place the musicians playing the ‘cello, oboe, clarinet, cornet, trombones and some of the other instruments on high chairs or stools, so that they could concentrate their tone directly toward the recording horns. They had to be placed so close together that it was almost impossible for them to play—the violinists, while playing, would oftentimes run their bows up the bell of the clarinets which were being played directly above them, or in one of the other musician’s eyes, which would cause a heated argument.¹⁸

Sooy also described an especially chaotic moment, “when a xylophone, propped three feet off the floor, on ‘flimsy stands,’ fell—taking out the horns and the vocal artist.”¹⁹

Listening to playback was not possible until well after performers had left the studio. This presented a particular challenge with field recordings. Recorders returned from their trips with hundreds of masters, the quality of which was unknown until the factory made a test copy. They had to rely on inspection with a magnifying glass to decide if the master was “clean.” If not, they had to record that piece again and with even the most assiduous visual checking there was no guarantee that it would be of sufficient quality for the Victor catalog. Harry Sooy explained: “In the early days of Mr. Johnson’s Recording and Matrix work, the first pressing from the master matrix was made in the Laboratory, and from this pressing, it was determined whether the selection, or record, was worthy to be listed in the catalog. If such selection was listed in the catalog, matrices were made and forwarded to the Duranoid Manufacturing Company, Newark, New Jersey, who made all the pressings for the market.”²⁰ A committee, including a representative of the Laboratory, the Company’s Musical Director, and the Director of Artists Department, among others, made the aesthetic assessment. There were times when even the biggest stars had to return and rerecord selections. In later years, Victor brought the pressing facility into the Camden plant.

Recordings were made internationally in Mexico City, Buenos Aires, and Havana, as well as in homes, hotels, and, in 1922, the White House. The Sooy brothers were well paid and integral to Victor’s success but rarely acknowledged publicly. In 1909, Johnson promoted Harry O. Sooy to “Chief of the Recording Staff,” and, in 1913, he was made a member of the “Recording and Matrix Committee.”

He became “Manager” of Victor’s Recording Departments in 1916, the same day Raymond Sooy moved up to “Chief Recorder.” The two brothers were in full managerial and operational charge of the Victor Talking Machine Company’s recording operations. Regardless of their key technical roles, they were allowed no A&R input even though they presided over landmark sessions with a range of famous talents. This included the first known jazz recording. Harry Sooy reported that on February 26, 1917:

The Original Dixieland Jazz band made their first records for the Victor Company. Incidentally, this was the first time the Victor Company made records of the real “jazz” and “blues” type of music for dancing, and, believe me, they were fully all that “jazz” and “blues” imply. The first records made by the Original Dixieland Jazz Band were “Livery Stable Blues” and “Dixieland Jazz Band One Step.” These were followed by “Tiger Rag,” “Skeleton Jangle,” and others of similar character, making a very big hit with the public, particularly those who liked “blues” dance music.²¹

The *New Orleans Times-Picayune* (April 17, 1917, 14) said of this disc, “Here is positively the greatest dance record ever issued.”²² Nevertheless, it was subsequently controversial that a white group cut the first jazz recording when African American and Afro-Creole musicians dominated the genre. Also in 1917, Victor made a successful foray into recording large symphonic recordings, opening their doors to top orchestras.

Victor went to great lengths to protect its image of refinement by keeping its opera stars to the fore publicly, but its profits came mostly from popular music. This is not surprising given that Americans were embracing the rise of modern consumer culture. In addition to recorded music, this included readymade clothing, household appliances and the Model T Ford. With rising prosperity and a declining proportion of income going to necessities, more Americans had disposable income.²³ Companies began using new, psychologically based advertising, publicity, or (as they were then known) propaganda techniques, which were pioneered by Sigmund Freud’s nephew, public relations guru Edward Bernays (1891–1995).²⁴ Recorded music exposed more people to more music, yet the belief that “mass duplication of the best available music would result in a process of social uplift”²⁵ proved wrong. Most Americans and Europeans purchased popular music that “few reformers considered uplifting.”²⁶

In 1923, Harry Sooy was finally appointed to an Artists and Repertoire (A&R) Committee but was excused after a few months. This was a boom time for the recording industry but change was about to come, with radio as the disruptive force. Commercial radio expanded rapidly in the early twenties and acoustic record players could not compete with radio’s constant stream of free and better sounding entertainment. After the holiday buying season of 1924, more than half the machines Victor produced did not sell. The company allowed dealers to sell off inventory at half price. They then licensed Western Electric’s new electric recording

equipment, switched over to electric recording and paired their latest turntables with Radio Corporation of America (RCA) radio receivers in cabinets. Harry Sooy grasped the revolutionary nature of these changes: "This meant discarding all of our old equipment used for direct Recording. . . . It also meant microphones for the talent to sing or play into, instead of a horn, as heretofore used, which necessitated different placing of the talent for the microphone, which we found beneficial because they could be placed whereby they would have more room and comfort while working."²⁷

The musicians could now see and interact with each other better; positioned more as they were when playing live. Raymond Sooy commented: "The new electrical recording process is a marked advancement in the recording of sound. The musicians can be placed in a natural position so they can perform with ease, likewise the vocal artists." Harry Sooy described what may be the first multitracked session in late 1925: "Mr. Kellogg (Bird Whistler) had an idea of making a record, himself with six Orthophonic Victrolas. This was done by using six records (pressings of a record he had previously made) on the Orthophonics in conjunction with himself, thus making seven bird voices on one record."²⁸ There would be further experiments with these techniques but it would be nearly another quarter century before overdubbing would begin to find widespread acceptance and, in the process, transform production.

The Gramophone Company in England "had suffered . . . because of the war" and did not have the capital to take advantage of a post-World War I boom, so Victor bought a 50 percent interest.²⁹ In the first quarter of the twentieth century, the Victor Talking Machine Company had become a primary force in the recording industry at home and abroad. Then, in November 1926, Johnson sold Victor to New York investment firms netting millions for the family and many key employees. Harry Sooy died May 22, 1927, and less than a week later, management made Raymond Sooy "Superintendent of Recording." Shortly before the 1929 stock market crash, the Radio Corporation of America bought Victor creating RCA Victor.³⁰ Paul Fischer, who conducted this primary research on the Sooy's, points out that at least one of the brothers was at or near the helm of the recordings made for the Victor Talking Machine Company for its entire existence as an independent (1901–29). The Sooy's became international travelers and were befriended by great artists and political figures. Recordings made by them and members of their department earned Victor a reputation for excellence, and stand as exemplars of acoustic recording, milestones in the evolution of the recording industry.³¹

Despite the magnitude of the Sooy's contribution, the Artist and Repertoire Department, Frederick Gaisberg, Calvin G. Child, and the like, decided who and what to record. They were regarded as key company figures, gaining international reputations, and considerable wealth. The Sooy's were not valued as highly as the directors, factory foremen, sales executives, or those who made aesthetic decisions. Management viewed them as part of an industrial process and, given sufficient space, equipment, and supplies, were expected to deliver.³² Acoustic recording was

not an exact science. The Sooyos positioned performers relative to the recording horns, made them feel comfortable, advised and guided them in the art of recording, and coped with personality issues. Additionally, they shouldered the engineering responsibilities, setting up and operating recording equipment. Cutting a cylinder or disc, even into the electrical recording era, was a single opportunity, non-editable, real-time process. Checking or verifying takes was done visually. Even a minor mishap during recording required a retake. In the field, the challenges were greater, and supplies were limited. Transporting the fragile masters back from a remote recording session to the factory could be fraught. Raymond Sooy told an illustrative story about an important Rosa Ponselle session he recorded in New York, December 8, 1927. They cut six twelve-inch discs and, being concerned about breakage in shipping, decided to carry them personally “to insure their safe arrival.”³³ They took the train back to Philadelphia and all was well until: “Waiting there for a bus to bring the records to Camden, someone in the crowd bumped me, and I dropped the records on the pavement, which broke every one of them in a thousand pieces.”³⁴ Sooy commented, “After this accident, I did not know whether to go back to Camden and tell my story or to jump into the river.”³⁵ Nevertheless, the Sooyos were entrusted with many important recording assignments for Victor, which implies that they achieved a high rate of successfully completed and delivered recordings. They were pioneers in the field of popular record production, although the creative dimension of their contribution went unacknowledged and undercompensated.³⁶

Documentation of Cultural Expression

The market for recorded popular music began to develop shortly after Edison’s invention. Additionally, as early as 1890, the machine’s ability to accurately document “human cultural expression”³⁷ for further study, was identified and applied by Jesse Walter Fewkes (1850–1930). At Calais, Maine, (in mid-March 1890) Fewkes recorded Passamaquoddy (American Indian) songs, tales, and vocabulary. Excited by his results, he spread word to folklorists, linguists, ethnologists, and others of, what he termed, the “imperative” of working “with the phonograph in preserving the languages of the aborigines of this continent.”³⁸

Perhaps one of the most famous images of an early “recorder” is that of a woman, Frances Densmore (1867–1957), pictured outside the Smithsonian playing American Indian songs to the Chief of the Montana Blackfoot (Figure 2.2). Densmore too, was fascinated by American Indian music. After several visits to Indian communities, she recorded twelve cylinders of songs, in 1907, with Big Bear (Kitchimakwa) on a borrowed recording machine in the backroom of a local music store.³⁹ With a grant from the Bureau of American Ethnology (BAE) she purchased an Edison phonograph, making seventy-nine field trips to roughly fifty-four locations. She collected songs of the Seminole on her last trip at the age of eighty-seven.



FIGURE 2.2 Mountain Chief, Chief of Montana Blackfeet, in native dress with bow, arrows, and lance, listening to song being played on phonograph and interpreting it in sign language to France Densmore, Ethnologist, march 1916, by Harris and Ewing.

Credit: National Anthropological Archives, Smithsonian Institution [NAA Inv. 0032 7300].

Densmore made approximately 3,500 recordings that now reside in the Library of Congress.⁴⁰

A black saloonkeeper in San Antonio singing “Home on the Range” was recorded on an Edison cylinder by John Avery Lomax (1867–1948), on his first trip west in 1908. Lomax wrote down the lyrics and published them in his 1910 book “Cowboy Songs and Frontier Ballads.” The song became a national favorite.⁴¹ Later, Lomax set out on a recording expedition under the auspices of the Library of Congress with his eighteen-year-old son Alan. It was June 1933. They toured prison farms, recording work songs, reels, ballads, and blues performed by prisoners. Lomax was looking for performers and music that had been isolated and thus unaffected by the homogenizing effect of radio and recordings on musical culture. In the trunk of their Ford sedan, father and son hauled a 315-pound acetate-disc recorder on which they recorded Lead Belly (Huddie Ledbetter), who they had discovered in the Louisiana State Penitentiary at Angola (Figure 2.3). In total, John and Alan Lomax recorded some 10,000 songs for the Archive of the American Folk Song at the Library of Congress. Along with the Lead Belly material are early recordings of other important American roots artists, such as Muddy Waters and Honeyboy Edwards.⁴²

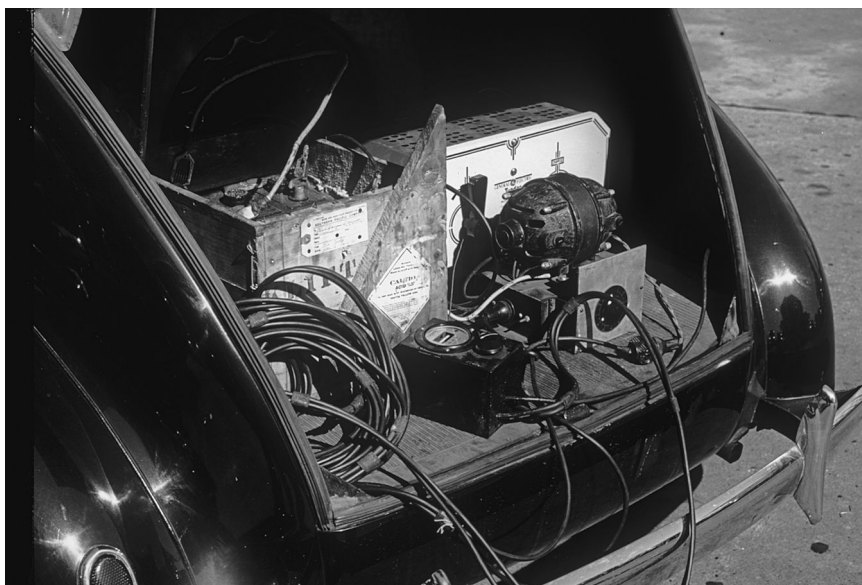


FIGURE 2.3 Library of Congress recording equipment in a car trunk, ca. 1940. (AFC 1941/038: Library of Congress Recording Laboratory Photographs item ph14)

Credit: American Folklife Center, Library of Congress.

The End of an Era

At the dawn of the twentieth century, the business of selling recorded music and its associated hardware was becoming established, competitive, and litigious—with many patents being contested. Marketing became important in differentiating one product from another. Thomas Alva Edison was, by this time, a national hero because of his development of the phonograph, electric light, and power distribution. Regardless, when he issued his new and improved Diamond Disc Phonograph, he conducted thousands of “tone tests” from 1915 to 1925 in many markets. These events juxtaposed phonograph recordings with live performances by the same artists. The challenge was for audiences to discern live from recording. Showmanship involving artists alternating between miming and singing, lighting effects, and theatrical sweeps of the curtains built excitement prior to the unabashed sales pitch for the new machines and recordings.⁴³ Of one of the most famous “Tone Test” events at Carnegie Hall, the artist—Anna Case—said later, “I remember I stood right by the machine. The audience was there and there was nobody on stage with me. The machine played and I sang with it. Of course, if I had sung loud, it would have been louder than the machine, but I gave my voice the same quality as the machine so they couldn’t tell.”⁴⁴ Many new labels were entering the burgeoning market in the mid-teens of the twentieth century. The Starr Piano Company of Richmond, Indiana, started its recording company in 1916, changing the label name to Gennett

Records later that year. The label not only had a recording studio in Richmond, but Henry Gennett "...set up a primitive recording studio in Starr Piano's new office at 9-11 East 37th St., in New York City."⁴⁵

Hoagy Carmichael, quoted by Rick Kennedy, noted of the Richmond place, "The Studio was primitive; the room wasn't soundproof and just outside was a railroad spur with switch engines puffing away noisily. Yet this obscure recording studio in a small Indiana city saw a history making parade of musicians. They made the name of the Hoosier Gennetts one of the greatest names in recorded music, and the gold-lettered Gennett label is one to collect."⁴⁶ Louis Armstrong, King Oliver, Bix Beiderbecke, Jelly Roll Morton, and many others cut seminal jazz recordings in this little room, at the Starr piano factory, where a nearby train could interrupt the session. However, in the late teens of the twentieth century, things came to a head between the independents, and Victor and Columbia. The giants were restricting competition by pooling their patents for lateral recording. This forced other labels to use the hill and dale method, which was incompatible with many players.⁴⁷ Gennett began recording laterally in 1918 and, along with other small labels such as Okeh, Compo, and Vocalian, prevailed in a 1921 patent infringement lawsuit (and 1922 appeal) brought by Victor. Gennett established itself as an important independent label, releasing some of the earliest jazz recordings and stimulating the independent sector.

A little more than four decades into the age of recorded music, the now-established recording industry was about to encounter a major challenge. Technologies and business elements were moving into position for radio and electrical recording. E. C. Wente developed the condenser microphone in 1917. The Radio Corporation of America (RCA), which was partly owned by United Fruit, formed in 1919. Just a year later, on October 27, the first commercial radio station, KDKA Pittsburg, received its commercial call letters from the Department of Commerce. Five days later they began broadcasting for one hour every evening from 8:30 pm with the presidential election returns. Neither the major nor the independent record labels behaved as if they understood the impending impact that radio—with its higher quality sound and free content—would have on the recorded music market. Nor could they predict how that effect would be amplified when combined with economically difficult social circumstances.

By 1923, many labels were active internationally, including The Gramophone Company, The Columbia Phonograph Company, and associated labels such as His Master's Voice (UK), Parlophone (UK), Odeon (Germany), and Fonotipia (Italy). The industry had also diversified stylistically with thousands of recordings from Europe, Asia, and the Middle East, including folk songs, jazz, spoken word, and classical music. However, the seemingly unlimited free music and entertainment from the accelerating new medium of radio loomed, and record sales had begun to decline from their high of \$106 million in 1921. Nonetheless, great artistry captures the public imagination even in difficult times. The "Empress of the Blues," Bessie Smith (ca. 1892–1937) released her first record

“Down-Hearted Blues” in the spring of 1923, purportedly selling more than 750,000 copies that year for the Columbia label, and launching her to national fame.⁴⁸ John Hammond (1910–87) later said that it was because Smith recorded for Columbia that he took his first project there (he spent much of his long production career at the label).⁴⁹ Ralph Peer (1892–1960) had worked for Columbia before serving in the Great War. He took over General Phonograph’s Okeh label on his return and began recording the people’s music that most labels were ignoring. In 1923 Peer recorded Fiddlin’ John Carson’s (ca. 1868–1949) “Little Old Log Cabin in the Lane” for the Okeh label when Carson was fifty-five years old. The track ignited passions across the country and is said to have sold more than half a million copies, initiating the commercial country music industry.⁵⁰ The story goes that Carson approached Atlanta’s WSB, the South’s first radio station a week after it went on the air in 1922. He showed up and gave an impromptu concert of mountain music that lasted, a station official said, until “exhaustion set in,” triggering an ebullient response from listeners. The station could be heard as far away as the Rockies, Cuba, and Canada; Carson became a regular and a national radio personality.⁵¹ There was now a proven market for regional folk music and, in September 1924, Peer recorded West Virginia musician “Pop” Stoneman in New York City, playing one of his own songs, “The Sinking of the Titanic.” The record is believed to have sold more than one million copies. Having built a reputation for understanding the newly successful “hillbilly” music, in 1926 Victor offered Peer a deal he could not refuse.

The Electric Period

Toward Electric Recording

As previously discussed, recording and reproduction of sound was—until 1925—not an electrical process. An electric motor may have driven the platter or cylinder of the recording or playback machine, but the signal chain was acoustic and mechanical. Radio proved to be the catalyst for change in the record business. Acoustic recordings played back on acoustic players did not compare favorably with radio’s louder and superior sound quality or the fact that the broadcast material was free. Edison had been the first to use electricity to record sound. He attached a stylus to the diaphragm of a telephone receiver, allowing the signal to vibrate the stylus and cut the groove. Nonetheless, he remained resistant to electric recording, even when Columbia and Victor began issuing electrically recorded discs using Western Electric technology in 1925. Theodore Edison said his father had become quite deaf by this time. When he was checking the Columbia and Victor discs, he apparently turned the “volume all the way up, which distorted the sound,” to the degree that, “he couldn’t hear that good electrical reproduction was possible.”¹

Sir Charles Wheatstone (1802–75) had coined the term “microphone” in 1827 using the Greek “micro” (small) and “phon” (sound). However, he used it to describe an acoustic stethoscope-like device. British-born David Hughes (1831–1900), who became a professor of music in Kentucky, developed a parallel fascination with electrical engineering. Noting that a loose contact in a circuit with a battery and a telephone receiver gave “rise to sounds in the receiver corresponding to the vibrations impinged upon the diaphragm of the mouthpiece or transmitter” led to him developing a carbon microphone. He presented his invention in a paper he read to the Royal Society of London in 1878 entitled “On the Action of Sonorous Vibrations in Varying the Force of an Electric Current.” Hughes chose not to patent his invention allowing it to be developed and improved, thereby donating it to the telephone and future broadcast and recording industries. He is credited with reviving Wheatstone’s term “microphone,” for what would, ever after, be applied to all types of devices used to convert acoustic sound waves in the air to their electrical analog.²

At the age of twenty-five, in June of the same year, Emile Berliner (later, the inventor of the gramophone) filed application for a patent for a microphone also

using the loose contact principle. At first, Berliner used metal contacts and then, ultimately, carbon. He sold his device for \$50,000 to the fledgling Bell Telephone company, making their new invention more practical and mass marketable.³ As is typical with inventions, there was rancorous dispute over whose came first. Edison had patented a telephone transmitter in 1877 in which a diaphragm modulated contacts covered with plumbago (graphite), thus varying the resistance. Edison sued and prevailed in the Supreme Court in 1892. In December of the previous year, Bell executive W. Van Benthuyssen told *The New York Times* that these principles were “common knowledge in some circles, having appeared in published works as early as 1854.”⁴ He said in the same article, quoted by Eliot Van Buskirk in *Wired Magazine*, that “France’s Count Du Moncel had written extensively on the topic over two decades earlier.”

In any event, the loose-contact carbon-microphone was highly efficient, producing robust output making it suitable for telephone transmissions before, and for a century after, electrical amplification was invented. Nonetheless, fidelity was low and the carbon granules would pack together decreasing sensitivity and increasing noise (a problem that was easily solved by tapping the microphone). In 1898 Professor Oliver Lodge of Liverpool patented the higher-quality moving coil microphone, but its low output meant that wide application would have to wait for the advent of electronic amplification.⁵

Others were working, since at least 1914, on electric technologies that would rejuvenate the recording industry, including vacuum tube amplifiers, electromagnetic disc cutters, and Wenté’s 1917 condenser microphone. Future electrical recordings would be backwardly compatible with acoustic players, but, for electrical reproduction to catch on, amplification and loud speakers would be necessary. In 1911, in Napa, California, Edwin S. Pridham (1881–1963) and Peter L. Jensen (1886–1961), using the same electromagnetic principles as the dynamic microphone, invented the “Magnavox” (Latin for great voice) moving-coil speaker. Filing patent in 1913, they were able to demonstrate their dynamic speaker by 1915, and it was said that the “amplified words could be heard clearly a mile away.”⁶ Their development, initially used in public address systems, played an important part in the spread of radio and electric recording, and loudspeakers today work on the same basic principles.⁷ Pridham remained with his Magnavox Company for his entire career.⁸ Jensen, who had trained under Valdemar Poulsen in Denmark (working on early radio transmitters and magnetic recording), went on to form Jensen Radio Manufacturing and later, Jensen Industries, which made audio components.⁹

Better Sound

It was the mid-twenties before the various electric disc recording and reproduction technologies finally coalesced. Electrical engineer Orlando R. Marsh (1881–1938) released 78s on Autograph Records in 1924—allegedly recording them electrically

using his own technology. This was the year before Columbia and Victor released electrically recorded discs. As usual, there were several competing systems in development, including one that the British branch of Columbia had nearly completed but abandoned when Western Electric launched theirs.

Once again, technology influenced art. The acoustic system favored rambunctious mid-range music. Sousa marches by the Marine Band, and opera singers like Caruso recorded and reproduced well via the acoustic horn, but the frequencies and dynamic range of a full drum set did not. Electrical recordings could now capture sibilance and subtle sounds as well as a wider frequency spectrum and louder instruments. Microphones allowed musicians to spread out instead of crowding in front of a recording horn. Electronic balancing of sounds gave producers more control over the process and results. Crooners such as Bing Crosby (1903–77) used the properties of the new microphones to emphasize intimate, rich vocal tones.¹⁰ Drummers could use their bass drums and full drum set (just as they would at a gig) without fear of overloading the cutting head. Gene Krupa, renowned for his heavy right foot, is reputed to be the first drummer to record with a bass drum. It was at OKeh Records in Chicago, December 1927, with McKenzie and Condon's Chicagoans. OKeh's recording director (producer) Tommy Rockwell reluctantly agreed to let Krupa play his full setup, saying "All right, but I'm afraid the bass drum and those tom-toms will knock the needle off the wax and into the street."¹¹ Apparently, that did not happen.

British speaker designer and audio engineer, H. A. Hartley, of London, England, claims to have coined the term "high fidelity" (later abbreviated to hi-fi) at this time. He wrote:

I invented the phrase "high fidelity" in 1927 to denote a type of sound reproduction that might be taken rather seriously by a music lover. In those days the average radio or phonograph equipment sounded pretty horrible but, as I was really interested in music, it occurred to me that something might be done about it. I investigated the nature of sound, the behavior of the human ear; the minimum requirements of good sounding equipment and finally produced something which did appeal to others also interested in music reproduction. As the weakest link in the chain of reproducing equipment was the speaker, my work naturally was devoted to improving speakers.¹²

It was the late forties and fifties when the term became commonly used by manufacturers as a marketing tool. Amplifiers such as Leak's 1945 "Point One" line introduced better than 0.1 percent total harmonic distortion (at 1 KHz) and a frequency response of 20 Hz to 20 kHz, as did McIntosh's later and more powerful Unity Coupled series.

Electrical recording introduced some new problems. Compensatory equalization (pre-emphasis) when recording the disc improved playback response by attenuating bass frequencies and boosting high frequencies while recording. This ensured that the bass did not cut the groove too wide (thus reducing the playing

time of the disc), and that the high frequencies could rise well above the noise floor of the disc. Disc players needed to decode or reverse the curve on playback (de-emphasis). Unfortunately, there were dozens of proprietary curves, including Columbia, Decca, NAB, RCA, BBC, EMI, CCIR, and AES. Playing back a Decca disc with a Columbia curve and so forth, did not produce the result the producers and engineers intended. This problem was not resolved for decades, until the RIAA (Recording Industry Association of America) published their curve that was adopted across the US industry in 1955.

Country Music

In July 1927, Pleasant Carter saw an ad in the Bristol, Tennessee, paper saying, “The Victor Company will have a recording machine in Bristol for ten days beginning Monday to record records.”¹³ Ralph Peer, by this time producing for Victor and using the new Western Electric equipment, recorded the Carter Family, Jimmie Rodgers, and many other foundational country artists in those legendary sessions on State Street in Bristol, Tennessee. Now known as the “Bristol sessions” and often referred to as “the big bang of country music,” they mark the beginning of the Carter Family and Jimmie Rodgers’s national and international careers and firmly established the country music genre. The Columbia Broadcasting System (CBS) formed that year. Former Columbia Records, Hollywood, salesperson Thomas G. “Tommy” Rockwell (1901–58), became general manager of Okeh Records, by then a Columbia subsidiary. Rockwell traveled through the South on several recording trips when, in 1928, two country musicians (Willie T. Narmour and Shell W. Smith)¹⁴ recommended he record Mississippi John Hurt who has been described as playing guitar like “two musicians at once.” Rockwell recorded Hurt for Okeh in Memphis that year and then Hurt famously disappeared from the recording scene for thirty-five years until musician Tom Hoskins rediscovered him. Hoskins heard a clue to Hurt’s location in a bootleg passed along to him by Dick Spottswood. On it Hurt sang, “Avalon’s my hometown, always on my mind/ Pretty mamas in Avalon, want me there all the time.” Hoskins found Avalon, Mississippi, and, at the end of a gravel road was the seventy-two-year-old Hurt.¹⁵

Tommy Rockwell also recorded early Louis Armstrong and Fats Waller masters.¹⁶ Contemporaneously, across the Atlantic, and somewhat circuitously, Walter Legge (1906–79), British impresario, critic, author, A&R person, and classical music producer, began his long and influential career. His first job at various UK-based EMI companies was at the HMV record shop in Oxford Street, London. This ended abruptly because he was critical of their policies. He went on to write and edit HMV’s monthly magazine for retailers, which gave him the opportunity to attend recording sessions. Fred Gaisberg, HMV’s musical director, became impressed with his knowledge of music but it was through Legge’s inspired innovation of *Society Editions*—a presold subscription recording service—that he began

producing recordings. Sir Thomas Beecham met Legge in 1934 and insisted that he supervise all his recording sessions. Gaisberg agreed that Legge should because, untypically for Gaisberg, he and Beecham did not get along well. Legge's abilities as an impresario and classical music producer reached their peak between 1945 and 1964 when he signed many of the world's great classical artistes to EMI and produced numerous outstanding and enduring recordings.¹⁷

Further Technological Foundations

In Germany, in 1928 Georg Neumann began production of his "Neumann Bottle," CMV3, the first mass-produced condenser microphone.¹⁸ At the same time in Germany, Dr. Fritz Pfeleumer (1881–1945) patented a process for the application of magnetic powders to a strip of paper or film.¹⁹ Nineteen twenty-nine was the year that Harry Nyquist published his sampling theorem (the Nyquist Theorem) that would prove fundamental to digital audio and holds true to this day. Interestingly, this coincided with the final production run of Edison cylinders and discs. It was also the year that Magnavox introduced the hum-bucking coil, which reduced loudspeaker hum.

RCA produced a forerunner of the LP in 1931. It was a wide-groove vinyl disc running at 33½ rpm. Unfortunately, it was an idea whose time had not yet come. The heavy weight of the tone arm and the type of stylus they used cut through the (mostly Victorlac) discs, causing many consumer complaints. In a still enfeebled recorded music market, RCA's new general manager Ed Wallerstein withdrew them from the market in 1933. However, the research would not go to waste. When Wallerstein was made president of American Records in 1939, after its purchase by CBS, discussions of a joint project began (using expertise and parts of the earlier RCA technology) that would emerge nine years later as the next dominant consumer format: Columbia's 33½ rpm, microgroove LP.²⁰

In 1930, AEG (Allgemeine Elektrizitätsgesellschaft), of Berlin, began developing its Magnetophone machine, based on Pfeleumer's principle. Pfeleumer granted AEG permission in 1932 and AEG contracted with BASF, of Ludwigshafen, who shipped the first 50,000 meters of magnetic tape in 1934. As so often happens, Pfeleumer's patent was challenged and, in 1936, the German National Court canceled it on the grounds that the principles were covered in Valdemar Poulsen's patents of 1898 and 1899. The decision left Poulsen on record as the inventor of magnetic recording. AEG showed the "Magnetophone" machine and magnetic tape at the 1935 Radio Fair in Berlin.²¹ These inventions established the next recording format, opened new potential for producers, and, after World War II, inspired the first Ampex recorders and magnetic tape (see chapter 5).²²

On November 12, 1931, Abbey Road Studios, or EMI Studios as they were then known, opened in London with Sir Edward Elgar conducting the London Symphony Orchestra playing "Land of Hope and Glory."²³ At the time it was the

largest sound recording studio in the world. Chairman Louis Sterling hired Alan Blumlein to install his electrical recording system. Inspired at the movies, by hearing a voice from a mono speaker on one side of the screen while the character was on the other side, Blumlein invented binaural recording. He patented his method in England describing the theory of stereo recording, including microphone arrangements, and a system for cutting stereo discs. The first binaural discs were cut that year but it would take a quarter century for stereo recording to become standard practice.²⁴

The Calm before the Storm

The year 1929 would prove to be transitional in many respects for the recording industry. Prior to the stock market crash, the Radio Corporation of America (RCA) and Victor merged, and the industry achieved its peak sales of about 106 million units. A confluence of factors, not dissimilar to those beginning seventy years later, caused a dramatic slump, and sales would not recover to this level for another sixteen years (discussed further in chapter 4).

The Thirties and Forties

Bing Crosby had capitalized on the electric microphone's potential for capturing a more intimate sound. Just twelve months after the stock market crash, having become the subject of a youth marketing campaign by George Washington Hill's Cremo Cigars, he became the nation's most famous crooner.²⁵ Bill Paley signed Crosby to CBS in 1931 just as radio was booming and record sales languished.

This was also the year that John Hammond began what would be a long and illustrious production career, largely for Columbia Records. His beginnings were inauspicious, with Hammond paying \$125 to use the recording studio and guaranteeing Columbia that he would purchase 150 copies of the Garland Wilson recording he produced. Hammond was a Vanderbilt, so money was no object for him, but Columbia—like the rest of the music industry and most of America—was suffering hard times.²⁶ Hammond stated that Columbia sold no more than 100,000 units, in total, that year.²⁷ This was a low point for the recording industry, with sales having dropped nearly 95 percent from around 106 million units in 1927 to about six million by this time.²⁸ Nonetheless, the technology of recording continued to improve. Albert L. Thuras patented the bass-reflex loudspeaker principle. Dr. Harry F. Olson of RCA patented the first cardioid ribbon microphone in 1932 using a field coil rather than a permanent magnet.

Sales of records may have been at rock bottom by 1933, but jukeboxes were booming when Homer Capehart sold his Simplex automatic record changer mechanism to the Wurlitzer Company. Wurlitzer's rivals were Seeburg and Rock-Ola, and

at a nickel-a-play, the American market grew to 300,000 machines by 1939. Radio had learned to pay attention to records receiving the most jukebox plays and this was the genesis of the 1935 network radio show, “Your Hit Parade,” sponsored by G. W. Hill’s Lucky Strike.²⁹ General George Squier patented an innovative system for transmitting music, initially over the A.C. power system, and subsequently through telephone lines. Based on this technology he founded Muzak, deriving the name from a combination of “music” and the name of a company he admired: “Kodak.” He piped recorded music into homes in Cleveland for \$1.50 per month on three channels. Subsequently, Muzak changed their business model to service factories and workplaces with recordings of popular artists. They established the idea that music improved the productivity and morale of workers and later developed specialized music programming for this purpose. However, at the outset, famous artists such as The Carter Family and Fats Waller would record their sets for exclusive transmission by Muzak and these were not broadcast or distributed to the general public through other channels. Nat Hentoff and Nat Shapiro published an illustrative vignette by Fats Waller’s manager, W. T. Ed Kirkeby, of Waller’s March 11, 1935, Muzak sessions. The sessions were squeezed in between his three daily sets at the Lowe’s State Theater. Waller’s band recorded twelve sides with ten minutes to spare before their theater set, and then Waller returned after his next theater set to record four more solo sides.³⁰

From 1934, Ben Selvin (1898–1980) was VP of programming for Muzak in their Manhattan, AMP studios. Selvin recorded artists from many genres, performing sets onto sixteen-inch vinyl transcription discs, for transmission over the Muzak lines through their ingenious technology and franchise system.³¹ Muzak’s recording, documentation, rights clearance, and quality-control systems were rigorous, with masters cut simultaneously on four identical lathes. The Muzak production staff carefully examined and annotated each master for performance and technical quality.³² Selvin was a musician and bandleader producing recordings for many labels and is reputed to be one of the most prolific recording artists of all time, earning the title “Dean of Recorded Music.” His 1919 pop hit, “Dardanella,” may have been the bestseller of the first quarter of the twentieth century, reputedly selling more than five million copies. Columbia hired Selvin in 1927 and he worked with artists such as Ethel Waters, and Ruth Etting, as well as soloists of the caliber of Benny Goodman, and Bunny Berigan. Selvin led a number of groups under dozens of aliases, held titles at several labels, and appears to have worked non-exclusively for many others.³³

In the UK by March 1931, record sales had dropped as much as 90 percent. Gramophone and Columbia, previously rivals, merged to form Electrical and Musical Industries (EMI). With Decca and Deutsche Grammophon as their primary competition, the consolidated organization was able to dominate the European market.³⁴

During the thirties and forties, there were several disc-cutting machines designed to capture the small home-recording market. These included the Remco

“Babytone” and the Wilcox Gay “Recordio.” Throughout the thirties as the Great Depression dragged on, the recorded music market showed modest signs of recovery, with some of the increase being attributed to cheaper disc players such as RCA’s Duo Jr. record player attachment for radios, which sold for \$16.50.³⁵

In 1935 New York’s WNEW became the first music and news radio station to play recorded music. The disc jockey, Martin Block (1903–67), is said to have eventually earned more than \$500,000 a year with his “Make Believe Ballroom” show, more of which is covered in chapter 6. BASF demonstrated their plastic-based magnetic tapes with the AEG “Magnetophone” recorder in Berlin in 1935. Just a year later, the London Philharmonic Orchestra conducted by Sir Thomas Beecham recorded a Mozart symphony using both the tape and the recorder for the first time. In 1938 Benjamin B. Bauer (1913–79) of Shure Bros. engineered the Unidyne Model 55 microphone, featuring a cardioid pickup pattern that led to the near ubiquitous SM57 and SM58 microphones. Leslie J. Anderson, under the direction of Dr. Harry Olson, designed the 44B ribbon bidirectional mic and the 77B unidirectional for RCA.³⁶

Electronics engineer and record producer Moses Asch (1905–86) formed his first label, Asch Records, in 1939 with the objective of creating an “Encyclopedia of Sound.” This would be the first of two false starts that would culminate in his successful application of, what we would now term, a long-tail business model to support his vision of creating a self-supporting and encyclopedic, ethnographic collection. Folkways Records and Service Corporation (now part of Smithsonian Folkways Recordings) was formed in 1948.

In 1942 the Armed Forces Radio Service (AFRS)—created to distribute programs to troops overseas—began producing the many, vinyl sixteen-inch transcription discs, containing popular and classical recordings for their Basic Music Library. They included artists such as Count Basie, Nat King Cole, and Louis Armstrong, as well as the NBC symphony orchestra conducted by Toscanini and Stokowski.

Radio, Film, and Tape Innovations

Major Edwin H. Armstrong (1890–1954) made the first experimental FM radio broadcast in 1935. This resulted in decades of patent battles with major corporations that left him sick, disillusioned, and broke. He committed suicide in 1954. The lawsuits continued after his death with his widow, Marion, winning their first victory over RCA in the year of Armstrong’s death. Using the money from that settlement, Marion Armstrong persisted and by 1967, with the defeat of Motorola, had won all twenty-one lawsuits. Edwin Armstrong was affirmed as the inventor of frequency modulation.³⁷

In 1940 Disney released *Fantasia*, the first film to use multichannel stereophonic sound that they called Fantasound. Other important innovations attributed to Disney, *Fantasia*, and the film industry include the introduction of the click track

and the development of a multichannel surround system using a dispersion-aligned loudspeaker system with skewed-horns. Disney also introduced the pan pot, control track level expansion, overdubbing of orchestral parts, and simultaneous multi-track recording.³⁸

Two years into the war in Europe, in Germany, AEG, Weber, and Von Braunmuhl introduced their version of AC high-frequency biasing on the Magnetophone, dramatically improving the quality. This was a decisive technological step toward the era of magnetic tape recording.

Economic and Societal Overlay

Cyclical Decline

Inevitably, economic and other societal influences come to bear on the ebb and flow of recorded music revenues and refashion the work and lives of music producers. Of course, correlation does not indicate causation and unraveling the complexity of those interactions presents challenges. There have been seventeen recessions in the United States since 1877; in fact, the phonograph was born in the trough of a recession caused by the railroad boom.¹ The disruption that the industry has experienced since 2000 is, as previously noted, not unique. Peer-to-peer delivery of free music (triggered by the launch of Napster) was widely blamed for the decline in mainstream sales, but the industry has faced competition from free sources of music before. By the late 1920s, free music delivered by the new medium of radio was having a similarly deleterious effect on the record industry. As we have seen in recent years, music also competes with other forms of entertainment for consumer dollars. This, too, was a factor in the thirties with free non-music radio programming and the excitement over the brand new talkies (motion pictures with sound). Depending on sources, sales of records in the United States dropped from somewhere between 104 and 106 million discs in 1927 to six million in 1932.² The number of phonograph machines manufactured annually fell from 987,000 to 40,000.³ Roland Gellatt reported, “The talking machine in the parlor, an American institution of redolent memory, had passed from the scene. There was little reason to believe that it would ever come back.”⁴ In the thirties, this slump in music sales resulted in the collapse of small labels and the strengthening of the oligopolies. In the UK, EMI and Decca manufactured nearly all the records sold. In the United States, RCA or Decca sold 75 percent of all records and the American Record Company, which controlled Brunswick and Columbia, sold most of the rest. However, the competition for consumer dollars from talking pictures and from free (relatively high-fidelity) music via radio were not the only factors contributing to this collapse: There was also the Great Depression.

When money is tight, expenses perceived to be non-essential are the first ones cut from household budgets.⁵ During the Great Depression, the availability of free music over the radio undoubtedly helped to alleviate pressure on cash-strapped families and may well have contributed to this difficult period

for the recording industry. The price of a radio had dropped from \$147 in 1929 to \$49 in 1933 and it was payable by installments. This was the rapid growth period for the uptake of radio and, by 1933, nearly 60 percent of US households owned a radio—up from 33 percent at the end of the 1920s.⁶ In acknowledgement, RCA developed the popular Duo Junior turntable, which played through a radio.

It is difficult not to draw comparisons with the first decade of the new millennium. The dotcom bust in 2000 and its consequent recession coincided with the introduction of free peer-to-peer music. Computer ownership had risen to nearly 60 percent of US households and there were 134 million internet users in the United States with another 266 million worldwide.⁷ There were numerous other forms of entertainment competing for consumers' attention and disposable cash, the latter of which was in short supply for many. A generation began to perceive music as free. Another global recession in 2008, attributed to the housing bubble and lax financial controls, did nothing to improve matters.

One Thing after Another: The Thirties through the War

Record sales languished in the 1930s and right through until World War II, which followed on the heels of the depression. Access to and from Asia was limited by the war in the Pacific, cutting off access to raw material for shellac from which 78s were manufactured. Shellac is a resin sourced from the secretions of the lac insect (*Tachardia Lacca*) that feeds off the sap of certain trees in India and other parts of Southeast Asia. Shellac was rationed in the United States due to the war effort, thus limiting sales and even, allegedly, putting Asch Records and probably others out of business. Amidst these difficulties—on June 27, 1942—James C. Petrillo, tough Chicago union boss of the American Federation of Musicians (AFM), “issued an ultimatum to all e.t. [electrical transcription] and waxing firms” that he would “pull musicians off wax after August 1, 1942.”⁸ Against resistance from record companies and congress, the ban went into place. It held until September 1943 when Decca agreed to a four-year deal that would start at the beginning of 1944. Within months, dozens of other labels signed with the union but Columbia and Victor held out until November 1944. Helped by the war, which impeded imports from the UK, the AFM scored a victory of sorts. During the ban, major label big bands were unable to record but singers belonged to a different union and a cappella recordings had filled the recorded music void. Between the time of Decca's agreement with the AFM and Columbia and Victor's, small independent labels (that were inclined to sign smaller combos) established themselves in the market place. This was one of many factors that may have contributed to the end of the big band era.⁹ Petrillo instigated a second recording ban in 1948, with a less decisive outcome for the union and a less devastating effect on the industry.

Recovery

By war's end, the health of the record business had recovered from its more than decade-and-a-half slump. Columbia Records' sales increased from around \$1 million in 1938, when CBS purchased it, to approximately \$10 or \$12 million by 1945.¹⁰ Overall, US record sales hit a peak of \$204 million in 1947. It was in this setting that the new technologies of magnetic tape and long-playing microgroove LPs were introduced. Both were liberating for producers in overthrowing the tyranny of the three- to five-minute side. Magnetic tape also introduced new levels of producer control by allowing editing and by separating the mastering process from the recording session—both of which permitted post-production refinements. Even more significant creative advantages would follow shortly.

By 1947, the now “big six” record companies, Columbia, Victor, Decca, Capitol, MGM, and Mercury, controlled the recording industry again. Nevertheless, just as there have been recurring contractions in the music business since its beginning, there are also periods of expansion stimulated by technological change. Once again, there are parallels with recent trends. Dr. Peter Alexander observed that the cost and scale-reducing production and manufacturing technologies of the second half of the 1910s and 1950s allowed smaller, more innovative businesses to gain traction.¹¹ In the late 1940s, magnetic tape lowered the cost of entry for entrepreneurial producers who introduced innovative culture-based products to the mass market.¹² Among many examples from around that period, Atlantic, Chess, and Sun Records come to mind. As in the 1910s, the smaller companies championed genres that were not well supported by larger companies, an example being “race” records that, renamed as rhythm and blues, would permeate other styles.

At the time of this writing, the industry—outside of the major labels—has been expanding similarly for more than a decade. More artists and producers made and released recordings every year, resulting in a more than fourfold gain in the United States and 30 percent increase in the UK less than ten years after 2000.¹³ And these may be conservative figures. Inexpensive digital recording equipment and access to alternative distribution and promotional channels, via the Internet, enabled this expansion. Demographics and public taste also factor in to these cycles. Whenever a significant slice of society (often teenagers) rejects the established mainstream and embraces fresh forms of music, new independent labels emerge if the technological and business environment is conducive. The power of the large corporations lies in their financial strength and ability, as an oligopoly, to manipulate market conditions. In a high-cost environment, they can control not only production, manufacturing, and promotional and distribution processes, but also the dynamic timing of the supply chain. Digital delivery and marketing, at least initially, collapsed the cost of most of these activities and democratized the process.

Why is this important for producers? The massive increase in the number of releases has been negatively characterized because less than 6 percent sell 1000

units or more in the first year.¹⁴ It is all but impossible to get accurate figures from major labels as to their success rate, but even as far back as the seventies a major label group chairman said to me (and the approximate magnitude of this number seems to be widely accepted) that less than 5 percent of their artists recoup. Whatever the real percentage of successful major label artists is, it is low. Therefore, if more artists and producers are able to make and release more recordings than previously and the success rate is similar to—and maybe slightly better than—before, this seems like a win for everyone. Major labels make significant investments in records they release. They base their business model on big-selling hits and they are obligated to produce quarterly growth for shareholders.

Below several hundred thousand albums sold, the major label model does not work well for artists, producers, or record companies. Moreover, in order to make a record, labels require artists and producers (before they are established) to audition and meet the company's criteria for commercial appeal or stylistic preferences. The convergence of these disintermediating digital technologies, that we have experienced, means artists and producers need no longer submit to this process. They can record what they like, release it, and market it. Should they experience a modicum of success, they can begin to build a business.

This is no utopian vision; it is a specter of hard work, much of it non-creative, over an extended period that may not generate even a modest middle-class income. Democratization represents opportunity not certainty, but the restrictive effect of major label gatekeepers has, if only temporarily, diminished. For artists and producers who value independence and copyright ownership or are simply entrepreneurial, creative freedom, ownership of intellectual property, and retention of revenues generated are now possible. A wide swath of possibilities falls under the rubric of an independent release. These range from an exclusive long-term deal with a large independent label, through shorter-term deals, and license deals, to entirely self-released productions. Economic and creative benefits vary widely as well. A deal with an independent label can be as draconian and difficult to get as a major label deal. However, many are not and most offer more creative freedom. Notably, the Grammy's Album of the Year category has been won by an independently signed album every year from 2009 to 2013.¹⁵

The Studio Is Interactive

Toward Greater Control

The recording studio and its machines were always integrated with the creative aspects of a production. Even at their most primitive, the recording environment, technology, and process influenced the result, and producers actively manipulated all three. This was true even in Edison's day. He was aware of the potential for recordings to improve upon the experience of a live performance, stating: "I shall yet put before the world a phonograph that will render whole operas better than the singers themselves could sing them in a theater... I shall do this by virtue of the fact that with a phonograph I can record the voices better than any person in a theater can hear them."¹ Photographs and accounts of the acoustic recording process toward the end of the nineteenth century indicate that recorders or directors of recording were doing everything in their power to optimize the quality of the recording. They positioned the singer inches from the collecting horn giving a perspective to the recording that was better than the "best seats in the house" for a live performance. They actively manipulated the position of the singer, moving him or her into and away from the collecting horn, to control dynamics and to allow the instrumental parts to come through clearly and so on.

The introduction of electrical recording in the mid-1920s extended the producer's control over the recorded perspective. It allowed the use of multiple microphone setups, the amplification and balancing of instruments of disparate volumes, and a less strident vocal style. Singing softly was no longer disadvantageous, allowing the popularization of "crooning" and all subsequent amplification-dependent singing techniques.

Some make the case that the simultaneity of acoustic and electrical recording to cylinders and discs limited the producer's options to the point that it is not production by today's standards. Clearly there is no comparison between the options for technical intervention available in the thirties and those under the control of a contemporary producer. Nonetheless, the art of music production has many facets of which technological mediation is but one. The earliest producers, by whatever title, intermediated enough decision points that the lineage through to the current generation is clear and unbroken.

Notwithstanding, shortly after World War II, the producer's role experienced a dramatic creative expansion. This was due to three technological developments that came in quick succession. The next subsection will discuss these in turn. The first development was the introduction of a refined form of magnetic tape recording that was sonically superior to any prior system, on a medium that permitted longer recording times and allowed easy and accurate editing. The second was the invention of the microgroove LP, which permitted the release of longer recordings and/or collections (albums) of shorter pieces on one disc. The third was the development of overdubbing, beginning with sound on sound and evolving into multitrack tape recording. Looked at from the perspective of capturing a performance, these technologies introduced a distinct shift in the degree of "fragmentation and control" or "disaggregation and intermediation" by the producer. Even when the objective is to record purely for documentation, there is a degree of artificiality, adaptation, and deconstruction of the performance in response to the technological limitations and possibilities of the medium. This began with the first phonograph recording. Since a production is a composition in sound on a specific medium, for playback on various other media, through diverse systems, the primary consideration is not the process of performance but the sonic end result heard by the listener.

Early recorders performed many tasks that would be separated into distinct roles as the industry developed. Fred Gaisberg initially performed the tasks of talent scout, A&R person, musician, engineer, mixer, mastering engineer, manufacturer, and distributor for the Columbia Phonograph Company. He later became an executive and administrator. Over time, these tasks were parsed into separate jobs in the industry, in response to technological advancement and increasing specialization of the individual processes. Prior to replication technology, the cylinders purchased by the public were the ones cut (manufactured) on a recording machine present at the session. If more units were sold than could be cut on multiple machines in one performance, the performers had to repeat the piece until enough cylinders had been recorded. Engineering was a matter of optimizing the technical performance of the cut. Choosing the most favorable collecting horn(s) was analogous to choosing the best microphone or the use of equalization. Mix capability was limited to positioning the musicians, instructing them with respect to dynamics and tone control, and guiding the vocalists in their proximity to the collecting horn. Around the beginning of the twentieth century, mass replication techniques separated the recording process from manufacturing, meaning that only one master cylinder or disc need be cut at the session. The roles of engineering and production began to further separate with the advent of electric recording but even with multi-microphone recording setups, the mix was still part of the basic engineering process, which was performed live. A mistake necessitated a retake.

Magnetic Tape Recording

During World War II, US Signal Corps Major John T. “Jack” Mullin (Figure 5.1) heard overnight broadcasts of symphonies from Germany that “sounded too good to be prerecorded.”²

Shortly after the allies liberated Paris, Mullin’s unit was reassigned there to evaluate captured German electronic equipment. In July of 1945, while on a mission in Germany, Mullin met a British army officer who asked him if he had heard the magnetic tape recorders used by Radio Frankfurt:

On the way back to my unit, we came to the proverbial fork in the road. I could turn right and drive straight back to Paris or turn left to Frankfurt. I chose to turn left. It was the greatest decision of my life. . . . The radio station was actually in Bad Nauheim, a health resort forty-five miles north of Frankfurt. The station had been moved into a castle there to escape the bombing of Frankfurt, and it was then being operated by the Armed Forces Radio Service. In response to my request for a demonstration of their Magnetophon the Sergeant spoke in German to an assistant, who clicked his heels and ran off for a roll of tape. When he put the tape on the machine,



FIGURE 5.1 Jack Mullin during World War II.

Credit: Pavek Museum of Broadcasting.

I really flipped. I couldn't tell whether it was live or playback. There simply was no background noise.

The advanced AC bias tape recorder was widely used in wartime German broadcasting. Mullin said, "The Magnetophon had been used at Radio Frankfurt and at other stations in occupied Germany by the time I stumbled onto it, but there was no official word that such a thing existed. The people who were using it to prepare radio programs, apparently, were unaware of its significance. For me, it was the answer to my question about where all that beautiful night-music had come from." Later, Mullin would joke that, "The reason we didn't know about the Magnetophon was that the Germans never bothered to classify it as top-secret."³ (See Figure 5.2.)

Wendell L. Carlson and Glenn W. Carpenter discovered the principle of AC bias in 1921 when they accidentally found "that adding a large high-frequency signal (ac-bias) to the recording head winding would greatly increase the recording sensitivity."⁴ Unfortunately, their invention was ahead of its time and lay dormant. Machines used DC bias until the late thirties "when AC bias was independently



FIGURE 5.2 AEG Magnetophon type K4 sp, advanced AC biased tape recorder with 6.5 mm ferric coated I.G. Farben tape. One of two shipped back by Jack Mullin at the end of World War II.

Credit: Pavek Museum of Broadcasting.

and accidentally rediscovered by three different groups of engineers.”⁵ One of these teams consisted of Dr. Hans Joachim von Braunmühl and Dr. Walter Weber at the Reichsrundfunk Gesellschaft (RRG Electroacoustic Laboratories). Von Braunmühl had recruited Weber and assigned him to investigate ways to improve the performance of AEG Magnetophon tape recorders. Again, a simple mistake produced a dramatic result. This was sometime around April 1940 and Weber, being a good research scientist, noted, analyzed, and was able to repeat the unintended consequence. He explained, “While experimenting with negative feedback, the test circuit began to oscillate under high degrees of feedback. When oscillation began, a dramatic decrease in background noise was observed.”⁶

In practical terms, they reduced background noise by 10 dB, dramatically expanded high frequency response to 10 kHz, improved the dynamic range to 60 dB and reduced distortion to 1.5 percent at 1 kHz. Friedrich Engel best summarized the achievements of the three men from Berlin who perfected the magnetic tape recording process: “Eduard Schüller of AEG built the machines; the native Berliner Friedrich Matthias developed and made the tape at IG Farben in Ludwigshafen; and Walter Weber, from the Berlin House of Broadcasting, was responsible for creating four decades of matchless recording quality thanks to the high frequency biasing process.”⁷ Yet again, these were not new ideas, they had been previously patented, but “Weber and von Braunmühl were the first to recognize the true potential of their findings” and they “[made] their developments quickly and effectively practical to [a] wide range of users.”⁸ This team was also responsible for designing and patenting “The Braunmühl-Weber dual diaphragm capsule, the first unidirectional condenser mic, which eventually became the Neumann M7 capsule used in the [still highly sought after] U47.”⁹

That fortuitous July 1945 visit to Radio Frankfurt culminated in Mullin—with permission—disassembling two Magnetophon machines and shipping them to the United States along with fifty reels of the 6.5 mm ferric coated I.G. Farben tape that each allowed twenty-two minutes of recording time (Figure 5.3). Stateside, it was Mullin’s demonstrations of the AC biased Magnetophon’s capabilities that led the newly formed Ampex Corporation to begin manufacturing tape machines, resulting in their Model 200 (Figure 5.4). Meanwhile, 3M began work on producing their 112 quarter-inch magnetic tape (slightly narrower than the 6.5 mm German tape), which would run for thirty-five minutes per reel.

Apart from the improved sound quality and longer recording time, tape offered the ability to erase and record over previous takes. Magnetic wire recorders already permitted longer recording times than discs and could be erased and recorded over. Wire masters were also editable without transferring audio from machine to machine (transfers incur a generation loss). However, wire recorders did not sound as good as the new AC biased tape machines and tape is easier to handle than the hair-like wire, which required a small knot for each edit and easily became tangled. Wire edits were not only fiddly to execute but they shortened each end of the edited

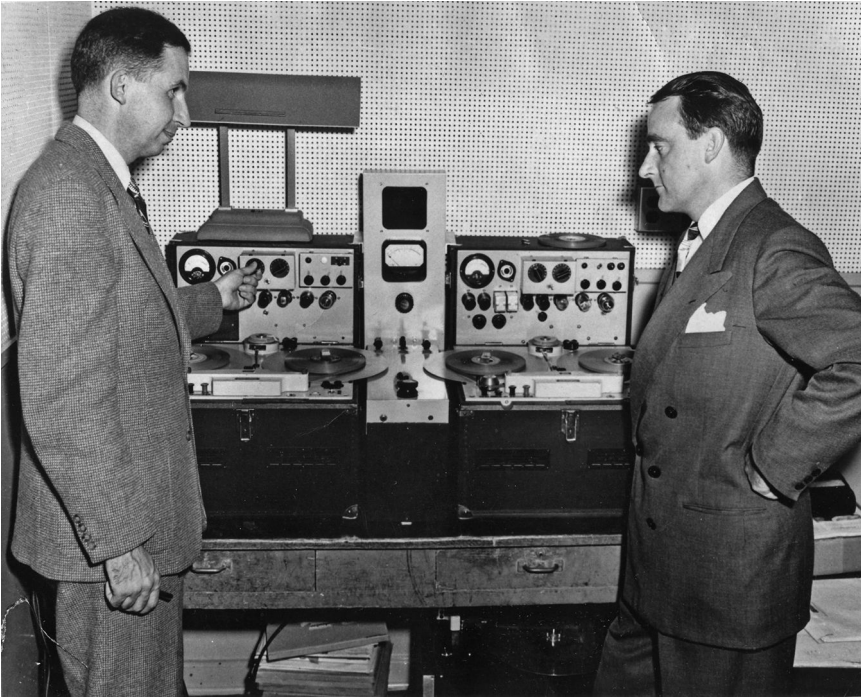


FIGURE 5.3 Jack Mullin (left) talking to Murdo McKenzie (producer of the Bing Crosby show) in 1947 with the two AEG Magnetophon type K4 sp, AC biased tape recorders.

Credit: Pavek Museum of Broadcasting.

wire. Depending on the material being cut together, this could audibly affect timing—particularly in the case of music.

A razor blade or scissor edit of tape can be assembled, disassembled, and reassembled using adhesive tape for a musically and sonically seamless result. Tape allowed producers to record multiple takes of complete performances, as well as short sections, which they could then cut between to fix mistakes and optimize the final product. Nevertheless, refinements were still necessary. Until Ampex and 3M delivered their products, Mullin used the Magnetophons and the fifty rolls of I.G. Farben tape to record the Bing Crosby radio show. Quoting Mary C. Gruszka, the Museum of Broadcasting reported,

At the end of each show, Jack did not simply bulk erase the spliced tape reel and start over. He disassembled the reel first; then sorted out the pieces of tape by thickness [to maintain consistent frequency response between the splices]. In the beginning, Jack used scissors and regular Scotch™ cellophane tape to make his edits (there was no special splicing tape available). The sticky tape had a problem: the adhesive had a tendency to bleed out and stick to the next



FIGURE 5.4 Jack Mullin in the NBC control room, 1949, with two Ampex 200 “portables,” serial numbers 13 and 14. They are loaded with 3M quarter inch-tape.

Credit: Pavlek Museum of Broadcasting.

layer of tape. To get around this, Jack rubbed all of his splices with a little talcum powder, rewound the tape, and then played the tape back. If the tape had not been replayed for a few days, he would have to repeat the talcum powder process all over again.¹⁰

As mentioned earlier in this chapter, the introduction of magnetic tape recording proved to be an important inflection point in the history of music production. By introducing post-production phases of editing and mastering, it further disaggregated the production process. The last time this had occurred was when manufacturing separated from the recording process half a decade earlier at the end of the nineteenth century.

Defining Some Terms

For clarity I will define some terms as I am using them here:

- Mastering is the final stage of optimization of the recorded material while transferring it to the format(s) that will be used in the manufacturing process.

This step is still necessary in the digital domain. Even though there will be no physical manufacturing taking place, the original recording usually requires optimization before transferring to consumer formats.

- Editing, in the context of this chapter, is the copying, cutting and replacement, removal, or insertion of sections (large and small) into the master recording.
- Sound on sound preceded what we now call overdubbing but was, similarly, a process of adding sounds to those previously recorded. The difference between sound on sound and overdubbing as now performed is that the sound on sound technique (using a single machine) was destructive. Once any part of the new sound was recorded on top of the previous material, the component elements could not be separated. Previous material could be preserved by bouncing from one machine to another while performing the next overdub.
- Overdubbing is the nondestructive addition of sounds to those previously recorded. Multitrack machines allow overdubs to be undone and redone in part and in their entirety as often as needed.

Mastering

During the electric recording era prior to the introduction of magnetic tape, many of the producers' tasks were similar to those of today. They might include budgeting and administration, selecting artists, musicians, background singers, repertoire, arrangements, engineers, and recording studios. Additionally, producers were, typically, the guiding force at the session. However, the creativity in the production process all took place in the preparatory period leading up to the session, in-between takes, and during the few minutes of the performance. Critically, the final master disc was cut live with no opportunity for later changes to it without a generational transfer that would increase noise and decrease fidelity. Magnetic tape separated the mastering of the disc from the process of recording, allowing for a later, final stage of refinement. Mastering from tape to disc also incurs generational loss. However, tape's significantly greater headroom allows for that loss and what is gained by optimizing a recording away from the intensity of the recording session often exceeds any loss. Separating mastering from the recording session, for the first time, permitted some post-production control by the producer.

Editing

Tape further extended the creative timeframe, beyond that of a straight-through performance of the piece, by allowing mistakes and otherwise inferior sections of the master to be corrected through editing. Furthermore, it empowered some producers through its potential as a compositional device. Editing had been possible on

disc and cylinder formats but was difficult and added generational noise. It necessitated transferring audio from one or more machines to another. Timing could be critical and it was a trial and error process. Wire recordings could be edited by cutting the wire and tying a small knot, but was very fiddly and could only be used where the timing of the recorded material was not a critical factor. Easy editing, as with mastering, was an immediate benefit of tape, enabling much greater control of the internal details of a production by the producer.

Sound on Sound

The fragmentation of the production process that allowed an incremental approach to production came with Les Paul's sound on sound innovation. Sound on sound dramatically increased the producer's potential for control. In musical terms, production ceased being a crescendo ending in a sforzando. Before sound on sound, that preproduction crescendo could have lasted minutes or months—finding and filtering material, commissioning and approving arrangements and orchestrations, selecting musicians, engineers, studios, and so forth. It could also comprise a meeting or phone call with the artist or just a short conversation before hitting the record button. Especially with jazz musicians, quick head arrangements were common: “You play an eight-bar intro, and we’ll all come in for the head,” and suchlike. Nonetheless, from the instant the cutting head was lowered onto the disc or cylinder, no musical corrections or changes could be made to that take. Sound on sound permitted the stretching out of the creative process. The explosive sforzando (typically three to five minutes for a single performance recorded direct to disc) could now become a slow motion process that sustained from the first note recorded to the final layer. The producer could now examine parts of the production in isolation, repeating and correcting for technical, musical, or creative reasons until he or she was satisfied. The length of the piece no longer defined the duration of the recording process.

Whilst it was a cumbersome and destructive method of overdubbing, the development of sound on sound was a critical step in the history of music production. Like editing, sound on sound recording was possible but not easy in the era when performances were mechanically cut into grooves on discs or cylinders. Overdubs for both disc and wire recorders involved playing back the original recording while performing the overdub and recording the mix of the two to a second machine. Each bounce raised the noise floor and degraded the quality of the successive dub. And so it was for tape until Les Paul.

Les Paul is probably most famous for the Gibson signature Les Paul electric guitar that became an iconic item of rock paraphernalia, but he was also a versatile studio guitarist, hit songwriter, television star, recording engineer, producer, and inventor. His contribution to the art of music production is immeasurable. Paul was

one of the pioneers of sound on sound recording and overdubbing, which he began experimenting with using disc technology. He described his disc-to-disc technique in an interview with the appropriately named *Sound On Sound* magazine:

I built two disc machines, and I'd bop between them while I played the first part and then added the second, third, fourth, fifth parts and so on. However, that was a rather difficult way of doing things, and the sound on sound also became a little tricky because of the degeneration that took place. After you'd go 25, 30 dubs down that first part got to sound pretty bad. So, what we did was layer the parts down in the order that would best cope with the sound deterioration. Instead of putting the first part on first, we might put it on last—it was all about the importance of the part we were dealing with. If I was beating out a drum part, a rhythm, with my hands on the guitar, that could deteriorate all it wanted and it didn't matter, and the same applied if I was just laying down some organ chords with tremolo on them.¹¹

Capitol Records' 1948 release "Lover" was the first recording by Paul with him playing eight different electric guitar parts. He recorded the parts as described: one at a time onto an acetate disc, then bouncing to another disc while playing a new part along with the first. Paul was not overdubbing to replace or emulate a band; he was using the technology creatively, playing with recording speeds to create effects that a live performance could not achieve. He used some five hundred recording discs to perfect the result.¹²

Paul also played guitar for Bing Crosby who, in 1949, gave him one of the earliest Ampex tape recorders. Some sources say it was the second machine made in the 200 series but in his *Sound On Sound* interview Paul identified it as an Ampex 300. In any event, he said he looked at it and, "all of a sudden the light went on—what if I put a fourth head on this machine?"¹³ While he was on tour, Ampex mailed him another head that he installed before the erase, record, and playback heads. He used this modified machine to record all of his and Mary Ford's biggest hits, some of them while touring and incorporating as many as thirty-seven dubs.¹⁴ The process could be and was also performed using two machines by bouncing from one to the other. This preserved the previously completed tracks (in the event of a mistake on the latest overdub) but generational degradation was still a problem.

Irrespective of the details, Les Paul—through his numerous innovations—further integrated the recording studio as a creative instrument into the production process. He disengaged production from real time, teased apart its component strands, and approached it as an incremental composition in sound, conflating it with the songwriting, arranging, orchestration, performance, and technical elements.

His many guitar parts were DI'd (direct injected or plugged directly into the tape machine) and he pioneered and applied a palette of techniques that would become standard tools for producers. These included double tracking, varispeed, delay and repeat echo. Some of these techniques he conceived and used even before magnetic tape, as he demonstrated on his disc recording of "Lover." He expanded

on them employing tape-based sound on sound on classic tracks such as “How High the Moon,” and his and Mary Ford’s many other hits. Paul pushed equipment beyond the manufacturers’ envisioned uses by discovering creative applications, and by modifying the machines. His creative and technological innovations exemplify the synergistic and bilateral relationship between technological advancement and the creative needs of producers.

Mixing a recording session live to disc was challenging and a mistake could usually only be fixed with a retake. Sound on sound, as a destructive overdubbing technique, meant that if Paul made a mistake on the most recent layer he lost all the layers he had done before. Balancing each layer was based on experience and trial and error. He had to play the dub back to be certain if the levels were correct or if the degradation was acceptable. He said he began to think that, “Using sound on sound was crazy. There’s a better way: Stack the heads one on top of the other, 1-2-3-4-5-6-7-8, and align them so we could do self-sync, with all the heads in line.”¹⁵ He explained the idea to his manager, who could not fully grasp the concept or the implications but, “Wondered if it was a good idea.” Paul told him, “I think it will change the world.” With that, his manager told him he “should do something about it.”

Overdubbing

Paul took his manager’s advice and visited Westrex in California: “But they didn’t think it was a good idea and said it wasn’t feasible. So I went up to Ampex. They leapt at the idea. And that’s how the 8 track was born.”¹⁶ There are credible conflicting accounts that Sel-Sync and the eight-track machine was Ross Snyder of Ampex’s invention. In any event, late 1955 and 1956, Ross Snyder, engineer Mort Fujii and the rest of the Ampex crew worked to overcome the technical hurdles. Finally, in 1957, they delivered the Model 5258, the first one-inch eight-track, to Paul for \$10,000—at that time—the price of two nice houses. It was about seven feet tall and weighed more than 250 lbs.¹⁷ Ampex called this Selective Synchronous Recording, which they trademarked as Sel-Sync. “[Les] Paul nicknamed it The Octopus.”¹⁸

This was the beginning of a new era in the art of music production: editable, multitrack technology enables producers to paint artificial soundscapes and write scores to a medium that captures precise sounds and nuances of individual performances. With editing and overdubbing capability, composition, arrangement, orchestration, performance, and production could truly merge into a single continuum with no clear lines of demarcation. It would be difficult to overstate the importance of this leap forward in recording technology. We take overdubbing for granted today but it forever changed the art of music production, empowering those who produce music by extending their creative control as composers of the sound recording. (It should be noted that in this context the producer may be a

person or team of people, ad hoc or otherwise, and may or may not include a person with the title of producer.)

The first eight-track machine was delivered in 1957 but, perhaps because of the expense and the fact that musicians were accustomed to recording together at the same time, the uptake of eight-track machines was relatively slow. Tom Dowd is said to have insisted that Atlantic buy the second 5258 manufactured. Nonetheless, Phil Spector was still using Ampex 350 three-track machines when he recorded his early sixties “Wall of Sound” hits at Gold Star.¹⁹ George Martin even recorded The Beatles’ production extravaganza, *Sgt. Pepper’s Lonely Hearts Club Band*, in 1966 and 1967 on four-track machines. Martin used extensive bounces or, as they were then termed, reduction mixes from one machine to another and this was about a decade after Ampex manufactured their first eight-track.

Notwithstanding, Paul’s pioneering work in sound on sound recording that led to multitrack overdubbing was a monumental breakthrough for producers and production. Previously, all sounds that would comprise a final production had to be created simultaneously in the studio in real time. On his and Mary Ford’s many hits Paul played all the guitar parts and Ford sang all the vocals, he conceptualized the tracks, optimized the order of overdubs, ran the machines and had, what seems like, an instant and exhaustive understanding of sound on sound tape techniques. Paul said, “I knew from the beginning that there was a great marriage between electronics and music.”²⁰

Ampex also produced some three-track machines using half-inch tape. Rumor has it that Capitol studios used one to record Frank Sinatra. Ross Snyder (manager of special products, Ampex) told David Sarser (sales manager, Ampex) that they “delivered a three-track half-inch recorder to Capital Recording for experiments even before the Thorn machine.” Sarser believes that “RCA was the first to use it on live classical recordings.” He says he sold a couple of them to RCA studios after their chief engineer told him that “Heifetz swings back and forth when he plays and would pop from the right to the left speaker.” Sarser told him he could solve the problem in the final mix to two-track if he just bought, “. . . one of the three-track machines . . . and put a single mic on the center track.”²¹ Engineers and producers used the three-track recorders in different ways. Some used them for overdubbing and others to record a stereo image with an important element, such as the vocal(s) on the center track, which allowed for flexibility in mixing. This was a time of experimentation and, according to Chris Michie, Frank Zappa (at his studio Z) used a staggered head, five-track, half-inch machine built by Paul Buff.²²

Eight-track, one-inch recorders did not gain wide acceptance for some years. Nevertheless, once multitracking caught on, high-end studios made the shift to sixteen-track two-inch tape machines and then very quickly moved to twenty-four tracks on two-inch by the mid-seventies. Each of the twenty-four tracks on two-inch tape was one-third narrower than those on sixteen-track (on two-inch tape) or eight-track on one-inch. In fact, track width had remained

constant on quarter-inch two-tracks, half-inch four-tracks, and so on. For this reason, twenty-four-track machines represented a sonic step backwards in terms of signal-to-noise ratio and crosstalk. Irrespective, artists and producers demanded the creative flexibility of more tracks and, fortunately, technology in the form of Dolby noise reduction would go some way to compensate for the technically retrograde move to narrower track width. Before long the desire for more tracks drove producers to begin synchronizing two or more twenty-four-track machines together.

Summing up Tape's Impact

Magnetic tape's potential to allow the fine tuning of a recorded performance, at first by means of mastering and editing, then through sound on sound and overdubbing, empowered producers to move to a gradational compositional approach. It brought new levels of control over the process and transformed methodologies and required skills. Producers had been active intermediaries since the beginning of recording history but this was a magnitudinous expansion of agency by which producers could influence the musical and sonic outcome.

The Microgroove LP

Regardless of the advancement in recording technology that tape represented, consumers could not fully appreciate the longer recording times or improved frequency response and signal-to-noise ratio until June 21, 1948. This was the day Columbia Records introduced their twelve-inch 33⅓ rpm, long-playing, microgroove disc, that they called the LP. This technology was developed in secret by a team led by Dr. Peter Carl Goldmark and included Ike Rodman, Jim Hunter, Vin Liebler, Bill Savory, Bill Bachman, and Rene Snepvangers. This new LP was a vinylite platter that was much more resistant to breakage than the brittle, shellac 78s. It could hold approximately twenty-two minutes of recorded sound per side, as opposed to the roughly four minutes per side of 78s.

The bandwidth of 78s was 100–12,000 Hz and LPs expanded this to 30–16,000 Hz; much closer to the range of human hearing (generally considered to be 20 Hz to 20 kHz). Signal-to-noise ratio improved from 32–40 dB for 78s to 45–60 dB for 33⅓ rpm vinyl LPs. This was still barely half the dynamic range of human hearing (around 120 dB) but noticeably better than 78s.²³ Columbia simultaneously released both ten- and twelve-inch formats, striking a deal with Philco to make the players. Columbia offered to license their technology to RCA, only “copyrighting” the term “LP.”²⁴ For reasons that do not appear to be documented, RCA Victor did not release their first microgroove long-player for eighteen months, allegedly sacrificing \$4.5 million in sales over that period and endangering their position in

the classical market.²⁵ Rather, in 1949, they introduced their own seven-inch, 45 rpm, microgroove, “Extended Play,” vinylite (later, polystyrene) record along with a player. The names single, 45, and seven-inch were used—interchangeably—to refer to these platters.

Columbia geared the LP entirely toward the classical market—the majority of classical pieces would fit on two sides of an LP. Regardless, others recognized the potential and the new discs allowed jazz musicians to release long-form pieces recorded closer to the way they had performed them in clubs for years. It also liberated pop producers from the singles mentality, eventually leading to influential albums such as *Pet Sounds*, *Sgt. Pepper’s Lonely Hearts Club Band*, and *Dark Side of the Moon*. The LP grew industry revenues and played into the development of freeform and progressive FM radio shows in the sixties that led to formats such as AOR (album-oriented rock) in the seventies. This was when FM radio began to embrace longer form, non-singles music and AOR further fragmented into spinoff formats. Commercial record production was no longer restricted to the three- or four-minute tracks. Songs such as The Beatles’ “Hey Jude,” Don McLean’s “American Pie,” and Queen’s “Bohemian Rhapsody” were all longer than would have been possible on 78s.

The Post–World War II Reconstruction of the Recording Industry

After the War

As the United States and Europe returned to peacetime normalcy between the end of World War II and the beginning of the 1950s, equipment and expertise developed for the war effort were introduced to civilian society and the recording industry. These technologies and techniques were used to create new businesses, and to record and disseminate music in ways that served the surviving members of a young generation trying to reclaim their lives. America had emerged from the Great Depression, suburbs were developing, and lifestyles were changing, as was the nature of music consumption. The baby boom generation was beginning life and bringing with it its unprecedented (and possibly unrepeatable) impact on the music industry. With the end of the swing/big band era, the dominance of singers, and the electrification of small groups, new music styles emerged. The southern influence framed as race records and country music began to gain a wider audience. As the forties drew to a close, *Billboard* journalist Jerry Wexler, who would become central as a producer in developing the genre, renamed the “race records” chart “rhythm and blues.”¹ This music, sometimes combined with country, has underpinned and shaped much of popular music from that time to the present.

James Bullough Lansing (1902–49) had begun manufacturing loudspeakers in Salt Lake City in the mid-1920s. Business boomed until 1939 when his business partner was killed in a flying accident. By 1941, in debt, Lansing had little choice but to accept an offer of \$50,000 from the Altec Service Corporation and thus began the Altec Lansing Corporation. Lansing clashed with management and with his contract up on October 1, 1946, he founded a new business: Lansing Sound, Inc. Altec complained that his new company infringed their right to the name so Lansing changed the name of his company to James B. Lansing Sound, Incorporated. Although a brilliant designer, he was not a good business person and suffered bouts of depression. In 1949 with his company again in debt Lansing took his own life. Corporate treasurer, William Thomas, with the help of some of Lansing’s life insurance money turned the company around and eventually bought

out Lansing's widow. With Altec Lansing still challenging the use of the Lansing name, Thomas, thereafter, used the mark JBL.

Based in Vienna, Austria, Dr. Rudolf Goerike and Ernst Pless founded Photophon in 1947, eventually changing the name to AKG (Akustische u. Kino-Gerate—acoustics and film equipment). In 1953 the company released both the D12 microphone, with Goerike's capsule design, and Konrad Wolf's C12 multipattern microphone with remote pattern control, a dual-backplate and 10 micron diaphragms. Rebranded by Telefunken as the M251 and by Siemens as the SM 204, the C12 and its variants are favorite microphones of many producers to this day.²

In 1948 union boss James Petrillo called for another recording ban, this time protesting against the declaration that the union's welfare fund was illegal under the Taft-Hartley Act of 1947. This strike lasted only eleven months and although the "Recording and Transcription Fund" was saved, the union was forced to make many concessions among which were payments for rebroadcast of music on FM radio. The AFM was diminished in its power over musicians' employers.³

Production techniques in genres outside of popular music were also progressing. John Culshaw (1924–80) joined Decca in 1946, became senior producer in 1956, and eventually moved to the BBC in 1967. Culshaw would expand classical music production from simply capturing the performance and the sound of the hall. He approached the recording process theatrically, using sound effects, different acoustic environments, and by encouraging opera singers to move around while recording. During Culshaw's tenure, Decca became a premiere classical music label, instigating frrr (full frequency range recording).

Radio, entering its fourth decade, was mature as a medium. As it had challenged the recording industry, twenty years prior, it was about to be challenged by the rapid proliferation of television. Research was, by now, influencing playlists. In 1949 Todd Storz, of Omaha station KOWH, may have been the first to adopt a top-forty format. By early 1953, KOWH had amassed the largest daytime audience in Omaha according to the Hooper (national rating service) reports of the time.⁴

Nearly a decade before stereo LPs became available, Magnecord produced the first US-made open-reel stereo tape recorder when they added a second head in a staggered configuration to its PT-6 half-track machine.⁵ Manufacturers quickly adopted tape recording technology and some would contribute substantially to the development of the industry. For instance, Dr. Willi Studer (1912–96) made his first Dynavox tape recorder, which would evolve into the Revox T26 and the Studer 27—a three motor, tape deck for radio stations.⁶ Consumer electronics devices that would fuel the hi-fi or audiophile market were likewise developing apace. Frank H. McIntosh and Gordon J. Gow sold the first McIntosh 50W1 Unity Coupled Amplifier, producing 50 watts at less than 1 percent distortion and a frequency response of 20 Hz to 20,000 Hz. More powerful amplifiers predated the 50W1 but not at these distortion levels and bandwidth. Although unity coupling was a fundamental design feature, the name was not created until 1954.⁷

As previously noted, the period after World War II was a time of musical transition, swing band music had drastically declined in popularity and many bands were unable to sustain themselves. Jazz moved into a more complex and less commercially viable phase beginning with bebop, and singers—previously secondary to bandleaders—became star attractions. Some say this was a consequence of the two-year AFM ban on musicians recording. Not being members of the AFM, singers such as Frank Sinatra and Bing Crosby (who both came from big bands) released recordings without musical accompaniment during the ban. Improved electric microphones and “public address” (P.A.) amplification systems may also have been factors in allowing greater intimacy between singers and their audiences. Whether on record or live, silky-voiced crooners could now be heard above their bands. Additionally, the growing use of electric guitars and electric bass guitars enabled a three- or four-piece ensemble to fill any sized hall with sound. For these and many other reasons, the era of instrumental music’s predominance came to a close.

The Boom in Independent Labels

At various stages in the history of the recording industry, independent labels have flourished. Conversely, there have been periods of consolidation during which the majors acquired the most successful independents and controlled market share.

Columbia, Edison, and Victor dominated the recording industry through the end of the nineteenth century and World War I. They used vertically integrated business models, manufacturing playback machines and records as well as acquiring musical content. As the patents on recording technology expired in the mid-teens of the twentieth century, a growth period for independents began. Labels such as Black Swan, Aeolian, Vocalion, Brunswick, Gennett, and OKeh Records sprang up, often specializing in niche areas of music that the big three were not recording. Some of these labels set trends that others, including the majors, followed. Peter Alexander posits that it was imitation by established firms of these innovations that triggered the decline in independents. Most of these smaller labels went out of business, merged, or were bought by the onset of the Great Depression.⁸

As previously mentioned in chapter 4, the June 1942 Petrillo ban on recording proved to be a renewed opportunity for independent labels since all production shut down for the three majors: CBS-Columbia, Decca-U.S., and RCA-Victor. Decca acceded to the AFM demands first but it was another year before CBS and RCA agreed to a deal. Many independents quickly agreed to the AFM’s terms and Peter Tschmuck, quoting Klaus Kuhnke et al., reports more than one hundred independent labels in Los Angeles at that time. However, few were able to compete in the pop market once the majors resumed production, Capitol Records being the notable exception.⁹

Alfred Lion started Blue Note Records in 1939 and established a strong brand that most associate with contemporary jazz. The same year, Moses Asch launched his first label, Asch Records, which failed due to shellac rationing during World War II. Asch's second label, Disc, failed for business reasons. Not to be deterred, his third company, Folkways Records & Service Corp., was founded in 1948 and enjoyed a forty-eight-year run of success. He had identified a long-tail business model, and a niche in traditional world music and Americana that did not place him in direct competition with the majors or larger independents. His training was in electronics and he operated a small recording studio out of the Folkways offices in Manhattan where all the business activities took place. He was able to build such a valuable collection of recordings that the Smithsonian Institution, in Washington, DC, acquired the label shortly after Asch's death and continues the business.

Magnetic tape allowed a low cost of entry for small labels and their independent, entrepreneurial producers, both of which proliferated primarily in underserved niches. Ahmet Ertegun founded Atlantic Records with Herb Abramson and a \$10,000 loan in 1947. In 1953 Jerry Wexler (1917–2008) joined the team. As mentioned, Wexler is said to have coined the term “rhythm and blues” in 1949, for Billboard's black music chart to replace “race records.”¹⁰ Wexler initially used his business, promotional, and marketing skills and contacts, Ahmet Ertegun was a blues fan and his brother Nesuhi ran their jazz section. However, the label built its reputation primarily on its work with R&B artists such as Ray Charles, Joe Turner, and Ruth Brown, to the extent that, on their 1950s paper sleeves they printed “Atlantic leads the field in rhythm and blues.”¹¹ Wexler, of course, eventually became a music producer of considerable renown through his 1960s work with definitive soul artists such as Aretha Franklin, Wilson Pickett, and Sam and Dave.

Elements of what would become rock and roll had been emerging in various recordings during this post-World War II period. In 1953, eighteen-year-old Elvis Presley began recording demos at The Memphis Recording Service, home of Sun Records. Assistant Marian Kessler, who supervised the session, was intrigued by Elvis and brought him to owner Sam Phillips' attention. Phillips, in 1951, had recorded and placed with Chess Records “Rocket 88” by Jackie Brenston—a track many point to as the beginning of rock and roll. In early 1954, Phillips took Presley into the studio and after a few false starts recorded, “That's All Right” on his Ampex 521 tape machine.¹² Less than eighteen months and four singles later RCA bought Presley's contract from Phillips (for \$40,000), which secured Presley's position as the “King of rock and roll” and financially stabilized Phillips' business operation.¹³

During 1950, eleven labels associated with ten different corporations occupied the weekly top-ten singles chart. A decade later, in 1960, the rise of independent record companies put forty-five labels from thirty-nine companies into the same chart.¹⁴ Looked at another way, by 1956, independent labels had eroded the previous 75 percent market share of the, now four, major labels' (Columbia, RCA-Victor, Decca, and Capitol), to about 48 percent. The majors fell further, to 25 percent of the market, by 1962. The early sixties was a high point, a time of opportunity

for small label owners and independent producers, due in part to the expansive effect of relatively low-priced and versatile magnetic tape technology. Most of these independent labels were owned by or had in-house producers: for example, Jerry Wexler, Arif Mardin, Tom Dowd of Atlantic; Moses Asch (Folkways); Sam Phillips (Sun); Leonard and Phil Chess, Ralph Bass, and Willie Dixon (Chess); Berry Gordy, Marvin Gaye, Holland, Dozier, and Holland, etc. (Motown); Ozzie Cadena (Savoy); Alfred Lion (Blue Note); and so on.

These individuals were aficionados of music styles neglected by large corporations and through their creativity, entrepreneurship, and hardheadedness became global tastemakers. They generated significant bodies of work that were commercially successful and internationally influential. By capturing regional musics that might have gone unrecorded, they served otherwise disenfranchised audiences and artists. Some, arguably, played a part in helping break down racial barriers at a critical time for American civil rights. By identifying grassroots movements and niche-market business models, they documented a great deal of American (and other) vernacular music that is now considered culturally significant.

As happened in the twenties, the majors reasserted their dominance by competing for similar artists and embarking on a series of buyouts, assimilating these successful entrepreneurial labels, producers, and their distribution networks.¹⁵ By the end of the seventies, six major labels once again controlled the recording industry: CBS, Warner, PolyGram, RCA, EMI, and MCA. This state remained until the mid-nineties when Universal (previously MCA) merged with Polygram, shrinking the six to five. Sony (previously CBS) then merged with BMG leaving only four majors. With the 2012 sale of EMI to Universal, the industry has, once again, reverted to three dominant corporations.

The low barrier to entry offered by magnetic tape, local radio, and independent distribution networks in the fifties stimulated this growth in independent labels. Since before the new millennium, DAWs and the internet have offered an even easier point of entry for producers, artists, and entrepreneurs. Almost a century after the first eruption of independent labels, another is in progress. Nielson SoundScan reported in January 2014 that independents have a 34.6 percent market share¹⁶ making the indie sector bigger than any single major label. Moreover, these numbers do not account for the hundreds of thousands of releases each year by individual artists and micro labels that do not register with SoundScan or have membership in A2IM (American Association of Independent Music). Many of these artists, producers, production companies, and labels are recording and distributing music inexpensively outside of conventional recording and distribution channels. A criticism often leveled at these labels and artists is that they do not sell more than a handful of albums or tracks. Regardless of sales, recordings are being made that would not have been in the past. If Sam Phillips had not set up The Memphis Recording Service, the world may never have known Elvis Presley. For as many iconic artists as Phillips recorded, there were many more who did not achieve greatness; this is the nature of the music industry. Opportunity offers no guarantee of success. What is

important is that the barrier to entry is as low as it has ever been. Producers with an ear for talent and sufficient entrepreneurial spark have the potential to become the next Chess, Atlantic, Motown, Folkways, Blue Note, Island, or DefJam.

The Fifties

By 1950, many elements were in place for the consequential transformation of the music industry and music production that was to come. The capability for manipulation in the recording studio was about to witness extraordinary growth. This was the year that Les Paul added a head to his Ampex 300 machine to record sound on sound overdubs. In 1951, Pultec founders Gene Shenk and Ollie Summerland introduced the first passive program equalizer, the EQP-1 based on licensed Western Electric filter circuits. They subsequently upgraded to the EQP-1A, which added a gain makeup stage.¹⁷ The war of the speeds ended with both RCA-Victor and Columbia selling LPs and 45s; turntable manufacturers began offering three-speeds and flip-over styluses to accommodate both the wider grooves of 78s and the micro-groove vinyl records. In 1952, Peter J. Baxandall published his widely adopted tone control circuit that is still in use today. Emory Cook began pressing experimental dual-band, left-right binaural discs, which needed a special two-needle playing arm. He made these recordings with two microphones six inches apart (approximately the space between a human's ears).¹⁸ Edgar Villchur's (1917–2011) 1954 invention of the acoustic suspension loudspeaker redefined high fidelity sound—improving bass response while reducing cabinet size. Villchur intended to license the technology but none of the established loudspeaker manufacturers were interested so Acoustic Research, the company founded by Villchur and Henry Kloss (1929–2002) introduced the AR-1 bookshelf speaker built using Villchur's principle.¹⁹ This was also the year in which RCA Victor sold the first prerecorded open reel stereo tapes. The price was \$12.95.

Decca recording engineers Arthur Haddy and Kenneth Wilkinson developed the Decca tree (1954), which is, still, a widely used (and adapted) stereo microphone array for recording orchestras and large ensembles. Christopher Raeburn (1928–2009) joined the company in 1954 and helped build the “Decca Sound.” He became one of the most highly regarded classical producers working with artists of the stature of Karajan, Solti, Pavarotti, Sutherland, Ashkenazy, and Bartoli.²⁰ The label was an early adopter of the microgroove LP and stereo recording techniques (1955).²¹

The early fifties were a heyday for the development of independent studios all over the United States and Universal Recording in Chicago was part of that movement. The multi-talented entrepreneur behind Universal was Bill Putnam, described by Bruce Swedien in *Mix Magazine* as, “...[T]he father of modern recording as we know it today.” Swedien went on to say, “The processes and designs that we take for granted—the design of modern recording desks, the way components are laid

out and the way they function, cue sends, echo returns, multitrack switching—they all originated in Bill’s imagination.”²² Putnam moved to Los Angeles in the late fifties and built the legendary United Recorders at 6050 Sunset and then Western Recorders (now Ocean Way) at 6000 Sunset in 1960. His legacy of recordings includes Basie, Ellington, and Sinatra, sufficient to reserve his place in the history of music production. Nevertheless, his technical developments and particularly those of the Universal Audio 1176 FET limiter and the UREI 813 studio monitors may overshadow his considerable recorded works. Additionally, as Swedien indicated, Putnam’s Universal 610 console laid out the template for future recording consoles and there were many other innovations such as the 100 D Preamp, the 101A Line Amp, and the 50BA Equalizer.²³

Forbidden Planet, a 1956 sci-fi thriller, was the first movie with an all-electronic soundtrack composed by Louis and Bebe Barron. The score was termed “a landmark in electroacoustic music”²⁴ by Barry Schrader, professor of electroacoustic music at the California Institute of the Arts. Schrader points out that their music foreshadowed the modern role of sound designer by several decades blurring the “line between music and sound effects.”²⁵ Mrs. Barron trained in music and composition. Mr. Barron studied electronics, custom designing his own circuits to “produce combinations of pitch, timbre, volume and other variables.”²⁶ Living in Greenwich Village they had become fascinated by the early fifties avant-garde music scene. A wedding gift of a tape recorder led to a section of their apartment becoming a studio in which composer John Cage recorded his “Project of Music for Magnetic Tape.”²⁷ The Barrons also recorded the score for the short, *Bells of Atlantis*, in 1952. Three years later, they crashed a Manhattan art party for the wife of MGM president, Dore Schary. They told him about their compositions and “ten days later were driving to Hollywood, where Schary signed them for *Forbidden Planet*.”²⁸ They produced the sounds for the movie using vacuum tube circuits; this was before commercial synthesizers were readily available. Mr. Barron recorded hours of sounds on tape for Mrs. Barron to sort through, reversing segments, changing the pitch, and creating delays. The score received critical praise, but was credited as “electronic tonalities,”²⁹ due to a union dispute with the AFM. It was the only movie score the Barrons ever composed.³⁰

At this time, the options for adding reverb to a recording included tape echo, and using acoustic spaces or dedicated echo chambers. Spring reverb—the go-to choice for Jamaican dub mixers—was still the only electronic reverb unit. Spring reverb dates back to the 1930s when Laurens Hammond (1895–1973), wanting to add reverb to his new tonewheel organ, had appropriated and modified an oil-filled electromechanical spring reverb that Bell Labs had designed for an entirely different purpose. It was not until 1957 that Dr. Walter Kuhl at the Institute for Broadcast Technology in Hamburg developed the EMT (Elektromesstechnik) 140. It comprised a metal sheet (about 1 m by 2 m by 0.5 mm) suspended by springs from a rigid metal frame in a wooden case. The signal vibrated the sheet via a center-mounted, speaker-type transducer driven from an effects send. A transducer

placed at the outside of the plate picked up the reverberated output, and a pad that pressed against, and damped, the plate, adjusted the length of the reverb. Plate reverbs have a unique, attractive, and useful quality, so much so that digital emulations of the classic EMT plate continue to be a staple of most reverb plugins and stand-alone digital reverb units.³¹

The National Academy of Recording Arts and Sciences (NARAS or the Recording Academy) was belatedly set up in 1957, thirty years after the Academy of Motion Picture Arts and Sciences and eleven years after the Academy of Television Arts and Sciences. NARAS evolved out of a group that came together at the Brown Derby Restaurant in Hollywood to choose recording artists who would receive stars on the Hollywood Walk of Fame. The founding members included Paul Weston (Columbia), Lloyd Dunn (Capitol), Sonny Burke (Decca), Jesse Kaye (MGM), and Henri Rene and Dennis Farnon (RCA Victor), with Jim Conkling of Columbia as its first president. Early members were industry notables, such as Frank Sinatra, Bing Crosby, Doris Day, Benny Carter, Stan Kenton, Spike Jones, Nat King Cole, and Darius Milhaud. With the Oscars and the Emmys firmly established, Paul Weston offered twenty-five albums to the person who suggested the best name for NARAS's new award. The first annual Grammy Awards (for 1958) were held in 1959.³²

By the summer of 1958, after a period of competing technologies, a worldwide standard for stereo records was established and the first stereo LPs were sold. Westrex Inc. developed the system that was adopted. It featured diagonal 45-degree cut grooves based on principles referred to by Alan Blumlein as “binaural” in his British patent of 1933.³³ Although not implemented until the late fifties, Blumlein described the entire concept in the early thirties, including his stereo-cutting equipment and many of the stereo microphone techniques we still use.³⁴ This same year, a friend told Milwaukee-based jazz musician and audiophile John C. Koss to listen to the new binaural tape. The friend said, “If you listen to it with a headphone (*sic*) it was (*sic*) absolutely thrilling.”³⁵ Koss's company happened to be working on a private listening unit with a turntable and amplifier; they subsequently incorporated a jack for headphones. However, they could not find any—other than those made for warplanes and communications. Koss said he was talking with his engineer who, “tore some cushions off another phone (*sic*), took two speakers and put the wires coming out into our machine and, oh man, psheew, it was just bouncing on my ears, it was just a great sound. It was like the first time you rode in a car...it was that much of a difference.”³⁶ The Koss Corporation demonstrated their listening unit at a Wisconsin Audio show in late 1958. They were using the headphones as a gimmick to sell their private listening unit. As it transpired, the listening unit did not sell well, but the headphones, or stereophones as Koss marketed them, were the hit of the show.³⁷

Accommodating advancing technologies, in 1959, AKG created the C24—a stereo version of its studio classic, C12 mic—and began manufacturing its line of studio-quality headphones.³⁸

Radio DJs

The term disc jockey (later abbreviated to DJ) appears to have first been used in an August 13, 1941 article in *Variety* magazine. However, the first person who might qualify for the title, Reginald A. Fessendon, played a record on an experimental broadcast from Brant Rock, Massachusetts, on Christmas Eve in 1906. This surprised and delighted a number of telegraph operators on ships in the Atlantic who were accustomed to hearing only the dots and dashes of Morse code.³⁹ As radio became established in the 1920s the musicians union, record labels, and publishers all stood opposed to recorded music being played on the radio. The union was concerned about the loss of jobs from the many live broadcasts, labels felt that airplay would erode sales, and the publishers wanted to be paid for the use of their copyrights.

In the mid-1930s Martin Block began playing records on his WNEW show in New York as a flexible fill-in between reports from the Lindbergh kidnapping trial. The station didn't own any records so he had to run out and buy some from the local record shop. Block stole his show's name and concept from Al Jarvis's *The World's Biggest Make Believe Ballroom* that had been on Hollywood's KFWB for three years prior. Nevertheless, Block found sponsors and an enthusiastic audience, building his *Make Believe Ballroom* into a nationally syndicated show. Block claimed that if he played a record on his show it would become a hit.⁴⁰ Acknowledging this power of radio, Capitol Records, in 1942, began sending out free promotional copies of their releases to radio stations and within six years the other labels did so too.⁴¹

This is an example of the economic short-termism that the recording industry has repeatedly demonstrated. It was inevitable that the other labels would follow suit, thus eroding any competitive advantage that Capitol gained. Radio stations were building viable business models by playing recorded music. Giving them product for free and not demanding a performance royalty for use of the sound recording (separate from the performance royalty paid to publishers and composers) continues to financially disadvantage American labels, artists, musicians, and producers. The publishers had not made the same mistake and, along with writers, still receive performance royalties for every spin on air. Shortly after Capitol's decision, the American Federation of Musicians initiated, its strike and recording ban protesting the use of recorded music on radio as previously discussed in chapters 4 and 6.⁴²

Regardless, by 1947 an estimated 3,000 disc jockeys were on the air in the United States.⁴³ Trade publications began tracking airplay and feedback from the DJs, local record stores, and jukeboxes, thus establishing the symbiotic relationship between radio stations, retailers, and labels.⁴⁴ This was the genesis of radio promotion staff, airplay logs, charts, radio formats, and payola. Payola was another short-term solution with long-term counterproductive implications.

Initially, it worked in favor of independent entrepreneurial producers and label owners who could “persuade” local stations and DJs to play their latest productions, but majors can always outspend indies. Spending enough money on “radio promotion” to achieve a national hit eventually became beyond the reach of all but the majors and richest independents. Music radio formalized, and the Telecommunications Act of 1996, signed by President Clinton, lifted ownership caps allowing stations to conglomerate, after which truly independent records (as opposed to those from “indie” labels funded by majors) all but disappeared from the airwaves and the charts.

As reported by Adam Marcus in a *Future of Music Coalition* and *American Association of Independent Music* education guide: Beginning in 2003, New York State Attorney General, Eliot Spitzer began investigating claims of payola. In April 2007, the radio conglomerates, including Clear Channel, CBS Radio, Citadel Broadcasting Corp., and Entercom Communications Corp., each entered into consent decrees with the FCC. This was in exchange for immunity from prosecution for any previous payola violations, a small fine, and a promise to implement internal reforms. A separate voluntary radio accord was negotiated between the station groups and the independent music community. These “Rules of Engagement” underscored the principles of access and transparency, with the stations agreeing to dedicate 4,200 hours of programming to independent music, and to feature “the recordings of local, regional and unsigned artists and those affiliated with independent labels.” The four major labels of the time paid a total of more than thirty million dollars in fines.⁴⁵

Mobile Music

More Music for More People

By separating performer, performance, and place from the act of listening to music, and by industrializing replication, recordings on cylinders and discs made more music available to more people. Performances whose availability were previously limited by regional or social factors were now able to be heard simultaneously by many people in geographically removed places and across a wider range of socioeconomic circumstances. However, cylinders and discs were large, heavy, and fragile and, because they could not withstand external vibration while playing, for the most part, they were unusable while on the move.

Vacuum tubes were central to the twentieth-century electronics revolution and allowed the commercialization of radio, which contributed (along with other factors) to a more than 90 percent drop in the sales of recorded music. However, technology tends to take with one hand and give with the other—and the vacuum tube, by improving recording and playback quality, eventually helped revive the recording industry from its lengthy doldrums. It may have taken time for the recording industry to embrace electrical recording but many studios still use certain pieces of tube technology. They are valued for their sonic richness in specialist applications now but tubes are large, they run hot, burn out, are expensive, and require much power to operate. Hugo Gernsback suggested in “Developing the Radiophone” from the December 1919 *Radio Amateur News* that “substitutes of vacuum tubes” would be worth “a king’s ransom for the patent.” Since 1906, oscillating crystals had been in use as rectifiers for simple detectors. Then, as early as September 1924, Gernsback announced “A Sensational Radio Invention” in the *Radio News*,¹ and that the work of a Russian, O. V. Lossev meant, “The crystal now actually replaces the vacuum tube.”² Tubes would eventually be replaced, except for specialty uses, but Gernsback’s announcement was premature and the vacuum tube remained a staple for decades. It took a deeper understanding of solid state physics to refine oscillating crystals into a practical and reliable replacement for the vacuum tube. In fact, the science was complex enough to garner a Nobel Prize in Physics (1956) for William Shockley, John Bardeen, and Walter Brattain’s 1940s invention of the transistor (from *transfer resistor*) at Bell Labs.³

Music Anywhere: Radio on the Move

For the first decade, radio receivers were big, bulky, and, largely, static pieces of furniture. Radio officially became mobile when William Powell Lear (1902–78) assisted Chicago-based Galvin Manufacturing in designing the first commercial car radio. Galvin introduced it in 1930 under the brand “Motorola” (from motor and “ola”—most likely derived from Victrola).⁴ Lear received a patent for the design in 1931. He eventually earned more than 100 patents for groundbreaking electronic devices and may be most famous as the designer of the eponymous Learjet.⁵ The first Motorola, model 5T71,⁶ cost nearly one-quarter the price of a brand new Model A deluxe coupe. Radio, much like the internet, became not only a means of dissemination to consumers but a mode of discovery for producers. English critic Patrick “Spike” Hughes, as reported by Dunstan Prial, was impressed with producer John Hammond’s “twelve tube Motorola with a large speaker unlike any other car radio in those days.”⁷ The powerful radio picked up stations from all over the United States and Hammond used it to “keep abreast of music being made across the country.”⁸ He discovered Count Basie while scanning the dial on a “frigid night in Chicago”⁹ outside of a Benny Goodman gig. Hammond heard the “faint sound”¹⁰ of “experimental station . . . W9XBY,”¹¹ broadcasting live from the “Reno Club in Kansas City,”¹² more than 500 miles away. He said, “I listened to this unbelievable band.”¹³ More than seventy-five years later, producer Shawn Campbell used the consumer media outlet YouTube in a functionally similar way when he discovered Cody Simson,¹⁴ as did manager Scooter Braun in discovering Justin Bieber and PSY.

By the 1950s, more than 50 percent of new cars came with radios installed and “cruising” with the radio blaring the top-forty became a teenage ritual.¹⁵ Decca originally released Bill Haley and The Comets’ “Rock Around The Clock” in 1954 to moderate success. After placement in the soundtrack of the movie *Blackboard Jungle*, Decca wisely reissued the single a year later, in 1955. The Comets’ bass player, Marshall Lytle, realized they were going to have a big hit while on a drive from New York to Boston: “[The car had] one of those new radios where you pushed a button and it went to the next station. I turned on the radio and hit the button and the station was playing “Rock Around the Clock.” I hit the button again and the next station was playing [it] and the next station, too.”¹⁶

Over the next few minutes, he said he heard the track twelve times on different stations.

Commercially available car radios had existed since 1930, but by 1950 there were 20 million more cars on American roads than in 1940. That number swelled by another 23 million before the close of the fifties. Fifties cars were essential to the new suburban lifestyle; they were stylish and becoming a culture in America.¹⁷ The futuristic designs were increasingly associated with the new sounds of rock and roll



FIGURE 7.1 Regency TR-1 transistor radio: “The World’s First Pocket Radio.”

Credit: Dr. Steve Reyer, <http://www.mequonsteve.com/regency/>.

through songs like “Rocket 88” (an ode to the Oldsmobile 88) and “Maybellene” (featuring a Cadillac Coup de Ville and a V8 Ford).

Shockley, Bardeen, and Brattain’s 1947 invention of the transistor would allow orders of magnitude of miniaturization and truly portable, battery-operated devices. By 1954, the I.D.E.A. Co.¹⁸ of Indianapolis began advertising the Regency TR-1: “The World’s First Pocket Radio,” 3” by 5” by 1.25”. Using a standard 22.5 volt battery, it had an internal “acoustically-baffled” speaker and “tiny earphone” (Figure 7.1).¹⁹ It retailed for \$49.95, not including the battery. *Time Magazine*, later, chose the TR-1 as one of the one hundred greatest and most influential gadgets in the period from 1923 to 2010.²⁰

The transistor radio represented a pinnacle for music mobility. It may have contributed to the explosive uptake of rock and roll. Perhaps not coincidentally, 1954 was the year that Elvis Presley began a fifty-two-week run of appearances on the *Louisiana Hayride*, broadcast by 190 stations across thirteen states.²¹ Prior to 1954, apart from in the car, recorded music had to be listened to within earshot of a static player or radio. The transistor radio could go most places people went and, coincident with its launch, many confluent factors were at work. More radio stations were programming music, early baby-boomers were becoming “tweens” and teens, and independent labels were proliferating due to lowered cost of entry.

Additionally, top-forty radio was well established and postwar economic growth left disposable dollars in people's pockets. Now, even kids who were too young to drive could listen to music on *their* personal transistor radios wherever they were. They could also buy the songs they liked, cheaply, on the new seven-inch 45 rpm singles. The transistor radio and the car radio became primary access and discovery points for new music over the next few years. Portable radios were ubiquitous by the sixties, to the extent that Motown (and other labels and producers) evaluated the efficacy of their mixes by how they sounded over tiny transistor and car radio speakers.²²

My Music on the Move

While transistor radios may have liberated recorded music from the home, workplace, and car, the listening options were limited to one highly mediated playlist over another. These pocket-sized portables extended the shared social context of radio, records, and live performance, but you could not choose your own music. To that end, Columbia, in 1956, flirted with "Highway Hi-Fi," a proprietary, seven-inch, 16 $\frac{2}{3}$ rpm record with one hour playing time per side, and Chrysler sold 18,000 under-dash turntable units. RCA, from 1960 to 1961, made models that played standard 45 rpm seven-inch records and so did Philips. By all accounts, from 1967 to 1969, Philco even made a small (7" x 4.25" x 2.25"), battery-powered record player called the Hip Pocket. It played seven-inch 45 rpm records but was designed for the more portable four-inch diameter Philco Hip Pocket flexi disc records. Fifty titles were available in that format including some Beatles flexis.²³

Despite some sales, none of these products offered a robust solution to the latent demand for personalized portability of music. Consequently, the mass market waited for a more roadworthy system, and it arrived in the form of the Stereo-Pak, four-track tape cartridge and player. Earl "Madman" Muntz introduced the Stereo-Pak in 1962 with technology modified from Bernard Cousino's endless-loop tape-cartridge design, and George Eash's Fidelipac three-track broadcast cartridges. Radio stations used the Fidelipac system from 1959 to play commercials and jingles. Muntz licensed about 3000 albums from forty companies for his "CARtridges (as they were first advertised), and sold hundreds of thousands of his players."²⁴ Bill Lear, inventor of the car radio and designer of the Learjet, installed Stereo-Pak players in his jet and became a distributor. Seeking to improve upon the Muntz/Fidelipac design, he patented a simplified version of the Fidelipac cartridge and built a player with new eight-track heads from Nortronic, designed to his specifications. His cartridge was the same size as the Fidelipac and ran at 3 $\frac{3}{4}$ ips as had Eash's three-track and Muntz's four-track. As much as eight-tracks are the butt of jokes today, they were highly successful from the mid-sixties to the mid-seventies in American car culture. They represented a significant step in the personalization of mobile music and Ford offered the players as an option on all

their cars from the mid-sixties. As quoted by Keith Wright: “By 1967, 2.4 million players were sold, and the eight-track player became the first tape format to succeed in the mass market.”²⁵

My Music Anywhere

The next and more important phase in the mobile music revolution debuted inauspiciously in 1963 and blossomed slowly. The Philips compact cassette would replace the eight-track, conquer the mobile music market, and introduce an even greater level of personalization by allowing users to record their own choice of material. Furthermore, it would compete vigorously with LPs, 45s, and CDs for decades.²⁶ The Philips cassette, with its low speed of $1\frac{7}{8}$ ips and narrow Ferric Oxide (FeO_3)-coated tape was, sonically, a step backwards from vinyl. To gain its widest acceptance it took the augmentations of DuPont’s Chromium Dioxide (CrO_2) coating, Dolby B and C noise reduction, and eventually “Metal” tapes (iron particles with a cobalt alloy layer on a plastic backing).²⁷ Throughout its gradual development, improvements, and widespread uptake there were many contributors to the ultimate ubiquity of the audio cassette, the various machines that played it, and its transformative power.

I was at the White City, BBC TV studios in 1979 demonstrating some new music technology on *Tomorrow’s World* when I met one of the program’s hosts walking down the hall. He held up a small silver-and-blue plastic box and asked if I had seen one. I said yes, because I owned several small cassette recorders, but then I noticed this one was much more compact than any of mine. He stuck the smallest, flimsiest headphones I had ever seen on my head, and I realized I would never be without music again.

The first generation, playback only, cassette Walkman was somewhat fragile, hissy, and ate tape, but in 1979 it had no competition. Twenty-five years after the transistor radio introduced music anywhere, Sony’s TPS-L2 Walkman, a fourteen-ounce pocket-portable cassette player, launched the next era of personalized mobile music. Now you could take your own choice of music and listen to it almost anywhere. LPs still sounded better but were neither mobile nor user-recordable. The cassette recorder made the perfect collection of music available to hundreds of millions of people and the Walkman allowed them to listen to their perfect collection anywhere. Sony made hundreds of models, through the DAT TCD-D3 of 1991, the MiniDisc of 1992, to the digital Discman of 1999. The Walkman became a billion-dollar industry with 50 million units sold in the first ten years and 220 million units sold worldwide over its three-decade lifespan.²⁸ I do not know of any statistics that quantify how the Walkman affected producers and productions but it moved music another notch toward ubiquity, utility, and disposability while at the same time providing options to the homogenized, advertiser subjugated grip of broadcast radio. The Walkman was more than music to go. It

introduced an epoch of individually determined aural and emotional environments and offered the wherewithal to isolate consciously from the surrounding environment. It permitted a willful yet acceptable social barrier and introduced the fully customizable, everywhere audio experience. Fully customized music was no longer tethered to place, nor was it a shared experience (Sony removed the second headphone jack from later models). It provided a personalized soundtrack to life, and life on the move.

Like its disruptive ancestor, the Regency Transistor radio, the Walkman made *Time Magazine's* All-Time 100 Best Gadgets list. The impact of the Walkman was termed "The Walkman Effect" by Shuhei Hosokawa. Hosokawa points out that (unlike the transistor radio) the Sony Walkman was regressive technologically, a simplification or devolution, in that it removed the record function and the speaker from the portable cassette machines of the time. Doing so made it slimmer, sleeker, and single purpose. The Walkman, in combining personalization with extended mobility, in the form of a fashion accessory, was a conceptual shift. As Hosokawa notes, walking is the most primitive means of human transportation and the Walkman connects it with music.²⁹ Music combined with movement is nothing new, but this is individually personalized music in a fixed perspective. Liberated from the limitation of place, the music simultaneously dissociates the individual from his or her environment while forging new correlations. Just as changing the music in a movie alters the emotional impact of a scene, controlling the sounds you hear as you move through your surroundings shifts your perception of tasks, activities, and life itself.

The Walkman was but another step toward the all-pervasiveness of music that Edison's phonograph began when it disaffiliated music from musicians. Music, divorced from performance, performer, and place, progressively penetrated our daily activities, from records, to radio, car radios, transistor radios, and cassette players, up to our all-in-one, present day mobile devices. A complex combination of technological innovation, consumer demand, and artistic creativity drives trends in the music industry. This could be characterized as a Darwinian process in which the new environment favors randomly selected characteristics in artists and producers. But, as humans, we are not passive victims of environmental shifts. Those who are intuitively or consciously attuned to technological and social change can modify their cultural behavior and use of technology to benefit from new circumstances.³⁰

The Walkman coincided with increasing interest in aerobic exercise and, almost immediately, it became common to see people exercising using the new device. Appropriate, personalized music eases the boredom and pain of repetitive exercise, and can increase the intensity of the workout.³¹ Different workouts demand distinct production qualities. This is borne out by, say, the plethora of yoga music, which tends toward introspective sounds as opposed to high intensity tracks favored for jogging and weightlifting. As consumer usage expands, so do opportunities for producers. The specialization of dance club DJs created demand for longer tracks at dance specific tempos, with different dynamic structures than radio mixes. This

opened up opportunities for those prepared to acquire new skills, resulting in new genres, dance music producers, and remixers.

By 1983, prerecorded audio cassettes outsold LPs, and vinyl sales declined further with the uptake of the CD. Through the eighties, and until the introduction of DAT machines and CDRs, cassettes all but replaced reel-to-reel tapes as the standard delivery format for A&R listening copies of mixes. Unfortunately, cassette tapes and machines were inconsistent from make to make. Sending tapes to the label or giving them to an A&R person was fraught with potential for misunderstanding. One situation stands out in my mind: an A&R person called—quite distressed—saying the mixes were “really bright.” Mine were not so I drove to his office; he slipped in the cassette and, sure enough, playback sounded thin and painfully bright. I looked at his machine, flipped the switch from the FeO₃ to the “Metal” setting and the mixes sounded fine. This was a simple mistake that was easily corrected. Regardless, the compact cassette was never a consistent enough medium for critical listening.

All the same, the cassette tape was a transformative technology for consumers, artists, and producers. Compared to LPs, 45s, or 78s they were small, light, and could hold much more music. You could record your choice of material and listen privately in a car or, after 1979, on a Sony Walkman—almost anywhere. Unfortunately, prerecorded cassette tapes often sounded inferior to LPs, the notes and credits were absent, truncated or unreadable, and locating tracks was a linear and slow process in contrast to the instantaneous random accessibility of tracks on LPs. Nevertheless, you could inexpensively record demos and preproduction rehearsals, capture new song ideas while on the move, duplicate your own material for sale at gigs, and fuel your hip hop career with mix tapes. Long distance travel became less tedious and I began to use flight time productively—listening to demos and writing out parts for the upcoming sessions. For the first time you could choose every track for jogging. When dual tape decks came out, the pause/record function enabled mix tapes, changing Valentine’s Day and painful breakups forever. It was also extremely useful for mocking up preproduction changes in arrangements. DJs even used that feature to extend single length mixes.

The mobility of recorded music made a quantum leap with the introduction of MP3 players and again with streaming services to phones. These on-demand services, offering almost any music, anywhere, anytime, while giving more control to the consumer (pull versus push marketing), open up new territory for those involved in music production. The massive amount of market data now available, including developing trends, allows producers more ways to assess how to orient their work, or not—sometimes artistic assuredness is the best strategy. Delivery and playback technologies affect both consumers and producers and they progress apace. The topics are discussed further in chapter 16, “Transformative/Disruptive Technologies and the Value of Music,” and in chapter 17, under the subheading “Streaming Audio.”

Expanding the Palette

Electric Instruments and Amplifiers

Similar technology that enabled radio and electric recording also allowed for the electrification of instruments. Early designers may have been, primarily, attempting to boost the volume of instruments for live performance, but in the process they provided a new tone palette for composers, arrangers, and producers. Electric and electronic instruments generally allow for greater tonal manipulation at source. From the producer's perspective, they also permit direct injection of the electric signal into the recording medium. In live performance, instruments (electric and acoustic) engage and interact with the acoustic space in which they are being played. Close miking minimizes the amount of acoustic space characteristics that will be captured on the recording. Direct injection never converts the electric signal to mechanical and acoustic energy. It allows the pure electric signal from the instrument to be recorded without acoustic room interaction, creating a very close sounding, almost microscopic perspective.

There had long been attempts to build louder acoustic guitars. Apparently, according to John Teagle, the Stromberg-Voisinet company marketed an electrified stringed instrument and amplifier set in a 1929 advertisement. There appears to be little evidence that it was commercially successful. Teagle also cites a banjo pickup and amplifier mentioned in the 1929 issue of *The Crescendo*: "The device consisted of a unit attached to the head of the banjo which transmitted the tone to a portable amplifying unit and radio speaker."¹

Then, around 1931 in Los Angeles, George Beauchamp and Paul Barth developed an electromagnetic pickup and used it on the aluminum bodied "Frying Pan" guitar. They formed a company called Ro-Pat-In with Barth, Beauchamp, Adolph Rickenbacker, and C. W. "Billie" Lane as shareholders and set up shop next to Rickenbacker's main plant. They called their first guitars Electro String Instruments and that eventually became the company name. Early in the thirties, they began branding the guitars with the better-known Rickenbacker name.² Acoustic feedback is a problem with hollow body electric guitars, so in 1935 Rickenbacker introduced its Electro Spanish (Model B). It was made of Bakelite and may have been the first solid-body Spanish style guitars, but it was heavy and not widely successful.³

Of course, electric instruments need amplification and there is some debate about the inventor of the first guitar amplifier. However, it seems that the first produced in any quantity, and the most influential, were built by Roy Van Nest at his radio shop near Rickenbacker and the Electro String Company in Los Angeles. Teagle reports that the circuitry was designed by “Billie” Lane—the fifth shareholder along with Beauchamp, Barth, and Adolph and Charlotte Rickenbacker. These amps were, likely, about 10 watts with up to a ten-inch speaker, an input, and a volume control.⁴ Rickenbacker used Ralph Robertson to design several other production model amplifiers, at least one of which may have used speakers designed by James B. Lansing.⁵ By the 1940s, in nearby Fullerton, Leo Fender (1909–91) was taking in these amps for repair.

Electric guitars and amplifiers certainly helped guitarists compete with louder instruments in a live setting, but they have a character of their own and guitarists quickly learned to combine guitar and amp settings to create their own signature sound. “Rocket 88,” by Jackie Brenston and his Delta Cats released on Chess Records in 1951, is thought by some to be the first rock and roll record. It features Willie Kizart playing guitar through a damaged amplifier. Producer Sam Phillips liked the sound and it went on record as, possibly, the first of the distorted guitar sounds that would become so characteristic of rock music.

Leo Fender began by building PA systems and repairing radios and amplifiers along with early electric and electroacoustic guitars at his Fender Radio Service shop in Fullerton, California. Quoted by Forrest White, he said, “In electronics, 1928 was an important year. That was when the first AC vacuum tubes were available.” Before that, tubes needed heavy batteries to power them. He also noted that Jensen had just built the first efficient loudspeaker so Fender began building fifteen-watt PA amps at that time.⁶ After repairing some guitar amps, he began building his own, as he received orders. During World War II, he went into business with Doc Kaufman (1901–90) designing and building electric lap steel guitars and amplifiers under the brand K&F. Kaufman left the business amicably in 1945. Fender went on to produce the Pro Amp, with a single fifteen-inch Jensen speaker, and the Dual Professional with two ten-inch Jensens. Both amps were covered in what would become Fender’s trademark tweed.⁷ It was in 1948 that Fender introduced their Broadcaster solid body electric guitar, renaming it the Telecaster by 1950. The iconic and versatile Fender Stratocaster that became and remained part of the look and sound of rock and roll debuted in 1954.

Bass players had also struggled to make themselves heard over the big bands and now they had to compete with electric guitars and PA systems. There were several attempts to amplify stringed bass instruments. Lloyd Loar of Gibson designed an electric pickup for the double bass sometime around 1924.⁸ Unfortunately, amplification was in its infancy and could not reproduce bass frequencies well. Seattle-based musician Paul H. Tutmarc (1896–1972) built some smaller prototypes in the early 1930s, the first being roughly cello-sized but it was too heavy. Tutmarc revised the design down to a forty-two-inch long, black walnut solid body, guitar-like

bass with piano strings and a rudimentary pickup. The instrument known as the Model 736 Bass Fiddle is illustrated “in Audiovox’s [Paul H. Tutmarc’s company] leaflet dating from around 1936.”⁹ Bacon and Moorhouse’s *Bass Book* describes it as having “a single pickup and control knob on a pearloid pickguard, a neck with 16 frets, and a cord emerging from a jack on the upper side of the body.”¹⁰ Others experimented with electric upright basses throughout the thirties and then Tutmarc’s son, Paul “Bud” Tutmarc Jr. (1924–2008), around 1940, began making a fretted bass guitar—called the Serenader—that was distributed by L. D. Heater Co., of Portland, Oregon.¹¹ It would be another decade before Leo Fender began making the iconic Precision bass (the first production model of which shipped in October 1951).¹² This instrument changed the sound of rhythm sections, paving the way for the bass heavy productions from Motown, Stax, and other sixties groups.

As Fender amplifiers had played their part in the rock and roll era, Vox amplifiers are strongly associated with the sound of sixties British music; The Beatles, the Rolling Stones, the Shadows, the Dave Clark Five, and the Yardbirds all used them.¹³ Jennings Musical Instruments—begun out of a music store in 1950s Dartford, Kent, by Tom Jennings and Dick Denney—powered the British beat boom. Initially, they gained traction because there was a post-World War II trade embargo on the sought after American Fender and Gibson amplifiers, but Vox quickly developed a following of its own. The Rolling Stones (who were from Dartford) and The Beatles, among many others, made them part of their sound and on-stage image.¹⁴

Similarly, Marshall Amplification developed out of a London music store in 1962. Conversations with guitarists about what qualities they wanted in a guitar amplifier led Jim Marshall into the manufacturing business. As Vox served the beat boom, Marshall became the visual and aural backdrop for the next era of harder, louder, blues-based rock bands.¹⁵

Keyboard instruments also took advantage of electricity; some of them developing as predecessors to the modern synthesizer by creating sounds electronically and others by amplifying acoustic vibrations. Harold Rhodes (1910–89) managed a chain of schools teaching the “Harold Rhodes School of Popular Piano” in the early thirties. After World War II, he established the Rhodes Piano Corporation with the 3.5 octave Pre-Piano using doorbell strings. In 1948, Rhodes invented and patented the “asymmetric tuning fork,” eventually building a seventy-two-note instrument. Leo Fender acquired the company in the fifties and released the Fender Rhodes Piano Bass in 1959, which was used “by Ray Manzarek for the bass sound of The Doors.”¹⁶ It was not until CBS bought Fender in 1965 that Rhodes began manufacturing his Suitcase 73, clad in black tolex with a silver top, mono tremolo, a 50-watt amp and built-in speakers. The company made improvements and in 1970 introduced the Fender Rhodes 88 dropping the name Fender in 1974.¹⁷ Heard widely on pop and jazz recordings from the sixties and seventies, for a time the Rhodes became an integral part of Miles Davis’s recorded sound and provided a transparent harmonic bed for many popular hits.

The Rudolph Wurlitzer Company began producing their own electromechanical, stringless portable pianos that used steel reeds with a DC pickup system that had a sound distinct from the Rhodes. According to Jared Pauley of *jazz.com*, “Sun Ra was the first musician to record with an electric piano, the Wurlitzer, for his 1956 recording *Angels and Demons at Play*.” Players of the stature of Ray Charles and Joe Zawinul also used Wurlitzer pianos. The instrument’s design was allegedly based on earlier research by Benjamin Meissner who, it is said, corresponded with Harold Rhodes regarding his developmental work.¹⁸ There were a number of other electromechanical keyboard instruments produced around this time including Hohner’s pianet and clavinet, and the RMI Electra Piano.

A choice of instrument can have a telling impact on the sound of a production, often becoming genre definitive, as the pedal steel guitar did in country music and the distorted guitar amp sound on “Rocket 88,” the Fender Stratocaster in rock and roll, and so on. Sometimes an instrument becomes indelibly linked with a recording: It’s hard to think about the Hohner Clavinet without hearing Stevie Wonder’s “Superstition” in your head (it was the C not the D6 that he used). Supertramp’s “Dreamer” is branded by the Wurlitzer piano sound, which may have been a catalyst for the song. Rodger Hodgson who wrote “Dreamer” said it “... was one of the first keyboard songs that I wrote. I had just bought my first Wurlitzer piano and I remember taking it to my mother’s house for a few days and I was so excited that this song just came roaring out of me—lyrics and all.”¹⁹ Similarly, *Rolling Stone* reported that Joe Zawinul was inspired to write the Cannonball Adderley jazz classic, “Mercy, Mercy, and Mercy” by “The sound of this odd little keyboard.”²⁰

Synthesizers

Humankind develops instruments using technologies of the time. The earliest known instruments—from 35,000 or more years ago—are flutes made of bone, and percussion instruments—possibly based on weapons used for hunting.²¹ Instruments constantly evolve: the piano (pianoforte) evolved out of the harpsichord, relatively recently, in the early 1700s, and the saxophone from the clarinet around 1841. At the dawn of the recorded sound era, we mostly captured music played on the acoustic orchestral, band, or folk instruments used for live performance at that time. Even automated instruments, using mechanical technology of the time, produced sound acoustically. Nonetheless, it was inevitable that the harnessing of electricity would spawn new generations of playable music machines. And that happened very quickly.

Elisha Gray (1835–1901) built what we might think of as a synthesizer in 1876, the year before Edison patented the phonograph. Gray’s “Musical Telegraph” used steel reeds in a self-vibrating electromagnetic circuit and in doing so invented a basic single-note oscillator. He transmitted the oscillations over a telephone line and controlled pitch using a two-octave piano-type keyboard.²² Six years later Gray

co-founded The Western Electric Manufacturing Company, which would introduce numerous innovations essential to the history of recording technology and the art of music production as we know them.

In 1899, using a keyboard controller, William du Bois Duddel (1872–1917) produced audible musical tones electrically by modulating the voltage driving a carbon arc lamp; he called his instrument the “Singing Arc.”²³ Duddel’s invention contributed to the development of wireless telegraphy. Seven years later Thaddeus Cahill (1867–1934) generated audio from a set of tuned dynamos. The Telharmonium, as he called it, was a gigantic polyphonic predecessor of the Hammond organ. In his 1897 patent, number US580035 A, he used the word “synthesize” saying, “I synthesize composite electrical vibrations answering to the different notes and chords required.”²⁴

These instruments represented a new level of sophistication in being one step removed from the mechanical/acoustic generation of sound. They did not produce sounds acoustically that were then amplified; they were the first to generate electrical signals directly. These signals required conversion to the mechanical (by driving a loudspeaker) to be audible in the human spectrum. Notably, the vacuum tube was invented in 1906, the same year as Cahill’s Telharmonium and was the first means of amplifying an electrical signal. The vacuum tube in allowing amplification of an analog signal was a critical step toward electrical recording. However, there was still no effective way to convert the electrical waveform to audible sound. Gray had used telephone lines and then a primitive diaphragm speaker to hear his “Singing Telegraph.” It was not until 1915 when Pridham and Jensen demonstrated their “Magnavox” moving-coil speaker, the antecedent of loudspeakers still in use today.²⁵

A twenty-two year-old from St. Petersburg, Russia, Lev Sergeyevich Termen (1896–1993), better known as Leon Theremin, built a prototype of a unique electronic instrument in 1918. He initially named it the “Aetherphone,” but it became known as the Theremin. In yet another case of serendipitous or accidental inventing, he designed it as a proximity sensor then realized he could play melodies by moving his hands and body around the antenna. Its otherworldly sound is instantly recognizable from its use in movies and the Beach Boys’ “Good Vibrations.”²⁶ Although difficult to play, because there is no physical contact with the instrument, Russian émigré Clara Rockmore (1911–98) enthralled audiences with her virtuosity and complex, sensitive performances with premier orchestras including Leopold Stokowski’s Philadelphia Orchestra.²⁷

Like the Telharmonium, the early vacuum-tube instruments that were polyphonic created each note or oscillator separately. This required one vacuum tube per oscillator. These instruments included Hugo Gernsback’s (1884–1967) 1926 Pianorad, and Armand Givelet (1889–1963) and Eduard Eloi Coupleaux’s 1929 “Orgue des Ondes” or “Wave Organ.”²⁸ These machines’ many, hot, vacuum tubes (the wave organ had 700 vacuum tubes) drifted out of tune easily.²⁹ Two years prior to building the “Orgue des Ondes,” Givelet and Coupleaux built a

monophonic synthesizer, the “Clavier à Lampes.” Then, in 1928, frustrated with the poor-quality microphones used for recording and broadcasting music, Givélet demonstrated what he termed “silent recording.” This is what we now call direct injection—connecting electric or electronic instruments directly to the transmitter or recorder without first converting the signal to mechanical energy.

Based on similar “heterodyne” principles as the Theremin, the 1928 “Ondes Martenot”—by Maurice Martenot (1898–1980)—was the first electronic keyboard to be mass-produced. As with the Theremin, the left hand articulated and the right played notes; much like modern keyboard synthesizers. Several of the early electronic synthesizers allowed for some form of artistic expression via velocity or pressure-sensitive keys or controllers.

In the depths of the 1930s depression, Laurens Hammond began an attempt to emulate the sound of the giant pipe organs in an instrument that would fit in “the backseat of a taxicab.” He used his extensive knowledge of electric motors to come up with an electromagnetic analog for the mechanical tone wheels of Hooke (1681) and Savart (1830). In a fortuitous breakthrough, he resolved how to create complex tones (approximately 253 million variations) from just ninety-one silver-dollar-sized tone wheels. He patented his device, the Hammond Organ, in 1934.³⁰

Harold Bode made several electronic instruments—including his 1937, four-voice, top-note priority, Warbo Formant Organ. He made the pressure-sensitive Melodium in 1938. George Jenny’s 1941 Ondioline, featured a keyboard sensitive to vertical and horizontal movement for control of amplitude and vibrato respectively, defining pitch by a resistor ladder as many synthesizers would decades later. In 1947, Bode made a dual-keyboard, modular version of the Melodium with tracking filters and envelope generators that he called the Melo-chord. Canadian electronic musician Hugh LeCaine created the Electronic Sackbut, in 1948, to emulate the spontaneous control sensitivity of acoustic instruments. It was monophonic and keyboard controlled but with finely detailed, real-time control of articulation by the player. It included key displacement, pressure and foot control of volume and attack. Horizontal movement of the keys or a touch-sensitive strip could alter pitch, while another pedal controlled portamento. The five-finger left-hand controller affected a complex mix of timbral qualities. LeCaine continued to design innovative musician-instrument interfaces during the fifties and created a keyboard-controlled “Special Purpose Tape Recorder” in 1955 that foreshadowed the Mellotron of the sixties.

The sixties and seventies saw the development of familiar names in synthesis: Moog, ARP, Oberheim, Sequential Circuits, EMS, Roland, Yamaha, and more. Initially, many machines were monophonic, developing through duophony to multi-voice polyphony. Musician interface control seemed to be a low priority with the focus being on left-hand articulation. Only a handful of machines have featured user map-able pressure, velocity, and horizontal key control. Brand differentiation mostly rested on the quantity and sound quality of the oscillators and filters, routing (for non-modular synths), and the amount of polyphonic voices. Most likely

because it was a compact, user-friendly, and good sounding machine, the 1970 monophonic MiniMoog was highly successful. It endures to this day in hardware form, emulated in software, and through its influence on later synthesizers.³¹

In the early seventies, Bill Bernardi invented the Lyricon, which was manufactured by Computone. This was the first commercial wind synthesizer and Computone later made a Lyricon Driver that had no internal sound-generating capability but acted as a controller via the VCOs (voltage controlled oscillators), VCAs (voltage controlled amplifiers), and VCFs (voltage controlled filters) of other synthesizers. These were the instruments that my musical partner John L. Walters used in our band, Landscape. They can be heard on the album *From The Tearooms of Mars...* and on the hit single “Einstein A Go-Go.” The Lyricon and Driver were precursors to Nyle Steiner’s EWI (Electronic Woodwind Instrument) and EVI (Electronic Valve Instrument), as well as other wind synthesizers and controllers.

Around this time, pitch-to-voltage converters offered an alternative option for wind players. However, the devices of the time could not track all the subtleties of expression, and this could cause mis-triggers, wrong notes, and other artifacts. Pete Thoms, trombone player with Landscape and many other groups, used the Roland SPV355 Pitch-to-voltage Synthesizer for touring and on the Landscape album, *From the Tearooms of Mars...* On the track entitled “Norman Bates,” the square wave effect had to be very carefully set up. Thoms was triggering the device using a Barcus Berry pickup on the trombone and mixing in some acoustic sound for the best result. He mentioned to me that Gary Barnacle (on tour with Elvis Costello in the early eighties) used “a rack full” of SPV355s and Bruce Fowler (on tour with Frank Zappa in the early seventies) confirmed that this was the best device for tracking trombone parts. Although the tracking was less than perfect, when combined with other electronic treatment such as distortion and octave splitters (Octavider), acoustic wind instruments could compete with other electric and electronic instruments.³²

There were many attempts at percussion synthesis through the seventies. I had been experimenting with creating percussion sounds on my EMS Synthi A and Roland modular system, but the rise time on the ADSRs (Attack, Decay, Sustain, Release) was not fast enough to create the necessary impact. In the late seventies, I wrote an article for *Sound International* on the state of electronic percussion entitled, “Skin and Syn: Drum Synthesis and Treatment.” At this time, I was working with Dave Simmons to create what would become the Simmons SDS5 drum synthesizer—most recognizable by its hexagonal pads. In the article, I examined the Syndrum, Synare, and Impakt electronics devices, all of which I had used at various times—along with the Moog drum and my own modular synthesizer mock-ups. (The Syndrum is probably best known for its part on Anita Ward’s “Ring My Bell.”) All of the devices were interesting but none provided sufficient transient attack to be a viable substitute for acoustic drums. Percussionists generally strike, shake, or scrape their instruments and the sound usually begins with a characteristic sharp transient or percussive attack, followed by an unpitched tone. People

are often confused about the unpitched, or indefinitely pitched, nature of percussion because a series of different sized tom toms, conga drums, and even cymbals may have apparently perceivable intervals between them. Although intervals may be perceivable, the tonal center of each instrument is not strong enough to sound dissonant when played with an ensemble in what might seem to be another key. This is not true for tuned percussion instruments such as timpani or marimba that do have strong tonal centers. It is worth noting that percussionists also play miscellaneous instruments that do not begin with a sharp transient. These include wind machines, thunder sheets, whistles, horns, and so forth. Sometimes known as effects percussion, this is the function that many of the early electronic percussion instruments performed.

From playing drums for most of my life I understood that a number of events take place upon striking the instrument. There is an initial very sharp transient from wood hitting plastic (the stick impacting the mylar head), a simultaneous secondary transient from positive phase movement of air as the membrane deforms away from the impact. The DSR (decay, sustain, release) portion of the sound ensues from the negative/positive/negative/etc. phase vibration of the membrane and the sympathetic engagement of the resonant membrane (where present), as well as the shell of the drum (where present). The pitch also shifts when the tension on the head increases from being struck. On a snare drum, the snare wires vibrate against the sympathetic or resonant head.

This analysis formed the basis for the various stages of synthesis that the SDS5 employed, including the use of the acoustic transient from the stick hitting the plastic surface of the pad, which compensated for the less than ideal rise times of early ADSRs. At the time, sampling technology was in its infancy. Since my interest was in creating a playable instrument with touch sensitivity that controlled more than just volume, and sounds that were programmable, we decided that analog synthesis was the preferred solution. I realized that the striking surface need not be round and, on one of my drives to our development meetings in St. Albans, it occurred to me that the way the hexagonal cells of a honeycomb fit together made ergonomic sense for the setup of a drum set. With my own group, Landscape, I used the bread-board prototype on our album, *From the Tearooms of Mars*... from which came the number-five (UK) hit, "Einstein A Go-Go." I used the first manufactured model on my production of Spandau Ballet's number-three (UK) chart record "Chant No. 1."

The late seventies and early eighties was an active time in the world of synthesis, with FM-based synthesizers such as New England Digital's Synclavier and the iconic Yamaha DX-7. This was also the beginning of the sampling era with the Fairlight CMI taking the lead, followed closely by the addition of sampling to the Synclavier, both of which are covered in more depth in Chapter 15, "Random Access Recording Technology."

Genre Hybridization

Perhaps nothing expands the sonic palette as much as introducing qualities from other cultures and forms of music. Musical styles or genres are defined by their, often amorphous, boundaries and yet they are constantly assimilating elements from elsewhere. Musicians hear and absorb new sounds and techniques merging them into their own performances, compositions, and productions. Initially, traveling musicians were the conduit for extrinsic ideas, but since the invention of the phonograph, cross-cultural transmission of influences and memes extended farther and wider than previously possible. Radio hastened this process, as did the car radio, transistor radio, and every technology that allowed more people to listen to more music, more often. As Brian Hulse, in his paper, “Of Genre, System, and Process: Music Theory in a ‘Global Sonorous Space’,” said: “in the digital age the notion of stable, traceable, and localized genres is quickly becoming a thing of the past. The internet conducts untraceable global migrations; multiplying infinitely the ways in which musical flows are transmitted, molded, expressed, and joined together. When we think of genre, we are less and less able to properly refer to a discreet, spatial location.”³³

As we move closer to the universal availability of all musics, there are many factors that can cause genre hybridization. These include growth in transcultural collaboration, commercial considerations, the homogenization of process, and more widespread technological commonalities. Many decisions are made in the process of a production, often with the objective of making a distinctive final recording rather than simply documenting the sound of a performer or group. In some genres, such as traditional music, these decisions might consciously exclude elements that are considered to be “nontraditional.”³⁴ More often, blending of qualities and sounds from different styles of music is encouraged by producers in order to create a unique identity for an artist or even for a single recording. Every now and then a hybrid form, such as Latin jazz, becomes a genre of its own, but it is worth noting that jazz itself, as well as blues and all the great American music genres that have powered the recording industry, are themselves hybrids. It is safe to assume that everything we listen to has been, and continues to be, crossbred. In which case, it is interesting to ponder: At what point does a newly hybridized music becomes distinct enough to earn its own genre classification and the right to be re-hybridized?

Some Key Producers

The Objective

The purpose of this section is to roughly sketch some examples of the skills, styles, and backgrounds that have shaped and been shaped by the history of music production. There are innumerable people who have contributed to the development of the art of music production. I learned many tricks and techniques from skilled producers and engineers, some who are well known and some whose names will never be widely acknowledged. We also learn from listening to records, live music, and ambient sound, very often subconsciously. Producers can be independent—for hire by anyone to work anywhere. They can own their own studio and sometimes their own label, or be staff producers for larger or major labels, in which case they usually work in the A&R (artists and repertoire) department. Most producers perform some A&R duties—finding artists and material.

Early producers such as Fred Gaisberg, John Lomax, Ben Selvin, Ralph Peer, and John Hammond assumed many roles. These included discovering artists, recording them, and in some cases they found the outlets for the recordings. In this chapter and throughout the book, I have attempted to pick producers who demonstrate diverse methodologies, and particularly those who have, in some way, influenced the history of music production. Some entries are arguable, some obvious, and some not so well known. Most likely your favorite producer will be missing from this list and there is insufficient space to represent every genre. The list is intended as dots that may be joined to form a bare outline, not to be encyclopedic, nor to reflect my personal favorites. The disparate styles and contributions of various producers can be dizzying and seem entirely individualistic. Every producer does have his or her own individual characteristics but there are methodological commonalities. I rationalized these into six functional typologies in my companion book *The Art of Music Production: The Theory and Practice*, 4th edition. In the most general of terms it can be said that record producers, in one way or another, exercise varying degrees of creative control over the recording and the successful ones make a positive difference.

Review of the Early Producers

We discussed a number of early producers in the first three chapters and I will quickly review some of them here. Fred Gaisberg was the cornerstone in the construction of the producer's role within the embryonic recording industry. He performed almost every function and defined many of the characteristics that are still in demand today. Jesse Walter Fewkes, Frances Densmore, and John and Alan Lomax not only played important roles in documenting the music and sounds of cultures that otherwise would not have been preserved, but they also set precedents for future documentarians. Ben Selvin was prolific in a way that was only possible when recording was live, and even so, his massive output as an artist and producer is daunting to behold. Ralph Peer understood what the people wanted to hear and supplied it. When he moved to Victor from Okeh, Peer understood this value he brought to the label. Confident in his ability, he had the foresight to negotiate a royalty on sales in lieu of his salary, reputedly making \$1 million a year when \$700 was the average annual salary in America.¹ John Hammond, active over many decades, introduced many important artists to the world. In the studio, he setup a respect for artistry and enabled definitive works and careers that have been influential. In classical music, beyond Fred Gaisberg's pioneering work, Walter Legge—despite his lack of musical training—is acknowledged as one of the most influential producers in the field. Legge introduced numerous famous artists, including Otto Klemperer and Maria Callas. John Culshaw, renowned for his contributions to the Decca catalog, pioneered a dramatic and realistic style of recorded opera complete with sound effects.

In terms of leaving a long-lasting legacy to producers, Les Paul's persistent probing into possibilities became a fulcrum, a tipping point at which the creative wherewithal began to expand toward infinity for producers. His innovations enabled successive generations to construct, deconstruct, and reconstruct increasingly—and it is unlikely that there are any limits.

Mitch Miller

Mitch Miller (1911–2010) was a studio oboist and conductor who had been a staff musician at CBS. John Hammond hired Miller to head the classical department at Keynote records. Chicago-based Mercury Records bought Keynote and Hammond put Miller in charge of popular recording for what became Mercury's New York branch where he proved to be highly effective, producing many hits for Mercury artists such as Vic Damone, Patti Page, Frankie Laine, and Eddie Howard. As Hammond put it, "Mitch had the ideal talent for picking hits, songs which fitted a particular popular artist on the label and which, with amazing regularity, reached the top ten best-selling records in the country. This is a rare and valuable

asset.”² As Gene Lees pointed out, in response to competition from the rapidly growing television industry, radio stations, “turned more and more to records and began a scramble for ratings that placed premium on repetition and a short ‘play list’ and sought the lowest common denominator of public musical taste.”³ Miller moved to Columbia Records at the request of its Vice President (and his old friend) Goddard Lieberson. Miller’s seemingly endless string of pop hits moved Columbia from fourth place to number one in sales, increasing sales by 60 percent within eighteen months. His musical taste did not gel with Frank Sinatra who refused to record “The Roving Kind” and “My Heart Cries for You,” saying, “I don’t sing this crap.” Undeterred, Miller recorded the songs with Guy Mitchell and both were top-ten hits.⁴

Sinatra’s opinion of Miller was not held by everyone. Tony Bennett said, “Mitch Miller put me on the map by producing some of my very first million selling records, and he was a great friend and a magnificent musician.”⁵ Miller’s high-gloss pop sound, with its liberal use of the Columbia echo chambers, inhabited the top ten through much of the fifties. His style was antithetical to the artist-oriented, transparent production approach of the man who initially championed him—John Hammond. Expressing his feelings publicly to *New Yorker Magazine*, Hammond said, “Mitch Miller’s a great guy, but ever since about 1948, when he started tricks with sound—making those horrible echo-chamber recordings, for one thing—all the record companies have been knocking themselves out to achieve phony effects. Fun for the sound engineers, maybe, but tough on the musicians. What’s the good of having every instrument in a band sound as if it were being played in the Holland Tunnel?”⁶

Miller was not putting artists and musicians in the studio and letting the chemistry work; his were calculated productions. He used elaborate arrangements and orchestrations and had a knack for plucking songs from fringe genres and adapting them for the mainstream. He understood that a pop production was art in its own right, utilizing the latest technology and studio expertise to create a connective blend of the song, the performance, and a sound that could exist in no other medium. He said, “To me, the art of singing a pop song has always been to sing it very quietly. The microphone and the amplifier made the popular song what it is—an intimate one-on-one experience through electronics. It’s not like opera or classical singing. The whole idea is to take a very small thing and make it big.”⁷ Miller disliked rock and roll to the extent that he declined Buddy Holly and allowed RCA to outbid him for Elvis Presley, telling *Melody Maker* in 1957, “Rock and roll is the glorification of monotony.”⁸

Leiber and Stoller

Jerry Leiber (1933–2011) and Mike Stoller (b. 1933) began writing together in 1950 at the age of seventeen. Almost immediately their songs were covered by substantial

R&B artists such as Jimmy Witherspoon and Ray Charles, but when they wrote and produced “Hound Dog” for Wille Mae “Big Mama” Thornton in 1953, Atlantic Records took notice. By 1955 they had signed an independent production deal with Atlantic and they subsequently wrote and produced hundreds of tracks, generating many worldwide hit records. Some of their hits include: Ben E. King’s “Stand By Me” and “Spanish Harlem”; The Drifters’ “There Goes My Baby” and “On Broadway”; and all The Coasters hits, including “Searchin’,” “Yakety Yak,” “Charlie Brown,” and “Poison Ivy.” When Elvis Presley covered “Hound Dog” four years after their production for “Big Mama” Thornton, it established them as the quintessential rock and roll writers and producers and they went on to write more hits for Elvis, including “Jailhouse Rock” and “King Creole.” Leiber and Stoller were influential producers in many ways: as writers they not only produced their own material but they also claimed the title of producers and were among the earliest to be credited as such.

They had formed their own “Spark” label with Los Angeles-based promotion man Lester Sill. They subsequently became staff producers for Atlantic, selling the label their rights to the Spark masters. Leiber and Stoller had attended Fairfax High School on Melrose Avenue in Los Angeles, as did Phil Spector several years later. Through a confluence of events on which few agree, Spector wound up in New York, slept the night on Leiber and Stoller’s desk and was, effectively, apprenticed to them for some months in their Brill Building office at 1619 Broadway. This was after Spector had written and performed on The Teddy Bears hit record, “To Know Him Is to Love Him.” The accounts of the details of their relationship may be somewhat conflicting but Spector did attend many of their sessions and there is little doubt that Leiber and Stoller influenced him in his approach to producing, writing, and the music business.¹⁰

Phil Spector

At age nineteen, in 1958, Phil Spector (b. 1939) wrote his first hit “To Know Him Is to Love Him,” which (in 1958) went to number one on the *Billboard* Hot 100 for his own group, The Teddy Bears. A multimillionaire by his early twenties and dubbed “The Tycoon of Teen” by no less than Tom Wolfe, Spector produced dozens of hits. These include “Da Doo Ron Ron” by the Crystals, “Walking in the Rain” by the Ronettes, “You’ve Lost That Lovin’ Feelin’” by the Righteous Brothers, and “River Deep Mountain High” by Ike and Tina Turner. He established a unique and instantly recognizable sonic fingerprint, allegedly inspired by his love of Wagner, that became known as the “Wall of Sound.” His tracking sessions used as many as thirty-six musicians in, the relatively small, studio A at Gold Star in Los Angeles. He chose instrumentation atypical of contemporaneous rock or pop music, including orchestral instruments, multiple drummers, bass players, and guitarists, and artfully blended them together in cavernous reverb.

Spector announced his retirement in 1966 but was later brought in to complete the production of the unfinished (and what would become the last) Beatles album, *Let It Be*. He subsequently worked with John Lennon on his solo projects, including *Imagine*, and with George Harrison on the triple-albums, *All Things Must Pass* and *The Concert for Bangladesh*. He developed a reputation for eccentric behavior, and artists who performed some of his biggest hits sued him for unpaid royalties. He is, at the time of writing, serving jail time for the shooting death of Lana Clarkson.¹¹ Nonetheless, his best work stands monumental to this day and his records are often referred to as Phil Spector records rather than by the artist's name.

His engineer Larry Levine said that Spector would not roll tape until about three hours into the session. Levine speculated that he was trying to tire the musicians to suppress their individuality. He commented, "There were mistakes in the room but you couldn't hear them on playback."¹² Bill Medley of the Righteous Brothers said of Spector's studio methodology, "He works for hours and hours until it is letter perfect; he knows what he wants." Spector, who was often credited with cowriting the songs, said that he always knew what he wanted the final result to be, but did not always know how to get there. Earl Palmer, who played drums on "You've Lost That Lovin' Feelin'" (in place of Spector's usual drummer, Hal Blaine), said, "...you could tell right away he knew what he wanted and wouldn't compromise."¹³ Palmer added, "Spector wasn't an arranger of notes. He was an arranger of ideas, of the elements that make a hit record. If there is any genius in him, that's where it is. He had his finger on what other producers would die for: he knew what the kids wanted to hear."¹⁴

Spector said in a sixties' interview, archived at the University of North Texas, "I am very influenced by old records, as much as I am by Wagner records." He went on to say, "I love a lot of Atlantic's old records. I love them because they have that honest, real, good sound to them. All I would do when I made my records is try to do something that somebody else *wasn't* doing: express myself. It just turned out that it was *really* something nobody else was doing and that's why it's got that Spector sound: it is just terminology for a style of producing."¹⁵

In the same interview, Spector also said that the Righteous Brothers' "You've Lost That Lovin' Feelin'" really captured something for him, with regard to the production. He claimed that he was not attempting to create a number one hit but wanted to make a forceful record, like Wagner, that presented dynamic feelings through the music. He also said, "It takes me a few months to make a record; it has to be built."¹⁶ Earl Palmer commented that, "[Spector] took two days to get eight measures the way he wanted them." Many feel that his pre-retirement record "River Deep Mountain High" (Ike and Tina Turner) was the pinnacle of his creative achievement. It was a hit in the UK and elsewhere but only reached number 88 in the *Billboard* Hot 100, which was devastating to Spector. Danny Davis, VP of Spector's label at the time, said, "When I left the company, the bills on that one single side came to \$22,000, and I don't believe they were all in then. He'd spent so much time on mixing and dubbing, going back time and again to put on something

he's [*sic*] just thought of."¹⁷ Spending that much time and money on the production of a single was unusual in those days, when whole albums were still being produced in a day or so.

Sam Phillips

Sam Phillips (1923–2003) was important as an independent record producer, studio owner, and as the founder of the Sun Records label. His A&R abilities resulted in the introduction of consequential artists such as Johnny Cash, Howlin' Wolf, B. B. King, Jerry Lee Lewis, Roy Orbison, Carl Perkins, Elvis Presley, Charlie Rich, and many more. He worked with blues, rhythm and blues, and country artists, freely mixing the influences, creating the rockabilly sound and foundational rock and roll recordings such as "Rocket 88." Apart from his Presley tracks, the Sun Records hits have resonated through generations. Examples of his productions include Carl Perkins's "Blue Suede Shoes" (SUN 234), Johnny Cash's "I Walk the Line" (SUN 241), as well as Jerry Lee Lewis's "Whole Lotta Shakin' Going On" (SUN 267) and "Great Balls of Fire" (SUN 281).¹⁸ Phillips' ability to identify diverse talent and to musically nurture artists, maintaining their artistic integrity by remaining open to their uniqueness while making a distinctive contribution as the producer, was impressive. Phillips, in many ways, defined a new direction for popular music and a style of record production. The sound of his records is original, much imitated, and definitive of an era and a genre. As cited by Jimmy Guterman, Phillips insightfully explained to journalist David Halberstam, "I have one real gift and that gift is to look another person in the eye and be able to tell if he has anything to contribute, and if he does, I have the additional gift to free him from whatever is restraining him."¹⁹

Steve Sholes

In 1929, while in high school, Steve Sholes (1911–68) began working for RCA at their Camden, New Jersey, plant as a messenger. Being a musician, he moved into production, rising, in 1945, to become head of both country and western, and rhythm and blues recording. At this time, country music was moving away from its traditional folk music roots—hillbilly music as it was termed—although the Western influence was still strong with artists like Gene Autry and Roy Rogers. Sholes discovered and signed virtuoso guitarist Chet Atkins who, it transpired, was a consummate arranger and producer and would make an important contribution to the development of country music. The "western sound" eventually waned and Sholes expanded the RCA roster. He signed or developed many artists including Atkins, Eddy Arnold, Hank Snow, and Jim Reeves. Additionally, he produced jazz artists such as Jelly Roll Morton, Earl Hines, and Dizzy Gillespie. He

played a significant part in developing Nashville into a music center by persuading RCA to become the first label to establish its own studio, offices, and staff there.²⁰ Empowered by his 1955 signing of Elvis Presley, from Sun Records, he ascended through the company's Los Angeles and then New York operations, placing Chet Atkins in charge of RCA Nashville.²¹ Sholes is credited as producer on the number ones Elvis Presley made for RCA during the 1950s.²² However, it is generally accepted that he was not a "hands-on" producer for Presley who, having learned a great deal from Sam Phillips, took charge in the studio. Nevertheless, as Paul Ackerman, in his *Billboard* obituary for Sholes, noted: "Sholes' foresight in having RCA sign Presley was remarkable when one considers the musical climate of the era." He went on to say that Sholes "was a major catalyst in this generation's music revolution."²³ RCA expanded its roster in the sixties to include artists such as Dolly Parton, and Waylon Jennings with Sholes and Atkins contributing to the development of what became known as the "Nashville Sound."²⁴

Norrie Paramor

Bandleader Norrie Paramor (1914–79) joined the British branch of Columbia Records, an EMI subsidiary in the UK, in 1952. American Columbia had just terminated their contract with EMI, cutting off the supply of top American artists. Then, HMV (also part of EMI) lost its contract with RCA Victor, losing them access to many more established artists. Like many staff producers and A&R people of his time, Paramor was an accomplished musician and arranger. Beginning in 1954, he produced a number of hits for artists such as Ruby Murray and Eddie Calvert. In 1956 he produced Tony Crombie and His Rockets' "We're Gonna Teach You to Rock," which, modeled after Bill Haley and His Comets, may be the first British rock and roll hit. Then, in 1958, he signed Cliff Richard and The Drifters intending to cover American hits. As it happened, Richard's more than five-decade career took off with a rock and roll song, "Move It," penned by Ian Samwell (then a Drifters band member). Initially a B-side, it became a hit when impresario Jack Good flipped the single over and promoted it on his British TV show *Oh Boy!*²⁵ Paramor, who had been initially dismissive of the song, seized the opportunity and cut the subsequent album "in front of several hundred screaming fans, albeit in the relatively controlled conditions of EMI Studio Number One."²⁶ Allmusic.com credits the album with being "the first major live album by a white rock & roll performer."

After the first sessions, the Drifters changed their name to The Shadows to avoid confusion with Ben E. King's group. Between Richard, The Shadows, and his other acts, Paramor became the British producer to beat for the next four years. George Martin said of his meeting, in 1962, when he agreed to hear Brian Epstein's last ditch pitch for The Beatles, "I was close to desperation for an act from the pop world. I was frankly jealous of the seemingly easy success other people were having

with such acts, in particular, Norrie Paramor, my opposite number on Columbia, whose artist Cliff Richard was on an apparently automatic ride to stardom.”²⁷

The Shadows enjoyed a substantial career of their own and went on to influence several generations of British artists including The Beatles, by demonstrating that a British group playing rock and roll could be successful. Many later guitar icons such as Jimmy Page, Mark Knopfler,²⁸ Peter Frampton,²⁹ Eric Clapton, David Gilmour, Brian May, Tony Iommi, George Harrison, Pete Townshend, Frank Zappa, Randy Bachman, Neil Young, and Carlos Santana³⁰ have cited lead guitarist Hank B. Marvin as an early influence. The band had more than thirty instrumental hits and backed Richard on a similar number.³¹

Paramor wrote, or co-wrote, numerous hit songs, composed several complete movie scores, some light orchestral works, charted as a recording artist in his own right, and produced hits for other artists he discovered, such as Helen Shapiro, Frank Ifield, and Billy Fury.³² Norrie Paramor died in 1979 having continued to produce Richard’s many hits through significant stylistic changes.

Joe Meek

Independent British producer, engineer, and studio owner Joe Meek (1929–67) enjoyed his first hit in the summer of 1961 with John Leyton’s “Johnny Remember Me.” Beginning as an engineer, he designed the state-of-the-art Lansdowne Studios in Holland Park, London, where he engineered Lonnie Donnegan’s number-one hit “Cumberland Gap” in 1957. The track was significant in helping to establish “skiffle” music in the UK. Meek was technically adept, autodidactic, and he built some of his own equipment including a spring reverb unit from an old electric fan heater. Unfortunately, he was volatile with a legendary temper that would eventually prove fatal. Reputedly tone-deaf and lacking a sense of rhythm, he nonetheless wrote hit songs (including “Put a Ring on Her Finger” for Les Paul and Mary Ford). He produced dozens of UK top-forty records including three number ones in less than a decade.³³ Meek left Lansdowne, having upset his fellow engineers, and converted his small London flat, on the busy Holloway Road, into a studio. Every available space was pressed into commission; he even recorded vocals on the stairs. An early proponent of close miking, Meek also sped up his recordings and used non-traditional engineering and production techniques creatively. This was before the availability of convenient effects units beyond spring and plate reverb, and tape delay. Meek developed a distinctive lo-fi sonic signature reliant on heavy compression and reverb, optimizing his productions for listening on a transistor radio to AM radio. The heavily manipulated Telstar, by the Tornados, went to number one on both the *Billboard* and UK Charts. He had just one more hit in 1964 after the Beat Boom began: “Have I the Right?” by the Honeycombs. After his Telstar royalties were frozen in a copyright dispute, Meek was invited to become an in-house producer

at EMI by, chairman, Sir Joseph Lockwood.³⁴ Sadly, he committed suicide, after killing his landlady on February 3, 1967. Coincidentally, February 3, 1959, is generally believed to be “The Day the Music Died” referred to by Don McLean in his eight-minute thirty-three-second pop opus, “American Pie.” That was the day that Buddy Holly, Ritchie Valens, and The Big Bopper died in a plane crash. Meek was sometimes referred to as “Britain’s Phil Spector,” although their methodologies and end results had almost nothing in common. It was, however, also February 3 (2003) that Spector shot and killed Lana Clarkson at his home in Los Angeles.³⁵ There is no doubt that quality in Meek’s productions was sporadic and that he was a troubled individual. Nonetheless, the studio was his instrument, and, like Les Paul and King Tubby, he often took it apart and put it back together to get the results he wanted, no technical standards being sacrosanct in his pursuit of the sound he sought. He often wrote, engineered, and produced his records; he built and ran his independent studio, owned an indie label, and sourced his artists. In many ways, he seems like a producer ahead of his time.

Brian Wilson

Brian Wilson formed the Beach Boys in 1961 and was the creative driving force behind the group as its writer, arranger, and producer (credited from the second album in 1963). It is remarkable, for the time, that Capitol Records allowed him to produce the group’s records and especially at outside independent studios. His productions were widely influential across the industry—in particular *Pet Sounds*, which (despite its comparative lack of commercial success) Paul McCartney cites as having influenced *Sgt. Pepper*.³⁶ Characteristic of Wilson’s finest productions, such as “Wouldn’t It Be Nice,” “God Only Knows,” and “Good Vibrations,” are complex, intertwined close vocal harmonies, underpinned and blended with equally sophisticated orchestral arrangements. He combined symphonic instrumentation including bells, sleigh bells, flutes, strings, horns, and timpani with theremin, hand-claps, Hammond organ, and muted upper-register Fender bass playing melodic lines, all mixed with great clarity, dramatic dynamics, and generous but judicious use of the reverb chamber. There are tantalizing tastes of Chuck Berry here and there, yet his arrangements feature breakdowns, and feel and tempo changes atypical of pop music of the time. Oftentimes, the rhythmic pulse comes not from the drums and bass, as in most rock music, but from higher register parts and light percussion. His drum set parts do not always play time throughout, rather, dynamically shading and emphasizing, or entering in sections for rhythmic lift. He cites hearing Phil Spector’s productions as being an “A-ha” moment when he realized that “you can use echoes on the drums, and you can combine three guitars together to get one sound, add pianos to that, and you can get one big wall of sound!” He said that he listened to “Be My Baby” when he “woke up every morning... For about four years.”³⁷ Notwithstanding any conceptual and methodological influences he

assimilated, or the countless artists and producers his own work colored, Wilson's productions remain unique, distinctive, and monumental.

George Martin

Pye, Philips, Decca, and Ron White at EMI Records all turned down The Beatles. Nonetheless, in 1962, after an initially lukewarm response to their audition tape, recorded at EMI Studios on Abbey Road, George Martin signed the group to the EMI label, Parlophone Records.³⁸ Prior to signing The Beatles, Martin was a successful comedy producer for EMI. He had trained in classical music at the Guildhall School of Music and Drama and had little pop music experience. Martin produced The Beatles' entire recorded output with the exception of the work done by Phil Spector on *Let It Be*. There can be little question that Martin's production, arrangement, and orchestration skills, along with his inventiveness, flexibility, and personal rapport with the band, contributed immeasurably to the band's success. Beyond The Beatles, he successfully produced in many genres including pop, rock, jazz, country, avant-garde, classical, baroque, movie soundtracks, stage cast recordings, and comedy. He was the head of Parlophone Records, as well as an A&R executive and producer. In addition to all these duties, he produced two albums a year and additional singles for The Beatles until they broke up. Martin scored number-one hits with thirty singles and sixteen albums in the UK, in addition to twenty-two singles and nineteen albums in North America with comparable statistics in many other countries. Despite the massive revenues his work generated for EMI, his salary there never exceeded \$8,000 per annum and he received no royalties for his work with The Beatles until he resigned from the company in 1965. At that point, he negotiated a royalty of 0.2 percent for future albums produced. In contrast, top independent producers today can earn a four or five percent royalty and a substantial advance. On his resignation from EMI, he set up AIR (Associated Independent Recording) with three fellow producers. This was a creatively fertile period for The Beatles and, in eighteen months, he produced *Rubber Soul*, *Revolver*, and *Sgt. Pepper*. AIR opened one of the world's premier studio complexes in London, and then another on the island of Montserrat. After The Beatles disbanded, Martin produced diverse artists such as Jeff Beck, America, Kenny Rogers, The Mahavishnu Orchestra, the Bee Gees, Dire Straits, The Little River Band, Cheap Trick, Neil Sedaka, Jimmy Webb, Ultravox, and many more, through multi-artist projects.³⁹

Martin's role changed over the course of the Beatles' career. During the early sessions, the band played together as they did on stage; if there was a mistake they performed the song again. They recorded most of their first UK album, *Please Please Me*, on February 11, 1963: ten songs in a little under ten hours—and they were in the middle of a tour at the time. They added the four sides from their two previously recorded singles to complete the record.⁴⁰ The sixties was a time of great change in recording techniques, not only stimulated by The Beatles, but also

Motown, The Beach Boys, and many others. It is a remarkable testimony to Martin's openness and musicality that he was able to accommodate the changing relationship between him and his protégés. He used his considerable creative, interpersonal, and musical skills in interpreting, realizing, and augmenting the group's ideas.

Holland, Dozier, and Holland

Holland, Dozier, and Holland wrote and produced more than fifty of the songs that come to mind when we think of Motown. They enjoyed a six-year run of success as a writing and production team with the storied label and many of their songs, now considered classics, have been covered by other artists. All three of the team had worked with Berry Gordy and Motown previously, but it was not until 1962 that Brian and Eddie Holland teamed up with Lamont Dozier. In 1963, they began their rigorous daily regimen at Motown's "Hitsville" studio, arriving at 9 am and working all day to create their historic hits. Their songs and production techniques defined the urbane essence of the Motown sound—mostly up-tempo dance tracks with strong lyrical and melodic hooks, driving R&B grooves, and the passion of gospel music layered on top of the finest musicianship and arrangements.⁴¹ The comparison has often been drawn between Motown's production systems, established by Berry Gordy, and Henry Ford's conveyor-belt mass production that earned Detroit the moniker "motor city." While resulting in no lack of quality, in order to be able to finish more songs and produce more projects, the three writer/producers divided their duties. Brian Holland and Lamont Dozier worked on the tracks and melodies while Eddie Holland retreated to his townhouse to write the lyrics. Their elaborate but direct and effective productions formed the backbone of Motown's memorable legacy.⁴²

Teo Macero

Teo Macero (1925–2008) was a staff producer at Columbia as part of an impressive array of producers that included John Hammond, Mitch Miller, and George Avakian, each with his own distinct style and background. Macero was a trained musician and composer and warrants mention here because of three groundbreaking records he produced, Miles Davis's *Kind Of Blue* and *Bitches Brew*, as well as Dave Brubeck's *Time Out*. Not only were these three of the best-selling jazz records of all time, but they were also among the most innovative, and each in its own way. *Time Out* explored odd time signatures, *Kind of Blue* modal jazz, and *Bitches Brew* a new and unique form of fusion, combining electric instruments and compositional tape-editing techniques. On the latter, Macero extended his creative integration of studio-manipulated compositional techniques based on improvised performance similar to those he had employed on Davis's preceding album, *In a*

Silent Way. Paradigm shifting productions in any genre are worthy of respect but to make quantum creative leaps and create enduring music that sells is a consequential achievement. To be sure, Davis and Brubeck were creative talents of the highest order and much of the credit for these recordings goes to them. Nevertheless, that Davis, in particular, entrusted Macero with so much creative freedom is powerful testimony to the man's production skills. In addition, these records were commercially successful at a time when jazz was far from the peak of the popularity it enjoyed in the swing era.

King Tubby

Osbourne Ruddock (1941–89) known professionally as King Tubby (despite his slim build), deserves mention here because of his impact on production through his contributions to the concepts and development of the remix. Even producers and remixers who are unaware of his work have been indirectly influenced by his innovations. Jamaican born, Tubby had a seemingly intuitive knowledge of electronics: building, repairing and modifying much of his own equipment. In the sixties, he operated a sound system—"Tubby's Home Town Hi-Fi"—that was regarded by many as the best in Jamaica and which became the test-bed for his early remixes. In 1972 he began experimenting with dropping out the backing track from a mix, leaving just the vocals playing a cappella and then vice versa. Before long he was adding dramatic reverb and echo effects, his stark, dynamic deconstructions effectively launching the dub mix phenomenon and establishing a basis for future remixers far outside the reggae genre. Tubby engineered and remixed multiple versions of tracks by producers such as Augustus Pablo, Winston Riley, Bunny Lee, and Lee Perry,⁴³ releasing his own albums *Dub from the Roots* and *The Roots of Dub* in 1974. Tubby's studio, initially in a back bedroom, was very limited compared to international facilities of the time—a further testimony to his musical and electronic creativity. The studio and workshop eventually took over his whole house, "providing apprenticeships for many of dub's future engineering stars, including Prince Jammy (now known as King Jammy), Philip Smart, and Scientist."⁴⁴ Sadly, Tubby was shot and killed outside his Kingston home on February 6, 1989, in an apparent attempted robbery.

Prince

Prince Rogers Nelson is by no means the first artist who produced him- or herself and others, but in the mid-seventies it was still rare that a label would allow a new artist to self-produce. Today, artist-producers are more common. Being from a musical family, Prince taught himself to play several instruments, including drums, piano, and guitar. He took a school course entitled "The Business

of Music” and by the time he was seventeen, he was developing arranging and production skills by dubbing audio from one cassette machine to another. Prince insisted on producing his recordings from the first, to the extent of passing on deals with major labels and producers of the stature of Maurice White who was then at the peak of success with his band Earth, Wind, and Fire. Prince also demonstrated business insight by insisting on being marketed across genres. This was not done for most African American artists of the time and was a bold assertion for a nineteen-year-old. With many labels interested, Warner Bros. agreed to his terms and, in 1978, Prince’s first album, *For You*, was released with the credit: “Produced, Arranged, Composed and Performed by Prince.” The album reached number twenty-one on *Billboard*’s soul chart and number 163 on the pop chart, but his blend that included soul, gospel, funk, disco, and rock, along with his distinctive use of synthesizers, his multi-instrumentalism, and self-production, attracted media attention, and audiences swelled at his gigs.⁴⁵ His concepts became an influential sub-genre known as the Minneapolis sound that, like, say, Motown, the New Romantics, and Grunge, captured not only a sonic identity but a look and a brand, extending into dance, fashion (with a certain androgyny), and video concepts. He regularly included women instrumentalists in his live bands—another assertion of his individuality at that time. I asked producer Sylvia Massy who engineered for Prince what it was like to work with him, and she was very complimentary of his abilities to the extent that she felt he really did not need anybody else in the studio because “he does everything we do better than we can, and he does it while dancing and twirling around.”⁴⁶ Aspects of his all-encompassing approach to the industry, including his views on copyright ownership, are aligned with trends made possible by technology, three decades later, and may have sign-posted possible ways forward for some of today’s and tomorrow’s producers and artists.

Rick Rubin

Rick Rubin was a co-founder of Def Jam in the early eighties and producer of seminal hip hop acts such as LL Cool J, T La Rock, and the Beastie Boys. He produced the latter group’s anthems “(You Gotta) Fight for Your Right (to Party!)” and “No Sleep till Brooklyn.” He had the inspiration and confidence as a producer to blend rock and rap, putting his two favorite forms of music together, which moved Aerosmith into the MTV era and launched Run-DMC. He left Def Jam to form Def American and eventually became co-chairman of Columbia Records. Impossible to pin down by genre, his diversity is dizzying with his productions extending far beyond his hip hop beginnings to include Slayer, Jay Z., Johnny Cash, Metallica, the Dixie Chicks, the Red Hot Chili Peppers, and Neil Diamond, among many others.

Quincy Jones

Even the most successful producers live in the shadows of the artists they produce. If there are any household name producers, they would be George Martin, for his work with The Beatles, and Quincy Jones (b. 1933), who is most widely known for his work with Michael Jackson. Of course, there is much more to both men and their careers than their work with these artists. A recording artist in his own right, Jones is the most nominated Grammy artist, with seventy-six nominations and twenty-six awards; he has an Emmy Award, seven Oscar nominations, and the Academy of Motion Picture Arts and Sciences Jean Hersholt Humanitarian Award. As a teenager, Jones dropped out of Berklee College of Music to tour with Lionel Hampton, which led to work as a freelance arranger in New York. He wrote for Tommy Dorsey, Gene Krupa, Sarah Vaughan, Count Basie, Duke Ellington, Dinah Washington, Cannonball Adderley, and his childhood friend Ray Charles. Returning from a tour as music director and trumpeter with Dizzy Gillespie, he recorded as a leader for ABC Paramount. From 1957, Jones studied composition with Nadia Boulanger and Olivier Messiaen while working as music director for Barclay Disques—Mercury Records' French distributor in Paris. After a financially disastrous tour with his own band, he took a job with Mercury Records in New York as music director and in 1964 they named him a vice-president of the label. He was the first African American to hold such an executive position in a white-owned record company. That year, he composed the music for Sidney Lumet's film *The Pawnbroker*, the first of his thirty-three major motion picture scores. He wrote TV theme music for *Ironside*, *Sanford and Son*, and *The Bill Cosby Show*. The 1960s and '70s were also years of social activism for Jones. Throughout the seventies he recorded several Grammy-winning albums featuring his blend of jazz and R&B. Jones met Michael Jackson on the set of *The Wiz*. Jackson wanted his album to be the best it could be and different from the Jackson's *Destiny*—their biggest album to date. Jones produced Michael Jackson's first solo album, *Off the Wall*, turning Jackson into a global superstar. Jones became the most in-demand record producer of the eighties. He also produced Jackson's 1982 album, *Thriller*, which became the best-selling album of all time, selling more than fifty million copies worldwide with six Top-Ten singles. Jones then co-produced the eleven-time Oscar nominated movie, *The Color Purple*. He has been tirelessly active in civil rights matters and in fostering appreciation of African American music and culture.⁴⁷ His productions are a who's who of the finest musicians, vocalists, engineers, arrangers, and composers of the period. His work is warm, exciting, and hip; he quickly embraces new forms and techniques, balancing them with a deep understanding of the history of African American music and Western European classical orchestration. In that regard, he has quoted Nadia Boulanger as saying, "Until they get thirteen notes, learn what everybody out there has done with these twelve."⁴⁸

Robert John “Mutt” Lange

Mutt Lange was born in Mufulira, Zambia (then Northern Rhodesia), and has produced definitive and career peak albums for multiple artists. Based on sales, he is one of the most successful producers in recording history. He moved to the UK in the mid-seventies, initially producing artists such as Graham Parker and The Rumor, City Boy, and the Boomtown Rats. He then embarked on a more than thirty-year run of massive commercial hits, including productions for AC/DC, The Cars, Billy Ocean, Foreigner, Def Leppard, Michael Bolton, Bryan Adams, The Corrs, Celine Dion, the Backstreet Boys, Nickelback, Maroon 5, and Shania Twain (his wife at that time), whose album *Come on Over*, may be the top-selling album by a female artist of all time.⁴⁹ Very few albums are diamond certified (ten million sales in the United States) and yet Lange has produced at least six of them and has contributed tracks to even more. As attested to by the dearth of photographs and interviews available, Lange guards his privacy and has done so since the early days of his career. Irrespective of genre (and he has worked in several), his productions are tightly arranged and orchestrated with strong hooks that manifest a pop sensibility with mass appeal. He is known for his attention to detail and lengthy album projects. Several artists he has produced have commented on how hard-working he is and how hard he works the artist, his primary focus being to shape the songs, whether he cowrites them or not.

Dr. Dre

André Romelle Young, better known as Dr. Dre, has produced some of the most influential artists in hip hop for more than two decades, including Tupac Shakur, Snoop Dogg, Eminem, 50 Cent, and The Game. His own group, N.W.A., introduced “gangsta” rap, changing the direction of hip hop with their album *Straight Outta Compton* (coproduced with fellow group members). Its controversial track “F*** tha Police” was the subject of an FBI warning letter to Ruthless Records.⁵⁰ Dre’s multi-million-selling 1992 solo album, *The Chronic*, marked his debut as an artist and was a pioneering recording in establishing G-funk—a sub-genre of “gansta” that blended funk samples and melodies with gangsta rap. From early in his career, Dre concentrically parlayed his success as an artist and producer into related entrepreneurship. He started Death Row Records with “Suge” Knight in 1991 and formed Aftermath Entertainment in 1996, signing and producing Eminem and 50 Cent. He cofounded Beats Electronics LLC with Jimmy Iovine in 2006, launching the distinctive red “Beats by Dr. Dre” headphones in 2008 along with other audio products and services.

Max Martin

Max Martin is a Swedish producer who emerged in the mid-nineties pop boom with his productions of Backstreet Boys, Britney Spears, and N'Sync. He subsequently produced many other artists, including Katy Perry, Pink, Kelly Clarkson, Miranda Cosgrove, Adam Lambert, Carrie Underwood, and Usher. Ace of Base's producer Denniz PoP invited Martin to join Cheiron Studios as writer-producer in 1992. Martin told *Time Magazine* that, "[He] didn't even know what a producer did" but that "[He] spent two years day and night in that studio trying to learn what the hell was going on." His style of writing and production has, seemingly, become the model for top-ten singles producers from the late 1990s, into and beyond the first decade of the new millennium. He has not only been influential in his methodologies but also through his direct collaborations with other pop producers and writers such as Shellback, Dr. Luke, and Benny Blanco.

The Sixties and Seventies

Cultural and Creative Revolution

In the field of popular music, the creative culture of production shifted significantly through the sixties and into the seventies. The fertile spurt of the baby boom artists combined with the searching experimentation of producers and engineers to consummate the many technologies and techniques introduced since World War II. Magnetic tape recording, the microgroove LP, seven-inch singles, multitrack recording, stereo discs, FET (field effect transistor) technology, and so much more, formed a solid platform on which innovative production techniques were built and disseminated. The enthusiastic buying power of the boomer consumers fueled this revolution and the next phase of the music industry. In a few short years, the techniques outlined in chapter five consolidated into standard production practice, transforming forever the creative process.

The Sixties

Rupert Neve started out recording audio direct to 78 discs before he went to work for Rediffusion, then Ferguson Radio, and as chief engineer of a transformer manufacturer.¹ He learned about transformers from “early sound designers like Norman Partridge”² and other audio engineering pioneers “whose names are mostly lost to history.”³ His first company CQ Audio designed and manufactured home hi-fi equipment. He formed his company, Neve, in 1961 and began building recording consoles utilizing Class A designs. The first being for musique concrète composer Desmond Leslie (1921–2001) and then another for Recorded Sound. He recognized the size and efficiency advantages of transistors over vacuum tubes (valves as they are called in the UK).⁴ In 1964 he built the first commercial transistor-based mixing console for Philips Records in London as well as a remote broadcast console for Radio Luxembourg.⁵

Philips introduced the Compact Cassette at the 1963 Berlin Radio Show. It was significantly smaller than any other tape cartridge technology, enabling small, battery-powered players.⁶ The same year, Leslie, Frank, and Norman Bradley unveiled the “Mellotron” based on an original design by Harry Chamberlin. The

Birmingham, UK-based company's tester happened to be Mike Pinder who bought a used machine to play with his group The Moody Blues.⁷ Criticized by some for its low fidelity, it was, nonetheless, a polyphonic, analog, keyboard-operated, sample player. Its distinctive sound was featured on many records, perhaps most famously: the Moody Blues' "Nights in White Satin" and The Beatles' "Strawberry Fields."⁸

In 1964 the Federal Communications Commission instigated a rule requiring AM and FM radio stations owned by the same company to run 75 percent different programming.⁹ In response, FM stations began to play rock music and experiment with a freeform progressive format giving DJs more freedom to choose tracks and play longer cuts, often without announcements. Bill "Rosko" Mercer (1927–2000) at New York City's WOR-FM in 1966 was a freeform pioneer, playing "rock, soul, folk and jazz."¹⁰ Jon Pareles in his *New York Times* obituary for Mercer reported, "In one set during the late 1960's, he recited antiwar poetry by Yevgeny Yevtushenko to the Mormon Tabernacle Choir singing the Lord's Prayer, then played Richie Havens's antiwar song "Handsome Johnny" as a lead-in to a news report about bombing in Vietnam."¹¹ Also on the forefront were Scott "Scottso" Muni on WNEW-FM New Orleans and Tom Donahue at KMPX-FM San Francisco, the West Coast's first full-time commercial underground station. These stations represented a clear move away from top-forty radio. A split emerged, with AM stations focusing on singles for younger teenagers, and FM on album tracks for college-age listeners. This was the genesis of the Album Oriented Rock (AOR) format that opened up the possibility for artists and producers to shift their focus away from making top-forty singles.¹²

Ray Dolby (1933–2013) worked at Ampex as a teenager before moving to Cambridge, England, to complete his Ph.D. in physics. He started his company, Dolby Laboratories, in London after having been inspired to design his noise reduction system for audio tape while working on a UNESCO traditional music recording trip.¹³ Dolby introduced A-type® noise reduction in 1965 with Decca being the first company to adopt the system; the other major labels followed suit by 1967. Dolby® introduced its B-type® noise reduction for consumer products in 1968. Its system of encoding on record and decoding on playback reduced inherent tape noise electronically, expanding the functional dynamic range of analog tape. A-type® noise reduction would remain the primary professional analog noise reduction system until the company introduced Dolby SR (spectral recording) in 1986.¹⁴

Abbey Road's Ken Townsend, at the request of The Beatles, devised a system for Artificial Double Tracking (as EMI termed it). The Beatles used it extensively while making their album *Revolver* in 1966. The new technique became widely known as Automatic Double Tracking (ADT). Geoff Emerick, engineer on many Beatles sessions, says that they "were the first artists at Abbey Road to overdub using headphones to listen to backing tracks."¹⁵ They were trying to avoid bleed or spill on the overdubbed track. As quoted by Andy Babiuk, Emerick said, "At that

time it was totally alien to any other producer or pop band to wear headphones for working.”¹⁶

As the sixties progressed, Field Effect Transistors (FETs) became more reliable, and by 1969 AKG launched its modular capacitor microphone system (CMS), which included small-diaphragm mics such as the C451, CK 1, etc.¹⁷

Mix Automation

Mix automation is an integral part of most DAW programs. Console automation began around 1973 with Paul C. Burr’s Allison Research system, although there are rumors of earlier systems, such as one at Motown in 1966, used to control an eight-channel console. Burr’s automation coincided with the spread of sixteen- and twenty-four-track tape machines and larger consoles and was helpful in handling the increasing complexity of the mixdown process. The Allison system used VCAs (voltage controlled amplifiers), for which the faders are control devices with no audio passing through them. Many engineers and producers were (and some still are) wary of VCAs because of the distortion they introduced (early versions in particular). The credit goes to David Blackmer, founder of DBX and a multiple patent holder, for inventing the VCA. The Allison automation system stored the information for the relative levels of channel faders, including mutes, on one track of the multitrack tape. Updates required bouncing the data to another non-adjacent track while adding new moves. Even after the transition from sixteen- to twenty-four-track recording, sacrificing two tracks to automation was significant. Since VCAs controlled the relative levels of each channel, the faders did not move on playback. Editing fader rides could be challenging and required identifying null points in order to modify the existing rides. Each bounce of the data track added a small delay, causing the information on moves and cuts to slip slightly. After several passes, this slippage could become noticeable and problematic. Occasionally, data became corrupted, which necessitated starting the whole mix over. Nonetheless, the system represented a breakthrough in handling large, complex mixes. Over time, the audio quality of VCAs improved, concerns diminished, and, because VCAs made automation and grouping easier, they were in widespread use through the eighties. Nonetheless, many engineers still favored systems with moving faders through which the audio actually passed.

Neve introduced their moving fader system called NECAM (Neve computer assisted mixdown) in 1977 at London’s AIR studios.¹⁸ NECAM addressed the sonic concerns about VCAs by motorizing their Penny and Giles audio faders. The system maintained moves within the NECAM computer locked to SMPTE, thus requiring only one track for synchronization of the moves. In practice, it was wise to maintain an empty buffer track to prevent the SMPTE code from being modulated by, or bleeding onto, an audio track, via crosstalk. With any automation system that recorded data or time code to analog tape, there was always the concern

that it would bleed across tracks enough that the characteristic data whine could be heard in the final mix. NECAM, from time to time, experienced problems and the faders would randomly shoot up and down from infinity to max. Witnessing a serious failure was a “night of the living faders” experience, amusing if it weren’t for the lost hours of mixing.

There were generational refinements to NECAM and then, in 1988, Neve debuted its completely new “Flying Faders” system. Automation became all but essential in managing forty-eight-track mixes and the increasing numbers of effects returns and “mults” or cross-patched channels (audio tracks split across two or more channels for different treatment in separate sections of the mix). George Massenburg’s standalone GML moving fader automation system proved popular with many high-end studios. Many producers and engineers were still suspicious of VCAs and some still preferred to mix on discrete (non-integrated circuit (IC)-based) consoles. GML was a good solution for retrofitting on refurbished vintage consoles such as O’Henry’s’ eighty-channel API in Toluca Lake, California. SSL, still the choice of many mixers because of its user-friendly ergonomic layout and onboard processing, continued to improve the user experience with their VCA-based system and finally satisfied the anti-VCA camp with their “Ultimation” moving-fader system.

SSL introduced Total Recall on their 4000E console in 1981. Total Recall stored, in the SSL computer, the positions of each pot (potentiometer) and switch on the console. The entire console or any part of it could be reset later by manually matching the positions of the pots and switches with those previously stored. It was a slow and neck-aching process because you had to look up at the screen as you were bending over the console matching the controls. Depending on the size of the console it could take a couple of hours to recall a mix. I recalled a mix at Enterprise studios in Burbank, California, that sounded nothing like the original mix, despite it having been done in the same room. It turned out that a maintenance person had been repairing some modules and had changed their positions in the console since the original mix had been done. With most recalls, a degree of fine tuning by ear was necessary. This was mainly due to disparities in the outboard equipment settings, which still had to be manually documented (usually on paper).

Total Recall and automation were transformative technologies for producers, artists, and A&R people. They reduced the necessity of finishing a mix in a single contiguous outpouring of effort. A complex manual mix required several pairs of hands and practice runs for everyone to learn and remember their moves. Automation allowed interim storage of balances, moves, and rough mixes that could speed the final mix. Total recall, though laborious to reset, was a timesaver too. Mixing began to be an iterative process rather than a performance. Inevitably, reducing spontaneity was considered to be a negative by some producers and engineers but very few mix moves are done manually today. The next step was resettable consoles and, in this domain, DAWs and digital consoles have the advantage—there

being no physical controls to move, the reset is instantaneous, and virtual systems are less expensive to build and update.

DAWs, with unlimited or many channels, offer the potential to reduce the number of mix moves and even eliminate them. If a section, piece, note, or syllable needs to be louder, quieter, or treated differently, it can be easier to copy the section to its own track and change the overall level or treatment of the new track (with the edit piece). Alternatively, levels and other parameters can be adjusted internally on the original audio track. These kinds of techniques are applicable at any point in the recording process and mean that the producer can hear the mix as desired, while continuing to work on the track without needing automation or rides to be engaged.

The Seventies

Neve designed their much-loved 1073 mic pre in 1970 for the Wessex A88 console.¹⁹ AKG's BX20, portable professional reverb, came to market in 1970.²⁰

Then, in 1971, the strangest device I had seen arrived at HMV Studios, Wellington, New Zealand, where I was working as a studio musician at the time. Designed by Bill Putman and Duane H. Cooper for UREI they called it "The Cooper Time Cube." It created 14ms, 16ms, or a combined 30ms delays. Shure SM57-type capsules transmitted and received the audio (acting as both speaker and microphone). The acoustic signal passed through long pieces of tubing, not unlike garden hose. UREI only made a thousand units, but the device developed a following for its useful delays and doubling effects.

David Blackmer founded dbx Inc., in 1971, deriving the name from the idea of decibel expansion. His VCA- and RMS-level detection circuits became invaluable recording tools yielding dbx noise reduction, dbx compressors, and VCAs for automated consoles. His model 160 compressor/limiters very quickly became standard equipment in most pro studios and were valued for certain uses.²¹

Nolan Bushnell founded Atari in 1972 with \$250. At Bushnell's request his second employee, Al Acorn, developed Pong in under two weeks as an exercise set by Bushnell. The game was an instant hit when it was installed in Andy Capp's Tavern in Sunnyvale California. Seventies producers were eternally grateful for Pong because it distracted musicians and artists, keeping them out of the control room. Continuing the theme of unlikely applications of technology to production, Dr. Francis Lee, MIT professor, developed a unit for heartbeat monitoring in 1971. Teaching assistant Barry Blesser suggested testing it with audio—resulting in the first digital delay unit—the Lexicon Delta T-101. Digital delay forms the basis of many other digital effects and Blesser later designed the first widely used digital reverb: the EMT 250, which debuted in 1975.²² Inspired by the EMT 250, Dr. David Griesinger, a nuclear physicist, musician, and classical recording engineer, added a microcomputer to a digital reverb design he was developing. He sold the prototype

to Lexicon who also hired him to refine the device. In 1978 and at about half the price of the EMT 250, Lexicon introduced the 224 digital reverb unit that, along with the 224X and 224XL, soon achieved near ubiquity in high-end studios of the time.²³

Punk music surfaced in the United States in the sixties, entering the mainstream by the mid-seventies. CBGB in the Bowery District of Manhattan was a central venue for bands such as The Ramones, Wayne County, Johnny Thunders and the Heartbreakers, Television, Blondie, and the Talking Heads. Earlier influences came from Detroit bands The Stooges, and MC5, as well as the New York City-based Velvet Underground along with (the later) New York Dolls. In London, Malcolm McLaren, who was associated with the New York Dolls, launched the Sex Pistols and much of early punk fashion out of the Kings Road store, called SEX that he ran with designer Vivienne Westwood.

The Sex Pistols' first single "Anarchy in the U.K." was released on October 26, 1976, on EMI but the group was so controversial that they were dropped by EMI, immediately signed and dropped by A&M, and their follow-up single "God Save the Queen," and catalytic album *Never Mind the Bollocks* came out on Virgin. The British scene coalesced around SEX, and The Roxy club in London's Covent Garden, generating other successful bands such as The Clash, Siouxsie and The Banshees, Generation X, and Adam Ant. As much a cultural movement and an ethos as it was musical genre, the music and philosophy spread the world over, evolved, and then splintered into hardcore and other subgenres while exerting influence on several forms of pop music since that time.

Toward the Digital Age

Digital Recording

By 1971, magnetic tape recording had been the recording format of choice in the industry for more than two decades, with the exception of a few “direct-to-disc” audiophile sessions. Analog magnetic tape recording had transformed audio quality and, more importantly, increased the producer’s ability to control the production process. Nonetheless, analog recording had sonic shortcomings that defied resolution. A Japanese company, Denon, experimented with recording audio using a stereo PCM (Pulse Code Modulation) helical scan video recorder from NHK (Nippon Hoso Kyokai—Japan Broadcasting Corporation). Thomas Fine reported retired Denon engineer Dr. Takeaki Anazawa as saying that their mission was, “To produce recordings that were not compromised by the weaknesses of the magnetic tape recorder.” From their tests, two commercial albums were released: *Something* by Steve Marcus in January 1971 (Nippon Columbia NCB-7003) and *The World of Tsutomu “Stomu” Yamashita* (Nippon Columbia NCC-8004).¹

The “first real-world”² test recording using Dr. Thomas G. Stockham Jr.’s (1933–2004) Soundstream Digital system was made in 1976 of the Santa Fe Opera for New World Records. Commercial recordings began being made using the system in 1977, the first for Sheffield Records (*The Art of Fugueing*). “The Soundstream system was a 50 kHz/16 bit process with powerful editing and cross fade capabilities that stored audio on a high speed instrumentation tape recorder.”³ Stockham had been working on audio digitization since joining the MIT faculty in 1957. He received the first Technical Grammy Award in 1994 for his pioneering work. Soundstream sold about sixteen of the systems priced at \$160,000.⁴ Stockham predicted pocket-sized hour-long digital discs sampled at 42.5 kHz. In fact, technology with similar capabilities had already been invented by James T. Russell (b. 1931). In 1966, Battelle (the company Russell worked for) filed the first of a series of twenty-five patents for his optical digital recording and playback system that recorded bits of light and dark, one micron in diameter that could be read by a laser. Russell built a prototype in 1973 and demonstrated it to “potential licensees, including Sony and Philips.”⁵ In 1979 “Sony and Philips began joint development of a digital audio disc.”⁶ Russell earned nothing from his invention and Battelle made little

more than \$1 million from the patents. This was the fundamental technology that Sony and Philips licensed to create the CD and DVD.⁷ Although Stockham's prediction was slightly off in its physical size, capacity, and sampling rate, by 1982, the seventy-four-minute CD, sampled at 44.1 kHz/16 bit, debuted from Sony/Philips.⁸

Hip Hop

Hip hop emerged in early seventies South Bronx as a live, albeit electronic and mechanical, musical montage artform but its origins can be traced back much further. The roots of its rap element may extend back to the storytellers, historians, and musicians known as the griots in West Africa, and there is a long and deep oral tradition in the African American community. Certainly there is a direct connection to Jamaican DJ, sound system, and toasting culture. The development of hip hop as a musical form required many elements, contributions, and influences to meld, including the conceptual and technical skills of turntablism as well as beatboxing and oral, lyrical, and melodic components. Probably a factor in its abiding longevity is that hip hop music expanded into a larger multicultural phenomenon encompassing not only DJing and rapping but also graffiti art, breaking (breakdancing), and fashion. It quickly spread across the globe, being adopted by, and adapted to, local culture and conditions. It may be the most enduring and widely influential American musical and cultural form to develop since rock and roll in the fifties and jazz before that.

A young Jamaican immigrant to the Bronx by the name of Clive Campbell, using the tag Kool Herc, introduced large Jamaican-style sound systems. In the context of what would become hip hop, Herc came up with the concept and practice of extending and combining the best parts of various recordings. This is the now familiar technique of spinning the same section consecutively using two copies of a record on separate turntables, or juxtaposing breaks from different records. Influenced by Herc, George Saddyler (aka Grandmaster Flash) began methodically experimenting and perfecting his DJing techniques, coming up with punch phasing, where he would play one break over another. Despite the acknowledged influence, it bothered Flash that Kool Herc would cut between discs at different tempos. Just prior to this, downtown disco DJs had been developing turntable and mix techniques that could hype up a dance floor and keep the momentum going. Flash had seen, disco DJ, Pete DJ Jones at block parties in the Bronx. Jones matched tempos, keeping the beat going from one cut to the next, which was better for dancers, so Flash combined the best of Jones's and Herc's styles.⁹

The turntable technique most associated with early hip hop was introduced by Flash's protégé, Theodore Livingston, known as Grand Wizard Theodore. Theodore started scratching, utilizing the sound of the backspin as a rhythmic element in his performance. (The backspin is the sound DJs hear in their headphones as they spin back to the cuepoint.) The spinning and mixing of vinyl discs, or

turntablism, as it became known, was the foundational element of hip hop music. Rap techniques evolved from verbal interjections by the DJs. Before the full-fledged MC role existed, Herc and other DJs would ramp up the excitement “with short phrases like ‘To the beat y’all’ or ‘Ya rock and ya *don’t* stop’.”¹⁰ Herc soaked these retorts in echo, reminiscent of the Jamaican toasters.

Because it was based on collage techniques using existing recordings from many genres, hip hop developed for more than half a decade before being recorded commercially. The early proponents were not connected with the existing recording industry and, aside from the legal issues, there was no clear path to selling a record made up of fragments of other records. There were other releases, but the first hip hop record to reach a wide audience was “Rapper’s Delight,” by the Sugar Hill Gang, which was issued in 1979. Nobody associated with the record was part of the core group of hip hop innovators although the musical elements and rap rhymes were drawn directly from the well-established Bronx scene. The hit put hip hop’s originators on notice and, although it took some time, Grandmaster Flash scored a worldwide and definitive hit with “The Message” in 1982. The same year, Afrika Bambaataa exercised his eclectic DJing sensibility on his hit, “Planet Rock,” which incorporated European electronic ingredients and a drum machine. Kool Herc never established himself as a recording artist.¹¹

Digital instruments including sequencers, drum machines, and sampling technology developed concurrently with hip hop and were permeating other styles of music. The analog cut and paste collage techniques that required considerable turntable skills to perform live, formed the basis for future hip hop tracks and many other genres. However, in the studio, digital drum machines and sampling devices gradually substituted for most of the DJ or turntablist techniques. Nonetheless, the DJ’s conceptual skills, including identifying beats, looping them, and adding elements to build an exciting rhythmic and melodic collage, as well as understanding the audience’s needs, metamorphosed into the hip hop producer role.¹²

The State of the Eighties

By the end of the seventies, six major labels dominated the recording industry: CBS, Warner, PolyGram, RCA, EMI, and MCA. However, all was not well: economies around the world were struggling. Recently available domestic VCRs were competing with recorded music for entertainment dollars, as was cable TV, and record sales were declining. A 1980 study released by CBS blamed home taping of records (onto blank Philips compact cassettes) for the loss of hundreds of millions of dollars in record sales. The RIAA launched the “Home Taping is Killing Music” campaign in an effort to instigate a blank tape levy. The United States and UK, along with much of the economically developed world, would experience severe recession in the early eighties. Nevertheless, a number of innovations that would change the industry’s fortunes were gestating. Three of these were the introduction of the Sony

Walkman in mid-1979, MTV in 1981, and the Compact Disc in 1982. As had transpired before and would again, technology that was blamed for a crisis would ultimately restore growth.

The Sound of the Eighties

Founded in 1969, Solid State Logic, Ltd. (SSL), introduced the SL 4000 B integrated studio computer system with an inline audio console in 1977. The B series featured VCA-based automation and an inline dynamics section along with parametric EQ on every channel. The ergonomics of this innovative new console was unparalleled. Using gates, compressors, and surgical EQ became fast and intuitive for engineers and producers. Along with the user-friendly automation, mixes began to be highly processed with any extraneous noise being gated out or muted. The SSL E series console debuted in 1980 with significant upgrades. The addition of “Total Recall” in 1981 enabled all console settings to be stored at any point in a session, saving setup time and allowing faster and easier changes to previously saved mixes. A new and (for a short time) amusing feature that the SSL computer introduced to studio life, was the stream of Monty Python-esque invective that it would unleash on-screen at engineers and producers who made keyboard entry errors. Long days and nights make humor a valued component of studio life and SSL also marked some master monitor-controls from 0-11 (instead of 0-10), referencing the famous comment in the 1984 movie, *This Is Spinal Tap*. The capabilities and signal path of the SSL console left its distinct imprint on the sound of eighties’ recordings, even influencing some made on other boards.

Hugh Padgham was setting up to record Phil Collins’s drums on the track “Intruder” for Peter Gabriel’s third solo album. They were in studio two at Virgin Records’ Townhouse Studios in West London with Collins’s drums set up in the very live-sounding, stone room. The control room had the new SSL console fitted with a reverse talkback chain, which was heavily compressed. Collins played his drums while the reverse talkback was on and Padgham, recognizing the uniqueness and power of the sound, brought it to the attention of producer Steve Lillywhite. Overnight, techs rewired the patchbay so Padgham could record the sound, and the Phil Collins compressed and gated drum sound—that launched a thousand samples—was born.¹³

Spandau Ballet released their first single, “To Cut a Long Story Short.” It was a top-five hit in the UK and many other parts of the world, marking the commercial introduction of the “New Romantic” movement that was influential on the sound of early eighties recordings.

Steely Dan’s paean to perfection *Gaucho* was released in 1980. Recorded over a two-year period, the album featured Roger Nichols’s digital drum replacement system that he called Wendell. Wendell, Wendell II, and Wendell Jr. changed the way many records were made and sounded. Even with Wendell, drum replacement was

often a painstaking process of dealing with mistriggers and timing issues. The situation would not improve much until DAWs reached sufficient levels of sophistication. Nichols, like Tom Dowd, was a nuclear physicist and he also founded Digital Atomics “that developed the rubidium nuclear clock, which helped synchronize digital recording equipment, and the vacuum desiccation system for tape restoration.”¹⁴ 1980 was also the year that Neve produced their DSP digital audio console.¹⁵

The Look of the Eighties

MTV changed the promotion and marketing of popular music in America when it launched in August of 1981—at first airing music videos all day, every day. In the United States, this caused a shift of corporate power and influence: one channel now reached a nationwide music market at the speed of light, and with visuals. It was not long before the many intermediaries of radio were being influenced by one gatekeeper—MTV. It often took months for airplay to spread to radio stations all over the country, but a few plays on MTV had kids buzzing in every state of the union by the next morning. In addition, MTV immediately shifted the creative emphasis of popular music. In order to take advantage of this new medium and its nationwide access, artists needed to make visually creative videos with a look that appealed to the MTV audience. As the first video played on the channel said: “Video Killed the Radio Star” and the lyric clearly states “we can’t rewind we’ve gone too far.”¹⁶ However, the industry as a whole did not immediately grasp the magnitude of change that MTV signified. Almost from the inception of MTV, my band, Landscape, had a video entitled “Norman Bates” on rotation. I was living in London at the time and I flew in to meet with our label, RCA Records in New York City, to urge them to release and promote the single. The label’s response was, “MTV doesn’t mean anything—it only has a couple of million subscribers.”¹⁷ (Penetration was already more than 2 million homes and rising fast.)¹⁸ What they did not appear to understand was that kids in those homes (at that time) were watching the channel every available moment. I moved to Manhattan shortly after that and for the first two years, MTV was what the name implies: Nonstop music videos.

Later in the decade, MTV launched in the UK, then all over Europe, gradually spreading out to most of the world. MTV’s power to create a hit soon became apparent. This caused a frenzy at the labels and, once again—as they had with radio (based on promotional value)—the labels initially gave away the opportunity to earn money for themselves and the artists from every play. Eventually MTV agreed to “pay a blanket licensing fee to the labels for use of their videos.” As artist royalty auditor Perry Resnick said, “since it is not ‘attributable’ to specific videos, the labels do not share this income with artists.” Resnick went on to say that it is, “rare, but not unheard of . . . [to] be able to obtain a share of MTV income for a few ‘superstar’ artists during royalty audits, depending upon the language in their contracts.”¹⁹

PPL (Phonographic Performance Limited) and VPL (Video Performance Limited) in the UK, which are owned by some of the major labels, collect performance income from users of sound recordings, such as broadcasters, pubs, and retail shops. Artists and producers have been able to secure payments from PPL, but to date, VPL is only distributed to sound recording copyright owners, which are generally labels. Labels will share VPL income with artists if their contractual language supports it, but even then it's often a fight. I have seen it paid out routinely, but once again, it is rare. VPL payments to artists are usually secured on audit, and then only if the contractual language strongly supports it.²⁰

MTV was able to build what became a global empire using content initially financed by the record labels but ultimately paid for by the artists who, depending on the terms of their contract, would find all or some of the cost of their videos recouped from royalties on record sales and/or income from the use and sale of the video. These charge-backs are not trivial adjustments to royalty income for artists and can affect producer payments. There would be pressure for the producer to stay within budget. When he or she delivered a track that the label considered had the potential to become a hit, the record company would authorize a video budget—for one song—that could be several times the recording budget for the entire album.

MTV changed the types of artists that labels signed; appearance and physical performance characteristics becoming more important than ever. Additionally, the cost of making and promoting a video increased to the point that small independents needed to be extremely creative to compete with major labels. Fortunately, some were. It is notable that music publishers were once again able to establish an income stream as they had with radio.

Many artists such as Duran Duran, Culture Club, Spandau Ballet, Adam Ant, and other groups regarded as part of the New Romantic movement (sometimes called the second British invasion) may not have enjoyed success in the United States without the national coverage and visual component of MTV. Nonetheless, the major label's inability to grasp long-term implications of new media echoed how they dealt with radio sixty years earlier and presaged their lack of foresight that would occur two decades on with digital delivery.

"Glam metal," sometimes known as "hair metal," evolved by the latter half of the eighties and for a time became the predominant form of commercial rock music. A period that was referred to by some as "corporate rock" lasted until the end of the eighties.

Shiny Silver Discs

Immediately prior to the introduction of the CD in 1982, prerecorded cassette tape sales surpassed those of LPs.²¹ Then, in November, the first digital audio,

twelve-centimeter Compact Discs (CDs) and players shipped in Japan. Sony and Philips had combined their technologies and the Philips' launch came in 1983. Nyquist had developed his sampling theorem in 1929, and it took many more theoretical, electronic, optical, and mechanical developments to bring digital optical technology to commercial fruition. The shiny silver discs were initially more expensive than LPs or cassettes and the players cost many hundreds of dollars; there was resistance from retailers (CDs did not easily fit into vinyl bins) and consumer uptake was slow at first. Regardless, by 1985, consumers had purchased millions of CD players and disc manufacturers could not meet demand. Growth became exponential. According to Philips,

... some 390 million CDs were sold worldwide in 1988, 56 percent more than the year before, the growth rate in the Netherlands was more than 100 percent. Research showed that CD player owners purchased 16 CDs in the first year of ownership, and around 9 or 10 discs in the following years. By 1989 CD sales had reached a share of 80 percent of the total audio carriers market, while that of LPs had declined to only 12 percent.²²

There were technical problems in the beginning. Marketing initially cast CDs as being virtually indestructible. Consumers soon discovered that a thumbprint or scratch could cause them to skip or stutter on early CD players. Some of the first CDs manufactured were mastered at a low level (not taking advantage of the full sixteen-bit dynamic range). Labels often used second- or third-generation production masters, thus transferring not only the original but also generational tape noise and audio degradation to the CD. Once producers, engineers, and artists understood these problems, they brought pressure to bear on the labels to remaster for digital, and to improve transfer protocols.

The frequency response of a CD is flat within ± 0.5 dB from 5 Hz to 20 kHz, with a signal-to-noise ratio of better than 90 dB. LP mastering had always been a compromise; the low end often needed to be shelved in order to keep track width manageable. The high end (particularly sibilance) would not always cut cleanly onto the master lacquer and the vinyl pressing process could exacerbate the problem. For producers and engineers who embraced digital mastering early on, the transfer to CD was, at least in theory, more transparent. With a well-mastered CD, it is possible to listen to others' recordings on a high-end system (such as in a professional studio) and hear something closer to the producer's intended result than you might on analog consumer formats. There are many variables in vinyl playback systems, such as wow, flutter, the type and quality of stylus, tracking arm weight, resonance and distortion, vibration, rumble, and the accuracy of the equalization curve. Different pressings can sound different, especially ones from other countries. Cassettes did not improve matters; they were sonically inferior to LPs in many ways. Simply the inconsistencies from machine to machine, and from one make of cassette to another, marked them as an unreliable professional audio source—despite their portability and convenience for casual listening.

Singles

An unfortunate consequence of the introduction of the CD was the eventual elimination of the single. From the beginning of the recording industry until Columbia's introduction of the microgroove LP in 1948, consumers could buy a single piece of music (with a B-side, once double-sided flat discs were introduced). RCA came up with the seven-inch, 45 rpm vinyl single in 1949 as a counter to Columbia's LP. The vinyl single eventually replaced 78s and the LP replaced the book-like collections of 78s known as albums (hence the application of that term to LPs, full-length cassettes, and CDs). For more than a century, there had been a cost-effective means of making single tracks (with a B-side) available. Cassingles (cassette singles) requiring less tape and using minimal packaging were attractive to consumers because of the low price (often the same as seven-inch vinyl). These typically comprised the one "radio" track and bonus B-side(s). Unfortunately, standard, 120 mm, CDs cost the same to manufacture, whether they contain seventy-six minutes or three minutes of music. Labels experimented with small diameter and creatively shaped CDs but these required an adaptor to play in any slot-fed CD players (as in most cars and some computers).

The larger companies appeared to favor the elimination of the single. Consumers would have to buy the whole album to get the one or two tracks they liked. Full albums generated more revenue for the label. No more singles meant no more "singles with options deals" and diminished the opportunity to test artists in the marketplace at a reasonable cost. Eliminating the single was not completely irrational. If a single becomes a radio hit too far in advance of the album being made available for purchase, marketing impetus is lost along with revenues. On the other hand, the financial risk is much lower with a new artist on a singles deal and the viability of a project can be tested more cost effectively. Singles gave consumers the track they wanted and there was more incentive to fill the album with meaningful tracks rather than fillers (more of which later).

Napster ultimately diminished major label control of the market by making almost any music you could think of available instantly and for free. The peer-to-peer system created the largest library of music ever, made singles available again, and for the first time allowed users to download individual tracks from any album. iTunes has never achieved the magnitude of Napster's peer-to-peer library. Nevertheless, it did restore a critical revenue stream and continued to deliver not only singles but also individual album track downloads, unless they are blocked by the label or artist.

Mixing

Mixing usually refers to a mix comprising mostly material recorded during the original production usually for a single or inclusion on an album. Mixers do

sometimes add and change material and this has become more common recently. Remixes often change much of the material and nature of the original production, more of which later. Specialist mixers began to emerge in the early to mid-eighties. Mixing had become a post-production process with the introduction of multi-track machines but was still regarded as being part of the producer and/or recording engineer's job description. Before multitrack recording, and even during the interim sound-on-sound period, mixing or balancing still needed to be done but it was done live during the recording. Even prior to electric recording, early acoustic recorders, producers, or musical directors made the decisions about placement of the performers relative to the recording horns that affected final recorded balance, tone, ambience, and so forth. Despite the term "balancing" or "balance engineer" that was often used through the sixties, mixing as both a pre- and post-production process has typically involved more than simply balancing the musical elements. Relative balance of instruments and vocals may be the most critical aspect, but stereo (since the fifties) and front/back placement, refinement of sounds relative to each other by means of equalization, augmentation with effects, and dynamic control are also important parts of a mix. Additionally, in recent years surround sound mixing has become more prevalent. Mixing and remixing are related but different processes that require specialist skills and are arguably separate art forms.

Dance Music

It is impossible to say when humans began dancing because of its ephemeral nature, but there is written and archeological evidence that people have danced for many thousands of years. Dance takes countless forms and serves divers purposes in society but humans as a species seem to like dancing, and music and dance are inextricably intertwined. Looking back over just the past century the boom in swing music in the thirties was due to its popularity as dance music but the music was mostly performed live for public dancing. Aside from at private parties or at small venues with jukeboxes, recorded music was not used for dancing at large gatherings until amplifiers and speaker systems reached a certain level of maturation. As portrayed in the (poorly rated) movie of the same name, a group of middleclass German youth, commonly termed "Swing Kids" (or "Swing Youth"), would gather to dance to recorded swing music. This was 1939 Nazi Germany and the group was strongly opposed by the regime.²³ During World War II in occupied Paris, groups allegedly danced to jukeboxes or records at clubs called discotheques and in 1942, one such club opened under the name La Discotheque.²⁴

Going back before the twentieth century, public listening booths at fairs and resorts had been a factor in the spread of recorded music. As mentioned in chapter 1, Louis T. Glass and William S. Arnold were issued two American patents (No. 428,750, -1) for a "Coin Actuated Attachment for Phonographs" (cylinders and discs) in 1890. They installed their first "Nickel-in-the-Slot," coin-operated, Edison Class M

Electric Phonograph that year in the Palais Royale Saloon, San Francisco. Neither electric reproduction nor amplification existed at that time, but four listening tubes enabled patrons to hear recordings of their choice. This predecessor to the jukebox was an immediate success.²⁵ The term jukebox comes from the southern juke joints of the twenties and thirties that featured jazz and blues musicians and were considered by many to be seedy places. Among many possible etymologies, the word “juke” is thought by some to have been brought by slaves from Africa and, like the terms jazz and rock and roll, may have had sexual or “sinful” connotations. After the introduction of electric recording and playback technology, jukeboxes became increasingly popular. From 12,000 units installed in taverns and diners in 1927, the number mushroomed to more than 300,000 by 1939 and they needed to be loaded with about 30 million 78s per year.²⁶ In some juke joints, jukeboxes began to replace musicians.

Jukeboxes along with American radio proved to be important in exposing Jamaicans to American R&B. The first of the mobile discotheques known as “sound systems” began in the forties, and were run by men with extraordinary pseudonyms such as Tom the Great Sebastian. The “sounds” (as they were called) played in enclosed areas (known as “lawns”) attached to Kingston rum shops, in a district that became known as “Beat Street.” Many Jamaicans of the time could not afford to buy records and players, so these events satisfied a need for music and dance, serving a social purpose and generating revenue from food and drink sales. As outlined in greater detail in chapter 18, these dance clubs that played recorded music for large crowds on powerful systems began to change the music. The DJs or “selectors” would curate the material for maximum effect on the dancers. Sonically, the systems emphasized bass frequencies and extreme high-end sounds. DJs began superimposing live spoken word improvisations over the records, which was known as “toasting.” When the supply of R&B records from the United States began to dwindle with the advent of rock and roll, Jamaican producers began making their own recordings specifically with the “sounds” and their audiences in mind. This ultimately led to “versions” and “dub.” The needs of the audience, intuited and directed by DJs and selectors, transformed the nature of the recorded music, influencing production in a recursive process.

After World War II in 1947 and around the same time that sound systems were starting up in Jamaica, Paul Pacine opened Whisky à Gogo in Paris where they played only jazz records.²⁷ In the fifties, radio DJs began playing records live at “sock hops” in high school gymnasiums. Amateur DJ Bob Casey began running and playing records at these kinds of dances using a double turntable built in 1955 by his father.²⁸ By this time, DJs were spinning records in clubs that could not be heard on the radio. This would begin to influence future productions in music centers such as London and New York. DJ Terry Noel at Arthur (the New York club Sybil Burton opened in 1965) is said to be the first DJ to mix elements of one record with those of another. The club became a celebrity hangout and producers would bring Noel test pressings of their new productions.²⁹ By this time, spinning records had become an art form in itself and, through interactions—in numerous clubs—between DJ

innovations and audience approval, new styles of music were evolving. Club-based techniques fed back into the studio. From the late sixties through the early seventies we can see the evolution of dub mixes in Jamaica, disco in Manhattan, and hip hop in the South Bronx that all eventually connected the needs of the DJ and dance club audiences directly back to recordings that producers would create.

All styles of music die or dissipate and over-commercialization is a common cause. A trend develops, artists, labels, producers, and the media identify it, and overwhelm the market with copycat productions. Disco undoubtedly suffered from this problem, but despite its detractors, rumors of its death were greatly exaggerated. Its beats permeated the New Romantic and futurist club sounds. It further embraced electronics, computers, and sampling, changing perceptions of musicianship and production values as it morphed into the many strains of electronic dance music. People like to dance.

In the late seventies, my group, Landscape, wrote a song called “New Religion”³⁰ that became the theme tune for BBC Radio 1’s weekly chart countdown in the early eighties. The title was a reference to the almost religious fervor surrounding dance clubs of that period. We also assigned the catalog number EDM 1 to our 1980 single release, “European Man,” and inscribed on the back of the sleeve, “Electronic Dance Music . . . [sic] EDM; computer programmed to perfection for your listening pleasure” (Figures 11.1 and 11.2).³¹ That track and album,



FIGURE 11.1 EDM1: label of “European Man” RCA single by Landscape.

Credit: Richard James Burgess collection.



FIGURE 11.2 Back cover of EDM1: “European Man,” RCA single by Landscape.

Credit: Richard James Burgess collection.

written and recorded in 1978/79 were probably the first commercial records made largely with a computer. Having played on many dance tracks as a studio drummer in the seventies it was obvious that computers would play a big part in the future of dance music. At the time of writing in 2013, EDM underpins many pop hits in addition to being a predominant genre itself. Even though he is usually categorized as a producer of Eurodisco and did not use the term EDM, Giorgio Moroder could be thought of as an early exponent of this music. His recordings were made prior to readily programmable drum machines but he made prominent use of sequencers and four-to-the-bar bass drum beats. Other precursor groups include Kraftwerk and Yellow Magic Orchestra.

With disco gone from the mainstream, at least in name, new styles of dance music developed out of clubs from the late seventies through the mid-eighties, including hi nrg, house, garage, techno, jungle, and many subgenres. House music was named after the Warehouse in Chicago, and garage after the Paradise Garage in New York. With DJs Frankie Knuckles and Larry Levan, respectively, both clubs had strong roots in disco; other influences included R&B and English synth-pop. I was fortunate enough to produce Colonel Abrams’s hits, including his 1985 number-one dance track “Trapped,” which has been referred to as precursor to garage³² and a proto-house track.³³ Then, in 1986, I worked on a production with Chicago’s Jesse Saunders who many consider an originator of house music.³⁴ The

club and twelve-inch remix scene was very dynamic at the time with many producers, remixers, and DJs moving between Europe and the United States, experiencing, absorbing and cross-fertilizing. The eighties was a time of explosive growth in specialist dance production and remixing for clubs. This work was ideally suited for producers, remixers, and DJs who were working in small MIDI-based project studios. They quickly embraced inexpensive digital equipment as it came to market and, ultimately, the DAW.

Remixes

Toward the end of the seventies, twelve-inch mixes and remixes for dance clubs became a necessity for artists and producers who made dance-oriented music and who recognized the opportunities clubs offered. Often labels had to be persuaded. The New Romantic movement emerged out of a club scene. For Spandau Ballet, I did remixes for every B-side, multiple versions for each twelve-inch and then a complete box set of new twelve-inch mixes for every track on their first album.

Disco had opened up a market for longer mixes of hit tracks. DJs were extending tracks using two turntables and sometimes editing tape. Then there were the longstanding precedents, such as the pioneering sixties and seventies work of King Tubby and Lee Scratch Perry in dub reggae. Tubby and Perry were not working with high technology at their studios in Jamaica and the trick-bag was light for producers and mixers even as the eighties began. We were mostly restricted to repeat echo, reverb, overdubs, mixing breakdown pieces, and tape editing. Often there was spill between instruments (having been recorded together without much isolation), which made breakdowns and cuts difficult. On tracks cut without reference to a click, tempos often fluctuated, making editing of pieces from the front of the track with others from the middle and end impossible. Since we were working on twenty-four-track analog tape, there were rarely any spare tracks for overdubbing new parts. Drum machine and sequencer synchronization had to be planned from the inception of recording a track and MIDI was not available until 1983. Nonetheless, this was the time when remixers, working on a safety copy of the analog multitrack, began stripping tracks back to the vocal and replacing everything else for highly specialized dance mixes. With DAWs offering unlimited tracks, nondestructive editing, and being able to change tempos without affecting pitch, remixing today is often more like a complete re-production of a track.

Further Eighties Developments

Neve, in 1985, unveiled their V series console—named partly for one of the designers: Greg Pope—V, allegedly, standing for Vatican.³⁵ Dolby introduced

SR (spectral recording) in 1986, which improved analog's signal-to-noise performance as digital recording was beginning to take hold, but SR was expensive to buy or rent and labels were often not willing to add extra costs to production budgets.³⁶ Digital Audio Tape (DAT) was introduced in 1987 for the studio market. It quickly became standard equipment in professional recording studios, and was mostly used as a simultaneously recorded backup to other professional digital or analog master two-track formats. DAT machines use the helical scan system that writes data diagonally across the tape via a rotating drum tilted at an angle from the vertical.³⁷ DAT did not capture the consumer market for a number of reasons. Firstly, the machines were expensive relative to other consumer recording machines. Secondly, there was little societal uptake—for instance, car manufacturers did not begin installing them. Thirdly, the hardware companies became embroiled in a long-running dispute with the major record labels over the labels' concerns that machines that could make perfect digital copies would exacerbate piracy. Eventually, manufacturers agreed to incorporate Serial Copy Management System (SCMS) chips in consumer machines that prevented serial copying, but there was never widespread uptake in the consumer market.³⁸ DAT was an important step for home and project studios in offering a relatively inexpensive (for producers and studios) high-quality master two-track format. The professional formats of the time included quarter-inch and half-inch analog machines and professional digital two-tracks such as the Sony PCM 1630 system, Mitsubishi X-80, and the Sony Dash machines, which were out of reach of all but the most successful producers and studios.

In addition to recorded music, data was also stored on various kinds of analog tape. For example, the Roland MC-8 Microcomposer and the Jupiter 8 synthesizer used Philips compact cassette tapes for backup. The process was time-consuming, taking up to forty minutes to back up a three-minute song from the MC-8, and the same again for verification; reliability was less than desirable. Floppy disk was a better format for data storage and the disks and readers quickly shrank in size while growing in capacity. Eight-inch disks with 100 KB capacities were replaced by 5.25-inch disks with the same capacity, eventually expanding to as much as 1.2 MB. Then, 3.5-inch disks came to market initially holding 400 KB of data and later as much as 1.4 MB. Users of the SSL 4000 series consoles needed their data to be portable or at least removable, and in 1982 Iomega offered a significant boost to disk capacity in their Alpha-10 Bernoulli drive. It used the "Bernoulli effect" to pull the Alpha-10's flexible disk up to the read-write heads, where a cushion of air prevented the magnetic storage platter from hitting the heads. Physically large by today's standards, the eight-inch diameter, 10 MB removable disks helped producers and engineers store and transport digital mix and console data.³⁹ However, Bernoulli drives and discs were priced at professional levels. Less expensive removable storage systems for everyday use in storing computer data and those being used by musicians and producers for music files and samples were regularly outpaced by file sizes and the need to store many files.

It was no surprise when, in 1988, Sony and Philips published the “Orange Book” standard for Compact Disc Recordable (CD-R) computer discs that would use the same laser technology as the audio CD. Taiyo Yuden jointly developed and manufactured the CD-R and it stored music that could be played back directly from the disc. Availability was initially limited, but broadcast and recording studios embraced them as reference discs. Sony unveiled their CDW-900E professional CD player/recorder, for which the 650 MB, seventy-four-minute CDQ-74 disc cost \$29.99. With discs at these prices and recorders costing many thousands of dollars, consumer piracy was of little concern. However, CD-ROM drives would be introduced to the computer market in 1992, changing usage of discs from mainly audio to data applications. This rapidly expanded the market, attracting more manufacturers and resulting in lower prices.⁴⁰ Standalone music CD burners would only burn to the more expensive blank “music CD-Rs,” which contained a Disc Application Flag. However, computer CD-R drives could burn to any CD-R blanks. With prices plummeting for blanks and CD-R burners becoming standard equipment in computers, consumers and the music industry were about to step into a world of inexpensive and perfect digital copies. In some markets, such as Germany (in the nineties), CD-Rs were blamed for significant loss of recorded music sales. More importantly, this confluence of audio and data uses signified the inevitable overthrow of music industry controls by the ongoing computer revolution.

Mergers and Acquisitions

By the end of the eighties, the six major labels controlling the music industry were Sony, Warner, PolyGram, BMG, EMI, and MCA, but this does not tell the whole story. The eighties are noted for the uptick of mergers and acquisitions. The recording industry was no exception to this trend and in 1987 Sony had purchased CBS Records for \$2 billion. A year later, MCA acquired a sadly diminished Motown for \$61 million, but as the six members of the oligopoly gobbled up larger indies, they too were trending towards ownership by large non-music-based corporations. This exacerbated the relentless drive for quarterly growth. From my anecdotal observation (as a producer and a manager at this time), the increased push for quarterly gains diminished the already short period allowed for the growth and development of new artists. In turn, this increased the pressure on producers to deliver hits from the first release—sometimes putting them at odds with the artistic intentions of the act. Unless they had other means of promoting themselves, through, say, touring or licensing, artists that did not chart risked being dropped from the label, shortly after the first single was sent to radio. An unpromoted album represents a black hole in a producer’s discography, several months out of his or her life, and zero royalty income.

The Internet and the World Wide Web

In 1969 the Department of Defense had commissioned ARPANET to promote networking research. The first hosts of the ARPANET connected Stanford Research Institute, UCLA, UC Santa Barbara, and the University of Utah, and the CompuServe time-sharing service began. Over the next four years, ARPANET allowed scientists to remotely access computers, collaborate and share data, and the use of email grew quickly.⁴¹ By 1979, the first Usenet newsgroups were popping up and people all over the world began discussing thousands of subjects electronically. CompuServe became the first email service for personal computer users.

In 1982 the term “Internet” was coined and within five years, there were more than 10,000 hosts, growing to 300,000 by 1990 at which time the ARPANET disappeared.⁴²

The Nineties

The Corporate State

The beginning of the nineties saw the United States and much of the world in recession again. Corporate consolidation continued in 1990, with MCA being bought by Matsushita for \$6.5 billion and Time, Inc., and Warner Communications, Inc., merging on January 10, 1990 to form Time Warner, Inc.¹ By 1994, six multinational corporations (with many divisions and products not directly related to the production of music content) controlled almost the entire market share for the global distribution of recordings. These firms were Time/Warner, Sony/CBS, Thorn/EMI, Philips-Polygram/PMG, Bertelsmann Music Group/BMG, and Matsushita/MCA. These entities controlled distribution, a fact that created a significant barrier to entry into the recording industry for smaller players.² Then, late in 1998, Seagram purchased Polygram from Philips and merged it with their Universal Music. The merger resulted in the largest reorganization in the history of the recording industry. Many iconic labels were conflated or closed, hundreds of artists dropped, and thousands of employees lost their jobs.³ Fewer labels and fewer artists meant less work for producers.

The Charts and SoundScan

In 1958, *Billboard* instigated the Hot 100 chart by compiling a list of records that received the most airplay and sales. Prior to 1991, when *Billboard* began using BDS (Broadcast Data System—for airplay) and SoundScan (for sales data), labels had a great deal of flexibility with sales they reported. There were many ways, particularly with large major label marketing and promotion budgets, to influence sales and airplay numbers. Upon implementation, BDS and SoundScan counted the numbers more accurately. Consequently, some genres, such as country and hip hop, charted much higher than they previously had while others reported significantly lower. Garth Brooks rocketed into the top-ten and NWA hit the number-one slot, when neither had entered the top-thirty before.⁴ Predictably, the change agents of one generation become the establishment in the next. At the time of writing, SoundScan favors larger, and financially better-off, entities. Newcomers, such as

Ultimate Chart, may be more representative of the music that consumers are listening to and buying.

Charts, of course, are not passive reflections of the market. Rather, they are recursive feedback mechanisms that influence sales and listening behavior. Once new systems become established the wealthier labels become very good at manipulating them. A healthy and diverse recording industry is a competitive one in which it is more difficult for individual companies to post consistent quarterly profits and growth, something that is necessary for large corporations. Instead of manipulating numbers and conditions in order to produce predictable results, research reflecting a complete picture of sales and use would be valuable for creators, consumers, and, consequently, the industry as a whole. Given the natural availability of metrics for online services, computerized inventory accounting in retail stores, and digital airplay programming at radio stations, every sale and use of a recording could be tracked and reported.

Alternative Rock

The emergence of Seattle-based Grunge in 1991 with the success of Nirvana spelled the end of the eighties hair bands and “corporate rock.” Thus began an era of alternative rock as pop music, coinciding with the growth across the United States of the network of alternative rock radio stations. Alternative rock, or indie rock, had been dependent on a small handful of stations such as WLIR (Long Island), WFNX (Boston), and KROQ (Los Angeles) in the early 1980s. By the mid-nineties, the network of alternative stations reporting their playlists and spins to Radio and Records, for the industry airplay charts, had mushroomed to more than one hundred. Most major markets had an alternative station but by the end of the decade, the format began to shrink.

The Telecommunications act signed into law in 1996 relaxed radio station ownership restrictions and within six years, although the number of stations had increased, the number of owners decreased by a third.⁵ Conglomerates bought and positioned groups of AM and FM stations up to their market limits, flipping some to formats such as talk and news based on research, demographics, and potential ROI (return on investment). For example, WHFS, a formative and important alternative station in the Washington, DC, area, changed to Spanish language radio and then talk and news. Local program directors no longer controlled their playlists and opportunities for regional developmental airplay for new artists diminished.

Toward Music Online

Tim Berners-Lee had submitted a proposal in 1989 to his management at The European Laboratory for Particle Physics (CERN) near Geneva, Switzerland. It

outlined technologies that would make the internet more useful. They did not accept the proposal at first but he persevered. By October of 1990, he had defined what we now know as the World Wide Web. The three fundamental technologies he outlined were HTML: HyperText Markup Language, URI: Uniform Resource Identifier, and HTTP: Hypertext Transfer Protocol, all of which remain in use today.⁶ Later that year, Berners-Lee wrote the first Web page editor/browser, the first Web server, and he served the first Web page.⁷

In 1991, commercial use of the Internet was first allowed and the internet service Gopher permitted point-and-click navigation. CERN released the World Wide Web software and President George H.W. Bush signed (then) Senator Gore's High Performance Computing Act (the information superhighway) into law. The first graphical Web browser, Mosaic, was developed at the National Center for Supercomputing Applications by a team led by Marc Andreessen. A Windows version of America Online was launched in 1993 and the service surpassed 500,000 subscribers.⁸ One year later Andreessen formed Netscape Communications Corp., with four of the five programmers who had worked on Mosaic with him and funding from Jim Clark (founder of Silicon Graphics, Inc.).⁹ By 1996, forty million people in 150 countries were using the internet and \$1 billion of ecommerce was conducted online. By 1998, there were more than four million web sites.¹⁰ This was the critical period during which the music industry missed the optimal window to begin online music distribution. The MP3 had been patented in Germany in 1989 and in the United States in 1996. MP3.com had launched in 1997, bandwidth was sufficient for users to exchange files, and Napster would not launch for another two years.

Progress with Digitized Data

In 1990, ISDN (Integrated Services Digital Network) lines became available and allowed for the transmission of audio over long distances. Producer Phil Ramone (1934–2013) recorded two albums, *Duets* and *Duets II*, for Frank Sinatra where artists performing with Sinatra recorded their parts over ISDN, in some cases from thousands of miles away. Ramone remarked that sound transmitted through ISDN had “excellent quality.” Five years later, The Winter Olympics in Japan opened with synchronized live audio feeds of a simultaneous performance from five continents using ISDN and satellite technology.¹¹ Sony introduced miniDisc machines in 1992 for prerecorded and rewriteable audio. The format did not become popular with professionals because of the built-in (lossy) ATRAC data compression codec designed to optimize space on the small disc. Waves Audio Ltd. was founded and introduced its first audio plug-in, the Q10 Paragraphic Equalizer, in 1992.¹² Yamaha unveiled their ProMix 01 in 1994. Automatable via MIDI, it synchronized with sequencing programs such as Cubase or Logic. It was the first inexpensive digital multitrack console.¹³

By 1995, music software programs often generated data exceeding the capacity and transfer speeds of floppy disks. CD-Rs had large capacity but were WORM (write once read many times) devices and the rewriteable versions were not as popular or convenient and they cost more. The introduction of Iomega's inexpensive 100 Mb Zip drives that would write data to removable rewritable hard-disk media proved to be a popular, if interim solution.¹⁴

Enhanced CDs (E-CDs), described in the 1995 Blue Book supplement to the 1988 Orange Book went by names such as CD-Extra, CD-Plus, stamped multisession, or Blue Book format. Based on original Red Book specifications, they included audio CDs that had additional CD-ROM data such as video, text, games, and so forth. The format wrote data and audio in separate sessions so that audio CD players could only access the audio information. This prevented the harsh sound of data from causing speaker damage.¹⁵

In 1998 Cher released her best-selling dance single "Believe," which used a heavily processed vocal sound. The producers tried to conceal the source of the characteristic sound, telling *Sound On Sound* magazine, in early 1999, that they used a Digitech Vocal talker.¹⁶ Regardless, we soon came to identify that sound as an artifact of new software, the brainchild of Harold Hildebrand, known as Auto-Tune. Hildebrand created Auto-Tune by applying the same, nearly two-century old, mathematical process known as the Fourier Transform that he had used as an Exxon seismic engineer. The track's British producers Mark Taylor and Brian Rawling, by creatively featuring the device's audible side-effects,¹⁷ launched a sound that would haunt the pop charts for more than a decade. In addition to the stepped pitch sound, Hildebrand's Auto-Tune (from his company Antares Audio Technologies), is also capable of subtly correcting vocal and other single-line parts. Like many technological solutions, pitch correction allows producers to make decisions based on creative preference rather than being limited to technically perfect performances. Auto-Tune, along with later pitch correction software and hardware units from other companies, is used more widely than the general public realizes—including at live concerts.¹⁸

Digital Radio

On October 28, 1998, President Clinton signed the Digital Millennium Copyright Act assuring American artists and performers a royalty from the non-interactive streaming of sound recordings on digital radio. The bill provides a small share for singers and musicians but omitted producers, engineers, mixers, and remixers because none of the parties involved in the negotiations represented their interests.¹⁹ ASCAP, BMI, and SESAC are the PROs collecting income generated by the public performance of a song on behalf of songwriters and publishers. These PROs collect revenues from Digital streaming and airplay on terrestrial radio as well as many other sources of public performance—clubs, restaurants, etc. They

represent all entities that write and publish music, including lyricists, composers, songwriters, and publishers. SoundExchange was set up after the DMCA was signed into law to be the PRO that collects income generated by the public performance of the sound recording. It represents record labels, artists, musicians, and singers. Because of their omission from the statute, SoundExchange does not represent producers, engineers, mixers, and remixers despite their roles as co-creators of the sound recording. Producers can only receive their share of these monies with the express written permission from the artist to SoundExchange. For the purposes of royalties, the DMCA covers internet radio stations and satellite radio but the NAB (National Association of Broadcasters) successfully lobbied to exclude HD radio as served by terrestrial stations (FM and AM stations) and it does not include any AM or FM broadcasts. In 2013, the largest radio conglomerate—Clear Channel—began direct licensing deals with labels for terrestrial royalties. The terms of these deals are not public. Each label must negotiate with Clear Channel and it is up to the label whether they pay 50 percent of the income to artists before recoupment (as per the DMCA) or any percentage at all. Labels are being asked to reduce their royalty rate on digital royalties in order to receive a terrestrial performance royalty. Producers' only entitlement to their share of this revenue would be through a negotiated contract with the artist. Direct payment from the label to the producer would require a letter of direction from the artist to the label.

WorldSpace Corporation, brainchild of the enigmatic Noah Samara, developed satellite technology that became the technological basis for XM radio. Worldspace went on the air in 2000 with the aim of reaching Europe, Asia, the Middle East, and Africa. XM and, its competitor in the US market, Sirius Radio, began broadcasting in 2001 to North America. Worldspace ceased operations around 2009 for lack of financial resources. For similar reasons, and despite their fundamentally incompatible technologies, Sirius acquired XM radio in 2008 forming SiriusXM. Satellite radio is also called SDARS (Satellite Digital Audio Radio Service) described by the FCC as “satellites operating in the 2.3 GHz frequency band to provide continuous nationwide radio programming with compact disc quality sound.”²⁰ The FCC's assertion of “compact disc quality sound,” which is reinforced by the satellite companies' marketing claims, is inaccurate.²¹ CD quality sound covers the spectrum of human hearing with an approximately 96 dB signal-to-noise ratio; satellite radio cannot legitimately make that claim.

Despite the mischaracterization of its audio quality, satellite radio has been a positive innovation for music producers in providing coverage across the continental United States and many more channels of music. The wider range of music may broaden subscribers' listening habits. As outlined above, unlike US terrestrial radio, Sirius-XM pays performance royalties for sound recordings they play, in accordance with the DMCA. Unfortunately, American producers have to file a letter of direction (LOD)—signed by the artist—with SoundExchange, in order to receive performance royalties for their work. This is inconvenient at best, difficult for many

legacy productions, and results have been inconsistent. For all practical purposes, it is preferable to have the LOD signed at the same time as the production contract.

HDRadio is a term coined by iBiquity Digital Corporation that bills it as “the biggest revolution in radio since the advent of FM broadcasting more than fifty years ago.” Created in 2000 by merging two leading developers of AM and FM digital broadcasting, the format was previously called IBOC (In Band On Channel). Stations can add two or three digital audio channels to their main AM or FM channel without using any new spectrum.²² HD radio receivers debuted in 2004 but uptake has been slow. The term HD radio implies high definition and the capability does exist for superior broadcast quality but, depending on implementation, the quality of HD radio streams can fall far short of CD quality. This is unfortunate, especially at a time when many producers and engineers are recording masters at much higher sampling and bit rates than 44.1 kHz, sixteen-bit, CD-quality audio. Additionally, with the “always on” connections available via mobile phones, radio is being increasingly forced to compete with higher quality digital delivery via cellular, Wi-Fi, and wired devices.

Millennials

Blockbuster success in the music industry is dependent, to a great extent, on demographics. The worldwide pop boom of the mid- to late nineties coincided with the echo boomers, millennials, or Generation Y, becoming tweens. In mid-1996, the Spice Girls released “Wannabe” in the UK and six months later they released it in the United States where it spent twenty-three weeks in the Hot-100, peaking at number one. The Backstreet Boys released their first single in late 1995 and by mid-1997, like the Spice girls, they were a multiplatinum group. This was on the strength of sales to a primarily pre-teen generation—the eight- to twelve-year-olds—the babies of the generation that had fueled the sixties music industry boom. The trend continued with Britney Spears’s album debuting at number one in the United States in early 1999 and then Christina Aguilera’s followed much the same pattern later that year. Each of these acts sold many millions of albums worldwide.

Preparing the Way for Napster

Major labels had been moving toward the elimination of the single since the eighties. CD singles were expensive to produce and the labels’ profit margins were much wider if people bought the album. Getting rid of singles favored the “one or two good tracks and a lot of filler” syndrome that also helped till the soil for Napster. Then, surprisingly, and almost coincidental with the establishment of the free download service, the majors raised album list prices to around \$18 or \$19. This was in the midst of a pop revival period with groups such as the Backstreet Boys, Britney

Spears, and Christina Aguilera whose audiences were, by and large, younger and really wanted singles.²³

I managed a band signed to Island Defjam at that time and the label priced their second album at \$17.99. I happened to be in a Tower Records store one day checking on my band's stock when two, barely, teenage girls walked up to the racks and picked up my group's CD. As they headed for the checkout they suddenly stopped, commented on the price, turned around, and put the CD back in the rack. On several occasions, I debated the issue with the label, even producing a survey I had done at my sons' high school. The results clearly showed that kids were not willing to pay such high prices, but to no avail. Unfortunately, for the majors and for the industry, there was an alternative brewing and it proved to be hard to compete with free. It would be 2003 before industry outsider, Apple, launched the US iTunes store, reestablishing an inexpensive singles market, reasonably priced albums, and legal, revenue generating, convenient, digital delivery.

Toward the end of the nineties, the process of pre-release market testing became stricter. If the media opinion poll results were unfavorable, the label was likely to shelve an album without release. By this time, major labels increasingly looked for artists who were largely developed. A&R people wanted the validation of airplay and sales figures as well as email list and websites' visit numbers (social media was not established as a criterion yet) before they considered signing an act in which they had expressed creative interest. The "story" surrounding an artist has always been important to US major labels and it makes sense for businesses to minimize risk. Nonetheless, with radio consolidation making it harder for local artists to pick up airplay and digital outlets not fully established yet, the creative community was caught in somewhat of a Catch-22 situation. This was the corporatized environment in which disruptive change may have been inevitable, more of which in chapter 17.

Periods of Standards and Stability

Proprietary versus Open Systems

Proprietary systems are a winner-takes-all play. They boost the leading or winning corporation's profits but are rarely good for the industry and they build a technological fence around creative work and sets of consumers. Proprietary systems are predicated on everything needed being contained within the system, which is rarely the case. Early cylinder recording was widespread but the various, proprietary, cylinder machines were incompatible with each other and with competing flat-disc devices.

Digital recording disturbed a long period of compatible standards in recording studios. Three companies released disparate proprietary digital tape machines starting in the late seventies with 3M's thirty-two-track one-inch machine (1979; \$115,000), the Mitsubishi thirty-two-track X800 one-inch (1980; \$170,000), and the Sony 3324 half-inch machine (1983; \$150,000). This technological smorgasbord partitioned the (digital) studio industry and may have contributed to the limited adoption of digital tape formats. Although, the high capital cost of the machines for studios, and major label reluctance to incur additional recording expenses were also factors. There were myriad professional and semiprofessional mastering formats; all incompatible with each other. The Mitsubishi X-80 offered razor blade editing; the professional Sony 1610 and 1630s were enduring; Sony's PCM-F1 converter for Betamax machines was popular for a time; and DAT machines became ubiquitous in studios for more than a decade. Consequently, those of us who were active through that period now have archives full of masters from several obsolete systems.

Different makes and even different versions of DAW software, while incompatible in their higher functions, do offer a degree of compatibility in that audio can be exported and imported in uncompressed formats such as WAV or AIFF. Saved effects, EQs, plug-ins, and automation moves will generally be lost in moving from one software platform to another.

Standards

There have been periods of relative stability and standards in the recording industry, which benefited producers and consumers. Once the lawsuits were settled with

Victor, lateral cut flat discs proved to be a stable and largely compatible recording and consumer format from the twenties through the mid-forties. Being able to buy records from any company that would play on any player was good for consumers and good for the recording industry.

Quarter-inch mono magnetic tape quickly became, for at least a decade after its introduction in the late forties, the recording standard. Two-track machines maintained backwards compatibility with mono at the introduction of stereo on quarter-inch. Standard consumer formats at the time were the microgroove LP (twelve- and ten-inch), the seven-inch 45 rpm single, and there was a substantial period of overlap with 78 rpm discs, but record players maintained compatibility with all three speeds and both groove widths for many years.

From the early fifties, experimentation with multitrack formats made moving from studio to studio mid-project more difficult. There were one-, two-, three-, four-, five-, and eight-track machines circulating until eight tracks on one-inch tape became the norm in the late sixties. Almost immediately (it seemed), sixteen tracks on two-inch tape and, shortly after that, twenty-four tracks on two-inch, were introduced with widespread uptake. Some engineers and producers resisted twenty-four-track machines because the reduced track width decreased the signal-to-noise ratio and increased crosstalk between tracks. Track width had largely remained the same from stereo on quarter-inch, through four tracks on half-inch, eight tracks on one-inch and sixteen tracks on two-inch tape. Whereas, twenty-four tracks on two-inch tape represented a 33.3 percent decrease in track width, and the difference was audible.

Regardless, the creative flexibility of more tracks won the day and twenty-four-track machines became an almost universally compatible professional studio standard from the early seventies through the late nineties. Moving mid-project from one professional studio to another became easy and was common practice. I worked in eleven studios to complete one album in 1979. For producers and engineers who still wanted the extra track width of sixteen tracks on two-inch tape, it was usually possible to swap back to a sixteen-track headstack on a machine with twenty-four-track electronics.

After twenty-four-track machines, the shift in professional recording standards was to forty-eight-track analog recording. This involved synchronizing two twenty-four-track two-inch machines with recording usually being done on one machine at a time. Most producers used the “master/slave” or “work reel” system. Basic tracks would be recorded on one reel (the master), then they would be sub-mixed to a small number of tracks on another reel (a slave or work tape), with the master and work reel machines synchronized using a SMPTE code track (typically track twenty-four on both tapes). This would allow unlimited work tapes for overdubs. Eventually, the overdubs would be mixed back onto any spare tracks on the master reel and, if necessary, to a second reel that would be synchronized for mixdown.

This system allowed for a great deal of experimentation in the overdub process and it was much easier to rationalize and clean up the tracks that would be used for mixdown. Repeated playing of an analog tape recording diminishes the transients and high-frequency response. When you stand near a two-inch tape machine, during rewind or fast forward they give off an evocative odor, which is the oxide coating and binder rubbing off and releasing into the atmosphere along with some of your precious audio. Using this master/work-tape method, the master tape could be set aside for much of the recording process, thus preserving transients and high-frequency response. There were many permutations of this forty-eight-track system, perhaps the most famous of which is Bruce Swedien's "Acusonic Recording Process." He coined this catchphrase flippantly while working with Quincy Jones, but in fact, it was a formalized system for using two machines. Swedien realized that not only did he have more tracks for overdubs but also he could record anything he wanted in stereo and have virtually unlimited tracks. He said at the time, "These true stereo images add much to the depth and clarity of the final production. I have a feeling that this one facet of my production technique, contributes more to the overall sonic character of my work, than any other single factor."¹

He most famously used this technique on the blockbuster Michael Jackson albums *Off The Wall* and *Thriller*. Subsequently, Swedien modified his process using digital devices to compile and store the audio after making the initial recordings to analog tape. Alluding to this in a 1984 talk, he said, "I think that what the basic digital recording medium does, it does dramatically well. Once I have the character of the sound to my liking, I will use a digital recording device to preserve it. As a storage medium, digital recording is unparalleled."² This statement also reflected his view that analog tape has a sonic characteristic that (at the time of his comment) he felt he could not achieve in recording directly to digital.

For all practical purposes, doing the bulk of the recording on a single machine made sense—especially when recording live musicians. Synchronization became fairly seamless but there was a necessary pre-roll and you had to be sure the machines were locked (in sync) before you began recording. As long as you made work tapes in advance, it was possible to record tracks for final assembly into a forty-eight-track master while working in less expensive twenty-four-track studios. It was a flexible working method that was compatible with many professional studios.

In the sixties, Dr. Robert Moog (1934–2005) chose one volt per octave as the control voltage for pitch on his synthesizers. Roland, Oberheim, ARP, and Sequential Circuits did the same and were compatible with each other. Unfortunately, other manufacturers such as Yamaha and Korg chose different, incompatible, systems. It was not until Dave Smith of Sequential Circuits and Ikutaro Kakehashi of the Roland Corporation donated the MIDI protocol to the world that a true and far-reaching standard was achieved. Although Sequential Circuits shipped some Prophet 600s with MIDI in late 1982, the first public demonstration was at the

NAMM show in 1983, where a Prophet 600 and a Roland JP-6 were connected via MIDI. MIDI is probably one of the greatest success stories in permitting maximal flexibility for creators. It would most likely not have achieved such universality had Smith and Kakehashi retained ownership or required a royalty. Today, MIDI is used for many applications including lighting, multimedia, for ringtones, and in theme parks.

Deconstructing the Studio

Democratizing Technologies

As quoted by Peter Alexander,¹ John Blair hypothesized that “Like a river, technology can completely reverse its course. When an easier and simpler route presents itself, it can move in a direction opposite to what had been true of the past and would logically be expected for the future. . . . new technologies [lower] barriers to entry, thus creating a potential stimulus to competition.”²

There have been many times since 1877 that music production costs have been relatively low. However, once multitrack analog recording was widely adopted this had not been the case. As outlined further in chapter 15, since the 1970s new technologies began allowing more parts of music production to be done outside of expensive commercial facilities. Nonetheless, the cost of professional quality multitrack audio recording remained high—beyond the reach of many creative artists and producers. Then, in 1991, Alesis bowed its ADAT digital eight-track machine, which recorded to S-VHS tape. Up to sixteen machines could be synchronized for a total of 128 tracks. This machine represented a penetrating step in, what is often termed, the democratization of the recording process. Priced at under \$4000 it was around a tenth the price (per channel) of professional digital multitrack machines (at that time) and it enabled the project studio market to blossom and to produce (close to) professional quality digital audio. Two years later, Tascam brought out their competing (and incompatible) DA-88 machine, and Mackie supported this burgeoning trend by unveiling their inexpensive eight-bus analog console.

Improvised Environments

Since the beginning of audio recording, many famous records have been made in homes, “the field,” hotel rooms, rented spaces, and other impromptu surroundings. Les Paul recorded all his hits either in the house he shared with Mary Ford (his wife and musical partner) or in hotel rooms while on the road. He improvised acoustic treatments and isolation from outside noise. Sometimes Ford would have to sing with a blanket over her head and Paul’s guitar parts were mostly DI’d.³

Nonetheless, Les Paul used state-of-the-art professional equipment and was technically adept, to the extent that he built some of it. Eccentric British producer, Joe Meek, who trained in electronics and audio engineering, made his early sixties international hits in his London flat, above a shop, on the very busy Holloway Road—with neighbors on all sides. He pressed every available space into service included the staircase. (In an oddly circular twist: it was royalties from a song he wrote that was a hit for Les Paul and Mary Ford in the United States, that had financed Meek's production career.) It is also worth noting that classical music, for which technical perfection is paramount, is often recorded in halls, churches, and other improvised environments.

When Is a Home Not a Home?

In the seventies, I worked in Ringo Starr's Startling Studios at Tittenhurst Park—previously John Lennon and Yoko Ono's house and home studio. It was a substantial fully fledged professional studio, in a large home. It was fascinating, in part because of the many reminders of The Beatles, Starr, Lennon and Ono, including the large white room in which the video for *Imagine* was shot. I also worked, as a studio musician, in Tony Visconti's home studio in Shepherd's Bush, London. My recollection is that from the outside it was a standard London townhouse or terraced-house (the UK term). The front door was to the right of the house, and to the left going down the hall were, what British real estate agents call, “two reception rooms.” Visconti had converted the first of these into the recording room, the second into the control room and he kept some equipment, such as the tape machine, further down the hall. These houses have common walls with the neighbors so everything was isolated and floated on a thick concrete floor. It was a small but fully functional professional studio. This was around the time Visconti produced David Bowie's *Young Americans* album and he had the first Eventide H910 Harmonizer that I had seen. He was using small, powered Klein + Hummel speakers as main monitors in a near-field configuration. Near fields, other than Auratones, were not common in those days.

Freedom

For many musicians, producers, mixers, and remixers, there is a great appeal to working at home. The studio is available when you want it and it can be built to your specific needs. Paul, Meek, Starr, Lennon, Visconti, and many successful musicians, writers, and producers built studios in their homes using varying levels of professional equipment and acoustic treatment. Some home studios are cosmetically attractive and others look more like experimental audio labs. Prior to the ADAT, less wealthy musicians frequently had well-equipped demo rooms at home

using semi-professional machines such as the Tascam Portastudio and eight-track, half-inch, tape machines. Today, in terms of quality of results, it can be impossible to distinguish between a home, project, professional, and mobile studio. A studio capable of fully professional work can now be a laptop with DAW software and I/O (input/output) hardware.

Fred Gaisberg initially used the Edison machines in any convenient space. Moses Asch's studio was a small room adjacent to his office. There, he recorded many artists such as Woody Guthrie and hours of classic songs including "This Land Is Your Land." Sam Phillips's Memphis Recording Service was more spacious than Asch's studio as was Chess Records' 2120 South Michigan Ave location. Nonetheless, none of these studios was financially out of reach for a small business entrepreneur. Each was a tool for them to make a living and one that enabled them to create culturally significant recordings that may not otherwise have been made. They were recording at a time when magnetic tape had lowered the financial and technological barrier to entry.

From the mid-sixties on, studios became increasingly sophisticated and expensive to build and equip, putting them out of reach of many creative people. The Alesis ADAT was a democratizing inflexion point, where the means of producing high-quality recordings began to deconcentrate socioeconomically. This relatively inexpensive machine provided a cost-effective way for a producer or musician, of moderate means, to produce high-quality multitrack masters. In a short time, many producers moved parts or all of their productions into their homes, project, or personal studios. Songwriters were empowered to produce higher-quality demos and to move into production. Aspiring engineers and producers who were not able to find work in a high-end professional studio were able to build experience and a discography in their own home or project studios. All of this dealt a damaging blow to the professional studio business but encouraged the recording of more music.

Random Access Recording Technology

Why Random Access?

Today, we take random access recording for granted—digital audio workstations (DAWs) proliferate, most of which record both digital audio and MIDI events. At the time of writing, three of the many high-end systems include Pro Tools, Nuendo, and Logic Pro. Systems range from: Free open-source software, through mid-priced integrated hardware-software units, to setups that cost many tens of thousands of dollars and more. Relative to professional analog or digital multitrack tape recording, the comparative power-to-dollars ratio of even the most expensive DAWs is very high. DAWs embody far more capability for a tiny fraction of the cost of any pre-nineties technology. The digital audio workstation revolutionized the art of music production. It bestowed upon many more producers, songwriters, and artists than ever before the power to manipulate and optimize music, as easily they can words with a word processor.

Dissenters say that the DAW has had a negative influence on music production, commonly lambasting Auto-Tune and its progeny, along with the capacity to align, replace, fix, and refine most aspects of a recording. Some blame the DAW's manipulative power for declining standards of musicianship, bad music on the radio, excessive mediation by producers, and so forth. The fact is DAWs do not oblige producers or musicians to fix anything. A DAW is a device that can record a live session from start to finish just as Edison's Phonograph did, or any recording device since. If the desire is to represent a performance as it happened, a DAW can do that; the human operators need only exercise restraint. The producer and the needs of the production dictate the use of the equipment not the other way round. This is conceptually no different than driving a Ferrari in a thirty mph zone.

I worked on both the 3M and Mitsubishi thirty-two-track digital tape machines from the early to mid-eighties in London, Stockholm, and Los Angeles. I played drums in the huge marble and glass isolation room at Polar Studios (built and owned by Abba) on tracks I produced for Adam Ant. Back in the gigantic control room, the assistant pressed play and I remember briefly noticing there was no tell-tale hiss indicating tape was rolling. Then the drum sound from the main monitors hit me, kicked me even, in a way it never had before. For the first time I heard drum transients captured the way the instrument sounds when you play it and there was

absolute silence in between. Additionally, I could now move and bounce tracks with no appreciable degeneration, and no crosstalk—digital offered clear advantages. Nevertheless, I made many subsequent albums on analog machines, in part because the majors would not pay extra for digital recording, but there were other reasons. Editing was possible but not as easy or reliable as on analog two-inch. I did some twelve-inch remixes for Thomas Dolby at Ground Control Studios in Santa Monica, California. Dolby recorded the original tracks (with Bill Bottrell) on a thirty-two-track, Mitsubishi X850. To get them into the structures I wanted, I rented a second machine and extended sections by copying from one multitrack to the other using SMPTE offsets. There was no generational loss and the edits worked perfectly but were neither fast nor intuitive. It took many hours to perform edits that we can now do on a DAW in minutes.

Dropouts on analog tape were a problem, but on digital tape, they could be sonically fatal. Several years prior, I was producing the group America on an early thirty-two-track, Mitsubishi X800 at United Western on Sunset in Hollywood. In the middle of a master take that we had worked on for days, several seconds of all thirty-two tracks suddenly disappeared. It took two days and a Mitsubishi technician to solve what turned out to be an error correction problem. All new technologies experience unforeseen issues but despite the advantages of the improved signal-to-noise ratio, increased dynamic range, and lack of generational loss, storing digital information on reels of tape was not a transformative solution for producers. The advantages were primarily technical. As with analog recording, linear tape storage limits creative possibilities because structural editing and other significant manipulation of parts, after they were recorded, were onerous. The music was not randomly accessible. Parts could not be cut and pasted easily.

On vinyl, when you wanted to listen to that great bass fill or guitar lick it was quick and easy to drop the needle right there. As a musician, you became expert at finding that part you liked or needed to learn. Hip hop pioneers such as Kool Herc, Grandmaster Flash, Grand Wizard Theodore, and Afrika Bambaataa used this random accessibility to pick out a section, replay it several times in a row, superimpose parts, scratch them, and, effectively, create new music. They appropriated consumer playback technology to create a new instrument. They developed the techniques of what would later be termed turntablism and laid a conceptual foundation for a significant application of sampling. But they could not have done this (in real time) using a linear format. They utilized the random access capability of the turntable and vinyl discs.

Cassette tapes and all tape formats are linear: you have to fast forward or rewind and it takes longer to get to one location than another. The tracks on music CDs are randomly accessible but, due to the limitations of the players, the internal data in the tracks is not, you still have to use the fast forward or reverse buttons to get to a specific internal location on a track unless you have a very sophisticated CD player. Notwithstanding, that is a failing of the interface rather than the intrinsic linearity of the medium. In professional analog studios, we used all kinds of

systems for quickly locating “the second chorus” on the two-inch tape. You had to wait, but a good tape-op or the auto presets on the remote could get you there in seconds. Inconvenience and impatience aside, locating “a chorus” using a linear system is not a critical problem. What makes random access important, in a creative setting, is being able to grab chunks or tiny fragments of music to copy, paste, cut, fix, tune, move, and modify. Writing a book or even an email is now, almost, unthinkable without being able move, modify, and fix things. Manipulative power has become integral to our creative processes.

The Beginnings of Random Access for Producers

For me, the random access story pertinent to producers began in the 1970s, although experimental and preliminary work happened long before that. The Roland MC-8 Microcomposer came to market in 1977 costing just less than \$5000, and nearly twice that in the UK, where I bought mine (about one-third the price of a house in London at that time). Canadian Ralph Dyck developed the initial idea and Ikutaro Kakehashi, founder and then president of Roland, recognizing its potential, expanded it to eight channels with many upgraded functions. They manufactured only 300 MC-8s. The invention was inspired (on Dyck’s part) and, it seems to me that, Kakehashi’s commitment was also exceptionally visionary for a president of a commercial manufacturing company. To put the MC-8 in perspective, electronic sequencers had been commercially available since at least the 1960s. They typically generated an eight-, twelve- or sixteen-note repeating pattern and, from the late sixties, generally triggered an analog synthesizer using Robert Moog’s voltage control functionality (presented at the 1964 AES Convention). In fact, the concept of automatically or machine-generated music stretches far back. There were music boxes, barrel organs, player pianos, and, more recently, Raymond Scott’s groundbreaking 1940s electro-mechanical studio, and so forth. Programming computers to play music began as early as 1951 when Australia’s first digital computer, CSIRAC¹ (Figure 15.1), allegedly played “Colonel Bogey.” Months later a Ferranti Mark 1 computer at Manchester University in the UK played “Baa Baa Black Sheep” and “In the Mood.”² Much subsequent research took place, including that at Bell Labs in 1957, Stanford, IRCAM, and elsewhere.

Permit me to diverge for a moment. I find it intriguing that technology evolves to solve known problems and in so doing, presents potential for previously unsuspected applications. Inventors, innovators, creative artists, and hackers (using the original definition) recognize these accidental or incidental capabilities. The development of turntablism in hip hop is a good example. Even people who consider themselves ordinary often find fascinating ways to misuse and abuse technology to great effect and, very occasionally, to the advancement of society. Some people set out to solve longstanding mysteries and find better ways to do things. Monsieur

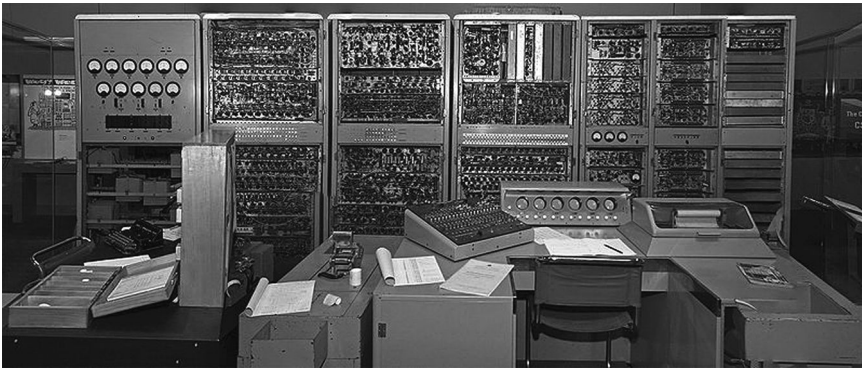


FIGURE 15.1 CSIRAC (Council for Scientific and Industrial Research Automatic Computer): Australia's first digital computer. In 1951 it was the first computer to play music. It is on permanent display at the Melbourne Museum and is the only first generation automatic electronic stored-program computer still in existence.

Credit: Photograph by John O'Neill, <http://upload.wikimedia.org/wikipedia/commons/8/85/CSIRAC-Pano%2C-Melb.-Museum%2C-12.8.2008.jpg>.

Scott solved the problem of how to record acoustic sound, building on previous research by others. Edison figured out how to play it back.

The multitude of inventions and refinements leading to viable magnetic tape recording solved known problems associated with disc and wire recording, improving frequency response, lowering the noise floor, and allowing seamless editing. Almost immediately, Les Paul identified a simple modification that resulted in sound on sound overdubbing that led to multitrack recording, which significantly expanded the role of the producer and advanced the art of music production. Edison understood the potential for a recording to exceed live performance when he referred to, "...a phonograph that will render whole operas better than the singers themselves could sing in a theater."³ He was referencing, what would become the imaginative art of music production. In his sweepingly prophetic statement, Edison foreshadowed the ramifications of more than a century of creative and technological developments. These have culminated (so far) in the power of present day DAWs, which—along with improved transducers, optimized acoustics, and much more—allow us to craft idealized perspectives, and perfect performances or create entirely artificial ones.

To get to the manipulative power of the DAW, many disparate developments had to take place. Sound had to be captured in such a way that we could cut it into pieces and reassemble it. Magnetic tape allowed us to do that, furthering the art greatly. However, digitization breaks sound into microscopic pieces that are reassemble-able in almost any configuration. Conceptually—using manuscript paper—arrangers and orchestrators cut and paste music determining precisely what is played, and in what order, by a group of musicians. As I have witnessed many times, with a few strokes of a pencil or a verbal instruction, arrangers and

orchestrators can move whole sections and tiny pieces around—before making the final recording. Overdubbing made the techniques of the arranger and orchestrator available to those who cannot or choose not to concoct complete ideas in their head and communicate them in the form of full arrangements and orchestrations via a score and parts. It also extended the iterative and incremental approach to composition, arrangement, and orchestration, allowing the capture of precise performance and sonic subtleties rather than imagined ones.

Head arrangements and improvised parts have long been a part of some musicians' methodologies. Building a track by overdubbing allows one performer or a small group to each record many parts, and to arrange them as they go. However, once captured on a linear storage medium, moving parts or sections in relation to others was not easy. Producers and engineers “flew in” sections from discs and tape for decades, much the way hip hop DJs do. Known as “flying in” a part, it might entail bouncing a segment such as, say, chorus background vocals or handclaps onto a second tape machine and then back onto the master in the desired location. Achieving accurate timing involved manually marking the second tape and the deck of its machine, then hitting play on an audible cue point in the track. It would rarely be in time on the first attempt, so you judged whether the part was ahead or behind the track by ear, adjusted the start position relative to your marks, and continued by trial and error until the “fly-in” was perfect. We became adept at flying-in but, compared to cutting and pasting on a computer, it was a cumbersome and slow process. Another disadvantage was the two generations of quality loss when using analog tape as described. Bouncing from one multitrack machine to another, in master/work-tape mode with calculated time code offsets, limited loss to one generation and timing was precise, but it was still a fiddly and relatively slow process.

The MC-8 Microcomposer, while laborious to program, was the first commercially available machine that allowed us to program all the synthesized or triggered parts for a piece of music. Using the MC-8, John L. Walters and I programmed parts for Landscape's album *From the Tearrooms of Mars...* which featured the hit “Einstein A Go-Go.” We triggered drum parts from the MC-8's multiplex outputs using the prototype of the Simmons SDSV electronic drums that I co-developed (this was prior to the launch of the Linn LM-1) (Figures 15.2–5). Melody and harmony parts were generated from synthesizer modules such as the Roland System 100M and other voltage-controlled synthesizers. Dave Smith and Ikutaro Kakehashi had not yet released the MIDI protocol so we were restricted to synthesizers that used the one volt per octave standard. Every parameter had to be defined and laboriously programmed via a numerical keypad. Despite its limitations, this method of working offered many fresh and exciting options. We could cut, paste, and copy, we programmed parts that were impossible to play, and changing keys, tempi, sounds, notes, or timings, after having recorded all the parts into the MC-8, was no problem.

Of course, these are all techniques that are commonplace today, but in the late seventies, they were unimaginably liberating. We still could not control acoustic instruments and vocals using this machine; they had to be played and sung live

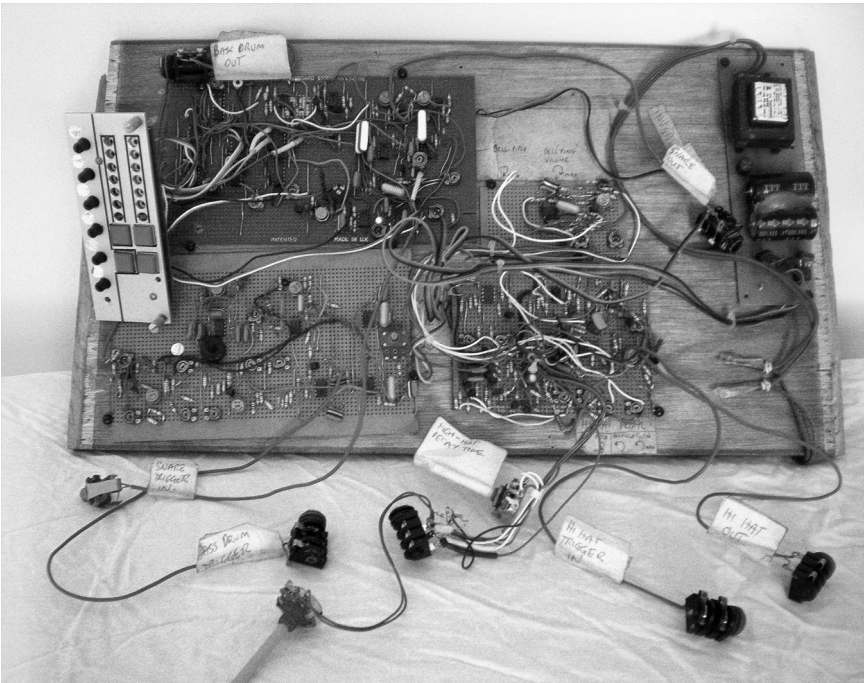


FIGURE 15.2 SDSV drum synthesizer prototype used on Landscape's *From the Tearooms of Mars...*

Credit: Richard James Burgess collection.



FIGURE 15.3 SDSV drum synthesizer early production model

Credit: Author's collection.

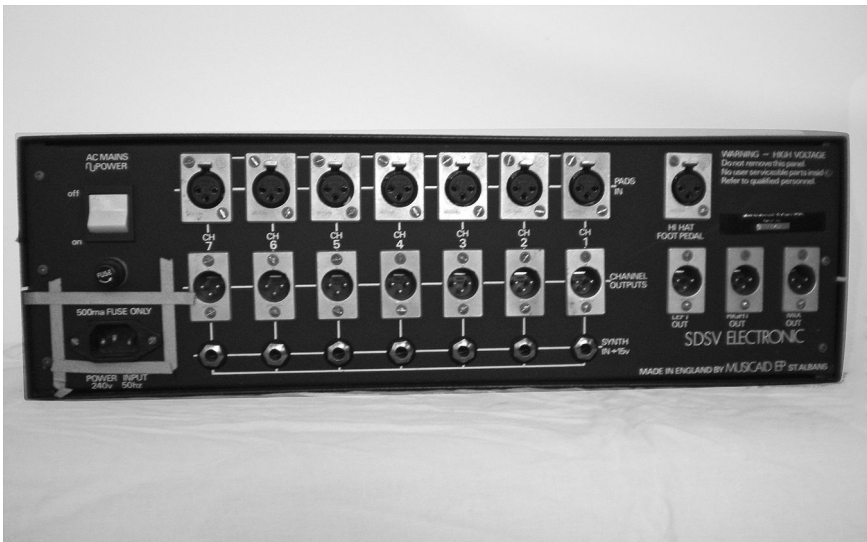


FIGURE 15.4 SDSV drum synthesizer early production model back panel

Credit: Author's collection.



FIGURE 15.5 Roland MC-8 MicroComposer used on Landscape's *From the Tearooms of Mars...*

Credit: Author's collection.

to analog tape, and once recorded, were difficult to alter. As we were completing the album, I learned about the Fairlight CMI, the first commercial sampler. It seemed like it might be the answer to recording acoustic sounds, so I flew to Sydney to meet the developers (Kim Ryrie and Peter Vogel) and took charge of one of the first three machines (it cost much more than the MC-8—the price of a whole house in London). We had finished recording the *Tearooms* album but thanks to the forward-thinking Kate Bush, Walters and I were the first to record Fairlight samples on a commercial album (Bush's *Never Forever*). The Fairlight CMI Series 1 was a conceptual, paradigmatic breakthrough for producers, but it was an eight-bit machine, sample length was short, and the frequency response and sonic quality too limited to use for vocals or critical acoustic lead elements. Regardless, the MC-8 Microcomposer and the Fairlight CMI dispersed the seeds that would take root and bloom into the next generation of production devices and techniques.

These were technologically exciting and productive times. New England Digital (NED) had built their first Synclavier featuring FM synthesis. NED rapidly and dramatically refined their machine over the next few years to incorporate sampling, sixty-four-voice polyphony, and most significantly, digital, hard disk recording. They termed the direct-to-disk system, the Tapeless Studio. This was a groundbreaking device but the price (in the hundreds of thousands of dollars) kept it from wide acceptance. Movie studios and some high-end production facilities embraced it and, along with the later models of the Fairlight, it set the standard for sampling and hard disk recording technology. Inevitably, as soon as a company releases expensive but useful high-end technology into a free market economy, less expensive devices emerge offering more cost-effective solutions. The Emulator, the Ensoniq Mirage, and the Akai S900 samplers followed the Fairlight and the Synclavier, at much lower prices.

Drum Machines, Next Generation Sequencers, and MIDI

The history of drum machines goes back to at least the 1930s, but by the early eighties, they were proliferating. Roland machines such as the TR808 and TR606 were by then easily programmable and the first machine featuring digital samples, Roger Linn's LM-1, evolved into the LinnDrum. Many of these machines did not communicate with each other. It was a momentous (and generous) breakthrough when Dave Smith of Sequential Circuits and Ikutaro Kakehashi of Roland released the general MIDI 1.0 specification to the world free of royalties for all to use in 1982. Amazingly, three decades later, the same basic MIDI spec., although it has expanded, is still in use, and on billions of devices including mobile phones.

MIDI was another transformative technology, in that different makes of synthesizers, samplers, and sequencing devices could now talk to each other in a common language. Standalone computer music machines such as the Linn 9000 became full production systems that controlled all the synthesized and sampled instruments.

Where the MC-8 had required numerical keyboard entry for every parameter of every note, Roger Linn's device readily accepted MIDI keyboard input and came with a full set of finger operated, touch sensitive drum pads. I immediately abandoned the MC-4 Microcomposer (Roland's successor to the MC-8) and bought an early Linn 9000. Relative prices were plummeting and taking into account inflation this unprecedentedly powerful machine now cost much less than the price of a car. The early machines could be glitchy—I saw Roger Linn recently and mentioned to him that I still have one of the early 9000s; his response was, "I'm sorry." Regardless, in spite of occasional lockups and losses of data, the machine instantly improved my working methodologies. The 9000 became the model for future MIDI production suites in a box and is the direct ancestor of Akai's MPC series that are still popular in hip hop production. These all-in-one production devices enabled producers and artists to perform, arrange, and orchestrate their music at home or in preproduction rooms. Besides mixing, the studio became a place to print preprogrammed parts to the, still necessary and still linear, multitrack tape so that we could overdub any non-programmable live instruments and vocals. Nevertheless, each instrument was completely isolated, and programmed parts could be re-synchronized, making completely different remix versions much easier.

By the mid-eighties, several synthesizer manufacturers were making stand-alone MIDI sequencers that, like the Linn 9000, were self-contained production boxes. At the same time, a new generation of software developers was piggybacking the burgeoning world of personal computing. They wrote software for new platforms such as the PC, Apple MacIntosh, Atari ST, and Commodore Amiga. These programs were fully fledged MIDI production tools that took advantage of the then-new graphical user interface (GUI). Unlike the tiny LED or liquid crystal window of most of the hardware systems, all or most parameters were accessible from a (usually) customizable screen.

This immediately cut down on note taking and mental juggling of information; visual editing became a useful reality. In addition, the machines stored MIDI settings, sounds, and parameter changes for onscreen editing, making settings changes from one song to another less time consuming and more intuitive. (The sound sources were still a mountain of MIDI keyboard and rack mount units, each with complex settings that often needed to be changed from one song to the next.) The MC-8 Microcomposer, the Fairlight CMI, and the Synclavier were harbingers of the sequencing and sampling power that would become available to artists and producers. MIDI increased access to a rapidly expanding palette of sounds and began the convergence and integration of the various technologies and methodologies. The many all-in-one units and subsequent software programs, along with falling prices, signaled the beginning of the democratization of the production process. Because it was still not practical to record full-length vocals or other acoustic parts, the professional studio was still a necessary, if now postponed and shorter, step.

However, electronic dance producers and remixers triggered looped acoustic parts, and sampled vocal and instrumental fragments according to their sampling

device's capacity—yet another example of technology defining musical parameters. Consequently, the electronic dance music community was early in embracing the project studio as a start-to-finish production solution. Those successful enough to transcend their bedroom setups often opened up single-room production suites, in many cases in backrooms of existing studio complexes. At the Work House studios in London, in addition to our two main rooms, we had two remixers with project rooms upstairs. These project studios rarely had an area for recording acoustic sounds; overdubbing, if necessary, took place in the control room with everyone including the producer/engineer wearing headphones. This is a familiar methodology today but was not widespread in the early eighties for anything other than the production of demos.

The Beginnings of Random Access Digital Recording

As the eighties progressed, the Fairlight and Synclavier were developing into fully functioned digital recording suites, what we now refer to as a DAW, but the cost of these sophisticated machines was still out of reach for most musicians and producers. At the same time, the base technologies were becoming less expensive and trickling down to lower-priced machines. The early MIDI samplers, drum machines, and all-in-one production hardware devices with limited audio quality and duration morphed into the next generation with complex feature sets and sixteen-bit 44.1 kHz, or better, digital audio quality. Akai's samplers, starting with the S1000, were capable of recording and playing back many minutes of vocals and acoustic instruments in high-quality stereo. Concurrently, several software companies were moving toward inexpensive digital two-track stereo, random access capability. Hybrid Arts, the company that introduced the popular SMPTE Track MIDI sequencing software (which I used and beta-tested), built the ADAP II, sixteen-bit hard disk recording software that made inroads into sound replacement for Hollywood films. Movies such as: *Born on the Fourth of July*, *Steel Magnolias*, *National Lampoon's Christmas Vacation*, and *Honey, I Shrunk The Kids*, as well as television programs including: *MacGyver*, *Beauty and the Beast*, and *Murder She Wrote*, used the Atari ST Mega and ADAP II.⁴

Fairlight ESP Pty. Ltd. released their MFX1, twenty-four-track disk recorder in 1990. New England Digital, who had led the way in hard disk recording systems, saw their sales begin to dissipate in 1990 and by '92, the business closed. Fostex bought parts of NED and brought over staff to build hard disk recording systems in the nineties. I beta tested a powerful random access digital multitrack machine for Fostex in 1994 but by that time the market had become crowded, competitive, and fragmented. Pricing was important and so were features. The power of having a versatile all-in-one machine was obvious, but the various software companies emphasized different capabilities and the choices were often a compromise between user-friendly MIDI sequencing and robust digital recording capabilities. Some programs of today that evolved during this period are Steinberg's Cubase;

Emagic's Creator, Notator, and Logic series; Mark of the Unicorn's (MOTU) Digital Performer; and Digidesign's SoundTools and ProTools.

Moving into the nineties, user preferences were forming according to functionality, price, reliability, brand loyalty, systems familiarity, and learning-curve aversion. Brands were beginning to dominate in specific genres and locations. Hybrid Arts eventually disappeared in this climate. Opcode survived much of the nineties only to cease production after acquisition by Gibson. Some systems carved out specialist markets. Sonic Solutions, which formed in San Francisco in 1986, occupied the restoration, and mastering niche, later expanding into consumer software. Cambridge, UK-based Sadie, which launched in 1991, focused on speech editing, building a durable base within the BBC and with other broadcasting companies around the world.

The ProTools story begins much like other companies in this space—in a small way with some hacking skills, passion, a good idea, and hard work. UC Berkeley graduates Peter Gotcher and Evan Brooks teamed up in 1984 to make replacement EPROM sound chips for E-MU's Drumulator that E-MU preferred to the originals. Digidrums, as they called themselves, went on to make chips for the most popular drum machines. They sold in the order of 60,000 drum chips for \$20 to \$40 apiece, which provided the start-up capital for Digidesign. In a *Sound On Sound* interview, Gotcher illustrated some of the challenges,

We did all those sounds with a home-brewed digital recording/editing system—a Sony PCM F1 we'd hacked so we could get data out of it and into a computer that Evan had designed and built. The audio waveforms were displayed as screens of hex data and we'd spend hours looking at screens of raw data looking for zero crossing points for looping. When the Mac came along, we realized that it was a much better machine for displaying audio waveforms, and that's when we decided we were going to create Sound Designer.⁵

Collaborating with E-MU in 1985, they introduced Sound Designer, a Mac-based visual sample editor for the Emulator II keyboard. Priced at \$995, it brought the kind of editing features, previously available only on the Synclavier and Fairlight, to a larger market. They expanded the application to include new samplers by Akai, Roland, E-MU, and the like.

By now, Fairlight and Synclavier had blazed a clear trail, and digital recording at a more reasonable cost was the next challenge. Gotcher and Brooks struggled with the Mac's eight-bit AD/DA conversion capabilities and even with a separate sixteen-bit interface, editing pushed the Mac processor to its limit, causing unacceptable wait times. Apple's Macintosh II arrived in 1987, with six newly added NuBus expansion slots. Brooks built a card with a sixteen-bit DA converter and prototype Motorola DSP chip, which took the pressure off the Mac's CPU for audio editing. Digidesign developed a full audio input/output system, releasing Sound Tools direct-to-disk recording solution with a software front-end in 1989. This was a nondestructive, random access, stereo, audio editing system with some

simple DSP capabilities. Several companies were developing inexpensive nonlinear digital stereo editors, and affordable digital multitracks were becoming inevitable.

Pro Tools debuted in 1991 priced around \$6000 (by that time, a fraction of the cost of a car and comparable to high-end MIDI equipment). Based on Sound Tools, but now offering four-channels, there were still technical challenges and increasing market rivalry. At the high-end of the market, Fairlight and Synclavier still ruled. Several post-production facilities had embraced Hybrid Arts' ADAP II, and both Steinberg and Emagic were adding audio capability to their popular Cubase and Logic MIDI sequencers. In this ecosystem, Digidesign licensed its Digital Audio Engine (DAE) to outside developers opening up Pro Tools hardware to other DAW software users.⁶

Convergence and Integration

The power of individual advancements like MIDI and random access recording was such that they immediately assimilated into the production toolkit. The convergence and integration, or packaging, of the many tools that producers use into one device (DAW), had its own further empowering effect on creativity and productivity.

The term "mixing-in-the-box" denotes a mix performed entirely in the digital domain, and within a specific DAW environment using associated plug-ins and effects devices. There are detractors who feel that such mixes lack the depth of those using external analog effects and modifiers. A counterargument is that by staying in the digital domain the audio is damaged less by multiple A-D and D-A conversions. As is often true, there was more validity in the criticism of mixing-in-the-box in the early days of DAWs because the technology was less advanced and computer resources would become exhausted with a big mix. Regardless, mixing-in-the-box is but a minor manifestation of this revolution of convergence and integration that we now take for granted.

An acoustic sound still requires a microphone, cable, and mic pre, but once recorded every other function can be performed and memorized in-the-box. Any sound that a compatible plug-in can synthesize or play from an internal library also exists entirely in this environment. We used to need a separate summing/routing device or console for recording, a patch-bay, racks of outboard equipment, a recording machine, then a console for playback and mixing along with all the cables, connectors, and converters. Most instruments such as piano, guitar, bass, drums, orchestral instruments, and synthesizers are now also available as plug-ins, as are many effects processors. Although, the choice to substitute in-the-box sounds for real instruments is a further creative step from the storage, manipulation, and mixing of various recorded audio components.

Additionally, DAWs brought producers a wish list of possibilities. To name a few: Auto-Tune and its derivatives, time compression and expansion, integrated documentation, and instantaneous recall of any project any time. Beyond all else, nondestructive editing and multiple levels of undo have changed the kinds of

manipulations we might attempt. Furthermore, for the price of a single high-end or rare piece of analog equipment, it is possible to own hundreds of emulations of machines previously beyond the reach of all but a few. Moreover, multiple instances of most of these virtual devices can be installed, each with its own setting. A plug-in is by no means a perfect substitute for a hardware device, but for those without access to the physical units, emulations are yet another technologically democratizing step.

Suffice it to say that most of the devices necessary for a modern production have now been consolidated into the DAW as software plug-ins. These not only include audio processing equipment but also soft, sound generation modules. There are now hundreds available at a fraction of the price of hardware synths and samplers. As with mixing in the box, the idea of generating all the sounds within the DAW, using soft synths, soft samplers and so forth, has its critics. Nevertheless, programming everything within the DAW software is convenient and maintains flexibility, especially for those who produce or write on a laptop while traveling. Furthermore, hits are being made this way.

By the late 1990s, prices were tumbling, and manipulating audio, the way we had been finessing MIDI, appealed to many producers and artists alike. While this was a tremendous technological leap, it involved no conceptual shift. The new capabilities were comparable to the sequencing approach that had mushroomed in the dozen or so years from the advent of the MC-8 Microcomposer, through the proliferation of MIDI devices and software. My own group, Landscape, may have been the first artist to chart with a computer-programmed record. We were invited to make a presentation on the MC-8 at an early eighties Roland UK sales meeting. In it I said, “Most records, in the future, will be made the way we made Landscape’s *From the Tearooms of Mars*... album—using computers to sequence, cut, paste, and manipulate arrangements and performances.” I remember thinking, after I walked off the stage, that I may have overstated the case but a quick listen to the *Billboard* Hot 100 confirms that very few recordings are made today without significant use of digital manipulation. Moreover, they all rely on related computer technologies for mastering, manufacturing, and delivery.

The early meaningful signs of convergence and integration were with the Fairlight II’s Page R and the Synclavier II. Producers and musicians who could not justify the expense of those machines were cobbling together affordable systems, throughout the eighties, empowered by MIDI as well as plummeting prices and soaring capabilities in sampling and sequencing technology. For many, there was the vision of keeping everything pliable and recallable until as close as possible to the moment of final decision in the mix. Dangerous as it might be, perhaps all that remains is to be able to tweak a mix right through the mastering stage. Then the question that has to be asked is: What if we made all elements of the mix manipulable by the consumer? We see what has happened with sampling and mashups (more of which later) and we know interactivity is a powerful market asset. Consumer manipulability seems inevitable.

Transformative/Disruptive Technologies and the Value of Music

Definitions of Terms

Depending on your perspective (often consumer versus large, established industry), transformative and disruptive technologies are not necessarily negative in their effects, and the two terms are not synonymous. Harvard Business School professor Clayton M. Christensen coined the term “sustaining technology.”¹ These: “Improve the performance of established products, along the dimensions of performance that mainstream customers in major markets have historically valued.”² Sustaining technologies can be either transformative (a radical shift) or continuous (incremental improvements). Christensen also coined the term “disruptive technology,” defining it as one that will generally: “underperform established products in mainstream markets. However, disruptive technologies have other features that a few fringe (and generally new) customers value.”³ They are “typically cheaper, simpler, smaller, and frequently, more convenient to use.”⁴ Christensen found that market leading corporations rarely failed due to even the most radically discontinuous (transformative) sustaining technologies, but rather “it was disruptive technology that precipitated the leading firms’ failure.”⁵

The Industry at the Turn of the 21st Century

Almost a century and a quarter after the invention of the phonograph and in the closing months of the second millennium CE, the major labels, once again, appeared unassailable. With the consolidation of Polygram and Universal, five companies collectively controlled sales of recordings accounting for 77.5 percent of the global market and, in the United States, 87 percent. The 1999 market shares were Universal, 21.8 percent; Sony, 19.0 percent; EMI, 12.9 percent; Warner Music Group, 11.9 percent; BMG, 11.9 percent. Domestically, Universal had 28.11 percent; Sony, 19.47 percent; BMG, 15.24 percent; Warner, 12.82 percent; EMI, 11.38 percent.⁶ The labels were signing acts, producing records, and sales were better than ever.

Missed Opportunity

Every successful introduction of a widely accepted or standardized format—including the wax cylinder, 78 rpm lateral groove disc, microgroove LP, seven-inch vinyl, compact cassette, and compact disc—stimulated growth in the recording industry. However, massively disruptive technologies complicate matters because they are difficult to identify in advance. They do not happen often, are not simply a sustaining improvement on previous technology, and often come from outside the industry. They are most disruptive when appearing in pairs or combinations.⁷ Such a disruption was the shift from physical product (at the time CDs, cassettes, and vinyl) and distribution to digital files and distribution, in the mid-1990s and early 2000s. Interestingly, the transition was long, slow, and well documented. In this case, the music industry did not divide or confuse consumers by introducing competing standards or formats. It simply appeared to miss the fact that physical distribution was giving way to digital distribution and that it was being enabled by a format change from CDs to digital files combined with a universal, almost frictionless, nearly free, delivery system. The industry apparently failed to detect the nascent market demand or to grasp the potential positive impact of digital delivery, and it did not respond meaningfully to the appearance of new hardware coming onto the market for playing digital files. The strange thing was that at least some labels were aware of the new players and their capabilities: Island DefJam gave MP3 players to its artists in the late nineties.

This is an industry that lives by demographics and places a heavy emphasis on servicing youth culture. Yet, it did not act as if it understood the social significance or the generational shift in the perceived need for greater choice, immediacy, and ubiquity/portability. The majors, of the time, were vertically integrated with their own sophisticated manufacturing and distribution systems. Had the new format been a chip or other media with a physical form factor, they might have figured out how to make it, ship it, and market it. As it happened, the new format did not require manufacturing plants, warehouses, trucks, or physical retail stores.

Prior to the shift to digital delivery, format changes were continuous or transformative technologies developing within the extant industry. All the cylinder refinements—from tin foil to wax, the introduction of mass replication technologies, the move to flat discs and from rubber to shellac, the standardization of speeds in the 78 rpm era, the LP, 45s, cassettes, and CDs—all came from vertically integrated companies who also produced music. Eight-track cartridges were an exception, combining interim developments and preexisting technologies with contributions by Bill Lear.⁸ Nevertheless, a physical format, such as the eight-track, developed by an outside company requires them to license the content from the copyright owners (the labels) or to license the technology to the labels, and when successful the relationship becomes symbiotic. Development of a physical technology like a disc or a cassette requires research and development, materials, manufacturing, and

distribution, which incur significant costs and, in order to recoup, needs content with broad consumer appeal. Manufacturers and distributors of physical goods are unlikely to take the considerable legal and financial risk of issuing unlicensed recordings on their format.

Edison, Columbia, and Victor all produced their own music and so did Philips. Sony developed the CD along with Philips and they made the hardware on which music could be played, but even they bought a major label (CBS Records) after the sustained success of the compact disc and the Walkman. In the case of eight-track cartridges, established labels recognized additional sales potential and encouraged the market by issuing their recordings on the format, just as they had on prior, externally developed, formats such as four-track cartridges and reel-to-reel tapes.

There are many reasons why consumer playback technologies do not take hold. The RCA long-playing disc in the thirties had design flaws that caused the discs to wear out quickly. Quad required special playback equipment, which never penetrated the market sufficiently. Large-format video discs in the seventies may have been premature, and two competing, incompatible formats did not help. The demise of recordable digital formats such as the Philips, Digital Compact Cassette (DCC), Sony MiniDisc, and Matsushita's Digital Audio Tape (DAT) may be the most instructive as to what happens when there are competing incompatible formats. Additionally, the labels' fear of digital piracy (with perfect copies) and extended negotiations over serial copy management systems (SCMS), affected adoption rates and may have presaged their failure to capitalize on digital delivery. Regardless, in the late eighties, there was a market need for an inexpensive recordable digital format; each of these systems had positive attributes but they were incompatible and all three failed to gain widespread acceptance. Companies have protected their proprietary formats back to the beginnings of the recording industry, for example: the lawsuit between Gennett and Victor over lateral grooves. With competing formats, the winner may not be the better technology, as happened when VHS beat out Betamax to dominate the consumer video format in the seventies.

Oh, Wait

There is a prior example of a disruptive technology that offered free music, delivered into consumer's homes, somewhat like digital delivery. Radio should properly be viewed as a form of music distribution; it is simply non-interactive streaming audio. The radio industry appropriated the value of recorded music to generate (at least part) of its income. Had the recording industry looked at radio this way, they would have monetized this use—as the publishers did. To be sure, the business model of radio was not immediately successful and this is another defining quality of a disruptive technology. Struggling to make money, United Independent Broadcasters merged with Columbia Phonograph and Records Co. The merged company did not do much better and, subsequently, sold out to

William S. Paley whose father was a cigar manufacturer and was one of the station's principal advertisers. Changing the name to the Columbia Broadcasting System, Paley understood that its financial success would depend on a mass audience that could attract advertising dollars.⁹ It is interesting to ponder the fact that both Victor and Columbia (at that time the surviving foundational major labels) wound up being owned by the companies whose technology disrupted their business (RCA and CBS respectively). This happened within less than a decade of the establishment of the radio broadcast industry. It is doubly interesting when considered in the light of Pandora's attempts to lower rates for the use of music and Spotify's ongoing unprofitability. Radio, like most businesses, was also financially insecure until it established its business model, grew its audience, and became the behemoth that it is today.

No Big Surprises

Much credit for the development of the MP3 and useable digital compression codecs goes to Karlheinz Brandenburg, although he acknowledges a number of co-developers. Brandenburg is now Director of the Fraunhofer Institute for Digital Media Technology where MP3 and AAC codecs were refined. He began the journey toward a practical compression codec as a doctoral student grappling with both technical and psychoacoustic challenges in order to find an efficient way to transmit music over ISDN telephone lines.¹⁰ Patented in Germany in 1989 and in the United States in 1996, its practical commercial application was demonstrated by an outsider to the music industry in 1997, when Michael Robertson launched MP3.com. The site listed unsigned artists and purportedly served as many as four million songs per day. With a revenue model of online advertising, at the height of the dotcom boom their IPO raised \$370 million. Nonetheless, downloads via MP3.com, whilst popular with indie artists and younger audiences, did not transform the industry. Initially, the recordings available there were largely unknown and finding music to suit your taste was a laborious process. Thus, the industry dismissed the site, ignoring the proof of concept and failing to extrapolate the impact that famous artists and well-marketed recordings would eventually have. When MP3.com attempted to shift its model to include major label artists it was, effectively, disabled by a firestorm of major label lawsuits.

Reputedly, SubPop distributed tracks in the MP3 format in 1999. That same year all major label recorded music sales were on physical formats and five companies, Universal, Sony Music, BMG, Warner Music, and EMI, controlled about 84 percent of the US market. This, of course, was the year that nineteen-year-old Shawn Fanning's Napster decisively disrupted the music industry and shifted the public perception of the value of music. Fanning said he did not intend to make money, rather, "I had a number of friends really into digital music and they would find sites to download music but these sites would go up and down all the time.

I realized there was a better way to connect people and their music together and a way to build it so it was accessible to those who were not tech savvy.”¹¹

The coincidence of instant, free music (including every well-known artist) with portable MP3 players was the music business equivalent of a large meteorite slamming into the earth, launching an ice age and making the dinosaurs extinct. PC World lists the coming together of Napster and MP3 players as one of the ten most disruptive technology combinations saying, “Disruption: The idea that media should be portable is disruptive. The notion that it should be free—and that some artists can survive, or even thrive, despite a lack of sales revenue—is even more so.”¹² Apple exacerbated the problem when it finally entered the market, two years later, in 2001 with its compact and aesthetically alluring iPod. The first of which was a 5 GB device that held a thousand songs. Not only had access to music been transformed, but so had personalized mobility in a compact form and quantity that represented a quantum leap for consumers.

What a Great Idea

In their lawsuit with Burst.com, Apple acknowledged that British inventor Kane Kramer had designed a digital audio player called the IXI in 1979 that never went into production.¹³ Kramer filed for patent in 1981 in the UK¹⁴ and in the United States a year later.¹⁵ Apple was claiming prior art, as if there was any legitimacy to the idea that the iPod was fundamentally original. Innovative design firm IDEO “provided turnkey product development”¹⁶ for a digital audio player for Audible in 1996 that used a proprietary compression system.¹⁷ The first MP3 player announced was Audio Highway’s Listen Up in 1996, but it did not ship until 1999 and even then in tiny quantities.¹⁸ The first MP3 player to market appears to be the 1997 SaeHan Information Systems’ player from South Korea. Shortly after that, in 1998, Diamond released their Rio player and in 2000, a number of manufacturers, such as Archos entered the market with their Jukebox digital audio player. Apple was by no means the innovator in digital music file players, but they made the most attractive one, with the largest capacity and then marketed it to perfection. Like the Regency TR-1 transistor radio and Sony’s Walkman, Apple’s 2001 iPod earned its place on *Time Magazine*’s All-TIME 100 Gadgets list.¹⁹

What Happened to Vertical Integration?

The first three companies in the recording industry were vertically integrated, manufacturing the players and the cylinders or discs, as well as owning the content and the distribution systems. The lateral cut 78 was developed by Victor, the micro-groove LP by Columbia, the seven-inch 45 by RCA, the cassette by Philips, and the CD by Sony and Philips. Once they acknowledged that proprietary solutions were

not in anyone's best interest, they embraced each other's technologies and, occasionally, that of outsiders such as Lear's eight-track cartridges.

When the CD launched, the industry experienced a boom because music fans were repurchasing albums they already had on vinyl. The MP3 had been developed some years prior to large-scale digital delivery sites and music had been circulating informally online during that time. Digital delivery involved not only a format change but also a completely new distribution model. However, the pipeline—being the internet—existed. Only the delivery system needed to be built. The recording industry could have been proactive in serving a new but extant market. By 1999, there were several MP3 players on sale, MP3.com had been delivering downloads for two years, and bandwidth was adequate for music downloading. The industry owned the content and had the marketing muscle, yet it made no effort to give its most sought after demographic of consumers what they had shown they wanted. The market research had been done and the results were written on the wall but industry leadership did not read it—nineteen-year-old Sean Fanning did. The generation that grew up with computers wanted their favorite music delivered online, now!

An Idea Whose Time Had Come

Given the social and generational impact of personal computers and the internet, by 1999, a music delivery system that worked somewhat like Napster may have been inevitable. The distribution network for digital delivery already existed in the form of the internet. The research and development of the various compression algorithms and software players had been done. The established industry did not attempt to establish a legitimate digital distribution system, effectively forcing an alternative market to develop. Digital files and delivery were not unknown technologies; the component parts had existed for about a decade. MP3.com had thoroughly test-run the system for the world to see but was limited by the lack of popular titles. It took someone outside of the major labels to unleash the pent up market demand by making the most popular music available in a convenient way.

Peer to peer (p2p) file sharing made so much sense. Just about anything you wanted to listen to was available immediately—even more than we are used to today. The uploading of the content was crowdsourced. Stores could never carry that size of catalog. Even Tower Records—the company that took pride in having a huge selection and local buyers who understood the market—had recently centralized its buying and limited the range of titles it carried. For kids too young to drive whether to use p2p or not was an easy decision, especially given that the music was free. Financially (or perhaps morally), it seemed that two attitudes prevailed amongst file sharers: “Big artists make lots of money so it will not affect them (or they do not deserve any more money), and smaller artists are not receiving royalties from the labels anyway.” Artists had been paying back

recording and other costs for a long time and for two decades they had also paid for expensive MTV-quality videos. With *Behind the Music*-type programs and information on the Web about successful and famous groups who were broke (such as TLC), consumers got the message and now they could choose whether to pay for music or not.

What made Napster particularly disruptive is that an entirely new distribution paradigm could be set up in a dorm room without funding a large organizational structure. The collection was built by crowdsourcing, it was housed in a distributed system with no centralized costs, and they didn't bother with copyright permissions. The fact that Napster distributed the music at no cost to consumers collapsed the perceived value of music, triggering a protracted slump in revenues. This was not unlike the effect free music on the radio had on sales in the twenties. Like radio, this was free music beamed right into your house. Additionally, prior to the dotcom bust of 2000, angel investors and venture capitalists valued viral development of large user bases with or without immediate prospects of a revenue stream. Napster was particularly damaging to the industry because it was so user-friendly and viral. It rapidly established peer-to-peer file sharing in the public mind.

Denial and Inaction

Disruptive technologies usually come from outside of the industry they disrupt. Ideally, the industry identifies the potential and buys or licenses the new technology. Ron Stone, founding partner in artist management company Gold Mountain Entertainment, consulted for the RIAA on behalf of the major labels through this period. Stone was in discussions with Napster and the majors (via the RIAA). He told me that, early on, Napster was willing to sell for \$5 million and that the majors declined the offer.²⁰ Instead, they litigated and procrastinated. Various estimates place the peak number of registered Napster users at more than 65 million.²¹ The major labels could litigate Napster out of existence but they could not change the fundamental societal shift that had occurred.

The majors had been in the distribution business since the dawn of the industry. Yet they opted out of digital distribution by not building or investing in a viable, revenue-generating, system. Even when digital delivery began full-force without them, they waited a further four years for a third party to build a digital store and allowed it to set pricing. In 2003 Apple launched the iTunes music store with 200,000 songs licensed from the majors; selling for ninety-nine cents apiece. This was a tiny fraction of the music available via peer-to-peer but, finally, music fans had what they wanted in an industry-approved form. The marriage between the iPod and the iTunes software was made in heaven for consumers and even more so for Apple. Over time, the iTunes store and other licensed digital delivery systems have reclaimed some of the revenues that might otherwise have been lost to free downloading, but overall numbers remain down.

What is particularly puzzling about this spiral of inaction and denial is that the industry did know digital distribution was coming. Robert Burnett quotes a 1995 International Federation of the Phonographic Industry (IFPI) report in *The Global Jukebox* that unequivocally states the understanding that music would be delivered “online, interactively,”²² going on to say that the challenge was how to make that transition “with an industry intact.”²³ Burnett goes on to cite an industry executive from a 1994 *Details* article saying, “We don’t simply want to be providers of content to someone else’s electronic delivery system. Why would we empower someone else to do this?”²⁴ Good question!

It may never be fully understood how much of Napster and its progeny’s success was due to the music being free and how much to the fact that it was a service done well and whose time had come. However, it is instructive that, as much as four years later, Apple was able to establish a profitable business, selling reasonably priced downloads via a user-friendly infrastructure. Seemingly, even with many free options, a large number of people were willing to pay for music delivered instantly in a convenient form. Of course, Apple’s primary motivation was to sell iPods, but they understood the synergy between content, delivery, and hardware and the value of controlling all three. The history was there for the reading: Edison, Berliner, Johnson, Victor, Columbia, RCA, Philips, and Sony grasped this concept. The much larger media conglomerates that formed the controlling oligopoly of the late nineties recording industry, evidently, did not.

The Consequences

More than a decade later, overall industry earnings, including both digital and physical revenues, are still depressed—down by more than 50 percent. From a high of \$14.6 billion in 1999, US music sales and licensing revenues fell 8 percent per year for a decade to \$6.3 billion. This was the first time in the history of the recording industry that sales were lower at the end of a decade than at the beginning.²⁵ It is impossible to say, with certainty, how much of these losses are attributable to Napster and the free services that followed. Nonetheless, with the US industry operating at more than \$8 billion less per year than it did in 2000, it is interesting to contemplate what might have happened had the majors created their own digital distribution system in the nineties. Even if they had missed that moment, what if they had quickly embraced and monetized Napster’s peer-to-peer model, before a generation learned to expect recorded music to be free? Millennials wanted music immediately and conveniently; the industry was not supplying it, so someone else did.

Recording industry history was repeating itself and even more so when the dot-com bubble burst in 2000, resulting in a recession that tightened personal finances. As with the introduction of radio in the twenties, music had become free and delivered directly into people’s homes. When money became tight after the 1929 Stock

Market crash and through the subsequent depression, recorded music sales fell by more than 90 percent. If the industry had identified both radio and the internet as alternative delivery mechanisms that it could have monetized, both the 1930s and 2000s slump in revenues might have been averted.

The Digital Disruption and Producer Income

The negative consequences of the digital delivery disruption for producers include less major label work, lower budgets and advances, and reduced royalty income. On the positive side, the oligopoly no longer controls distribution and there is a lowered barrier to entry for entrepreneurial producers, much as there was in the late forties and fifties.

Performance Royalties

In the United States, the recorded performance or production does not have the same potential revenue-generating value the song does. Songwriters and publishers earn significant additional revenues from airplay and other public performances of their songs. There are no comparable payments made to the artist, producer, or copyright owner (often the record label) for the use of the sound recording by terrestrial radio or other public outlets. This is not true in other economically developed countries. For instance, in the UK, radio stations and other outlets make a performance payment to the owner, featured artist, and non-featured performers (as well as the publisher and writer) every time a record is broadcast or played publicly. The US labels initially dealt with this (in the first half of the last century) by banning airplay of records, so radio—flush with advertising dollars—financed live shows on air. Radio stations made transcription discs to time-shift live performances, but by the forties, record companies decided that airplay had promotional value. In 1942 Capitol began sending free promo copies of its releases to stations and the other labels followed suit. Publishers made no such concession and consequently receive payment, along with songwriters, when their songs are played over the airwaves.

The DMCA (Digital Millennium Copyright Act of 1998) provides payments for use of the recording on satellite and internet radio, but as mentioned earlier, does not include producers, engineers, mixers, and remixers. Currently, there is no legislation that requires US terrestrial radio, which includes FM, AM, and HD channels, to make payments to labels, artists, musicians, background singers, or producers. Since the 1920s, radio conglomerates have built empires and fortunes using the public airwaves. Initially, it struggled to find a business model, but once radio began to convert its audience numbers into advertising dollars, it has not looked back. That on-air music attracts audiences has been known for a long time.

At first, the musicians union focused on keeping musicians employed by only permitting live performances. Nevertheless, the struggle over playing records on air and not compensating musicians or anyone involved in the creation of the sound recording dates back to the earliest days of radio.

It is testimony to the lobbying power of the radio conglomerates that there have been more than twenty-five unsuccessful bills presented to Congress since 1926.²⁶ In 1932, US Representative William I. Sirovich (R-NY) expressed disquiet regarding, “[The absence of] protection to the author and manufacturer who puts his talents or his money into the [sound recording], without getting any compensation from the others who are using it for commercial gain.”²⁷ Attorney Shourin Sen demonstrated in his 2007 *Harvard Journal of Law and Technology* article that the percentage of performers writing their own material has steadily increased since 1950. Using statistics from *All Music Guide* he shows the percentage of the top fifty songs on *Billboard*’s year-end charts written by their performers was 7 percent in 1950, 22 percent in 1960, 50 percent in 1970, 60 percent in 1980, 64 percent in 1990, 68 percent in 2000, and 88 percent in 2004.²⁸ In the fourth edition of *The Art of Music Production: The Theory and Practice*, my own research traces a similar pattern for producers. Songwriter producers, in the top ten of the *Billboard* Hot 100, increased from 0 percent in 1960 to nearly 100 percent in 2011.²⁹ Artists and producers have to make money somehow. Although causation is difficult to prove from statistics, this trend has the hallmarks of an art form and a profession reshaping itself to accommodate an unbalanced compensation system.

That a recording played over the air has no value when a song does is hard to rationalize. The argument that value is exchanged because airplay promotes sales is unsupportable other than for releases that receive significant spins. Much of the music played on terrestrial radio is catalog material with a low concentration of spins and is often not back-announced so that listeners can identify it. For this material, airplay does not produce meaningful sales. Songwriters and publishers are paid from airplay and if the spin promotes a sale, they are paid the mechanical royalty from the sale too. Promoters could equally well argue that concerts promote record sales and thus decline to pay artists to perform at their venues. In fact, promoters often decline to pay baby acts until they can attract an audience, but radio does not play records that do not test well.

Radio has long tested recordings using methodologies such as auditorium music testing (AMT), where as many as 200 people rate up to 600 song hooks. Callout research tests a smaller number of tracks over the phone and online music testing (OMT) does what the name suggests.³⁰ Radio spends money on testing because recordings attract audiences, and listeners equate to advertising dollars. This is why stations control their playlists so tightly. Recordings that test poorly are quickly taken off the air. Listeners tune in to a station because they like the programming. In the case of music radio, the programming generally conforms to genre or format. Program directors add value by interpreting research and assembling attractive playlists and programs. In the case of a contemporary hit record,

there is a reciprocal or mutualistic relationship. When there is no potential for a hit, the relationship tends to be one-sided or commensalistic, where one side benefits (the station) and the other is unaffected. Recordings promote radio by attracting listeners, but many recordings experience no measurable sales or use benefit from the airplay. Furthermore, research by Stan J. Leibowitz of the University of North Texas showed that those who listen to more music radio buy less music.³¹ Listening to talk radio showed no such substitutional effect on music purchases.³²

The performance royalties earned by a hit song (as opposed to the recording) played on terrestrial radio are substantial. As John Meager reported in the *Irish Independent*, Gerry Rafferty earns more than \$100,000 in royalties every year from his 1978 song “Baker Street.”³³

For producers and artists who write, royalties from use of the composition can compensate for the reduced royalty income from the sound recording due to diminished sales. But the lack of a performance right for the sound recording causes economic distortions, with critically unbalanced incomes occurring in groups with both writing and non-writing members. For mid-level producers working in the current lower sales environment, the absence of this revenue may deny them the ability to make a living. The absence of this performance royalty for sound recordings affects labels and may have been a factor in accelerating the introduction of 360 deals (more of which later). It may also exacerbate the longstanding tendency for business people to demand a share, or all of the publishing—or even a writing credit—when they made no creative contribution.

Radio stations in most economically advanced countries in the world pay a performance royalty when they play a sound recording over the air. The fact that the US stations do not, withholds an important source of income from labels, artists, musicians, singers, producers, engineers, mixers, and remixers. Collections agencies in other countries will not pay royalties to the United States if the United States cannot reciprocate. It is nearly impossible to calculate the amount of money lost to US recording artists, producers, and independent labels every year. However, informed sources estimate the number to be in the hundreds of millions if not billions of dollars. Major labels have domicile in multiple territories and are thus able to collect these monies.

Direct versus Statutory Licenses

In 2012 the largest radio conglomerate, Clear Channel Communications, agreed to a direct performance royalty deal for terrestrial airplay with Taylor Swift’s label, Big Machine. The deal pays Big Machine a percentage of advertising revenues in exchange for a reduced rate direct deal for digital performance royalties. According to *Billboard* the digital rate will drop from \$0.21 per play per listener (set by the US Copyright Royalty Board (CRB) under the DMCA) to 2 percent of webcasting ad revenues on a pro rata basis. The terrestrial rate is said to be a pro rata 1 percent

of advertising revenues from traditional radio.³⁴ Subsequently, Big Machine struck similar deals with other radio conglomerates. A number of other independent labels have followed suit with Warner Bros. being the first major to negotiate a direct deal (in 2013). After nearly a century of US radio broadcasters making no payments to sound recording copyright owners and creators, these deals might appear to right a longstanding wrong. However, there are a number of negative aspects and likely ulterior motives.

Direct deals will deny US labels, artists, producers, etc., the possibility of a reciprocal right with other countries. The hundreds of millions of dollars in performance royalties that are generated by airplay of American recordings on foreign radio stations will not be liberated. By striking these direct deals, US broadcasters can save many millions of dollars by not having to make reciprocal payments to foreign copyright owners for the airplay of their recordings. For the labels that have struck these deals, the reduction in digital royalties may initially be outweighed by the terrestrial royalty. Nevertheless, in the longer term, as consumers increasingly choose digital delivery of radio, the balance is likely to tip the other way toward a net loss of revenues for the recording industry. Finally, there is concern that Clear Channel's motivation is to establish a market rate that the CRB might accept as the industry standard when it sets the next four years' digital non-interactive rates in 2014. The same concern was expressed when SiriusXM tried to make direct licensing deals with labels. The satellite broadcaster wound up suing SoundExchange and A2IM, alleging collusion. In January 2013 the case against A2IM was dismissed with a stipulation agreement reaffirming A2IM's First Amendment rights to opine, recommend, and advocate on such issues.³⁵

Pandora is rumored to be considering direct license deals and Apple has chosen that route for its new streaming service. Unlike the statutory deals, direct license deals do not require the label to pay 50 percent of revenues to the artist without recoupment, although some labels may still choose to do so.

Post-Millennial Business Models

American Idol

American Idol is worthy of note because it created its own space and has exercised considerable influence within the music industry as well as with consumers. Talent shows are a longstanding concept but Simon Fuller's particular vision, which began with the British show *Pop Idol*, embodied unique twists (some borrowed from the reality shows) that made it important in the field of music production. Fuller established himself in the music industry, after a stint in publishing and A&R, by managing producer and artist Paul Hardcastle, whose hit "19" was the source of the name of Fuller's Management company.¹ 19 Entertainment managed the Spice Girls, which for most would have been enough. Nonetheless, the entrepreneurial and visionary Fuller parlayed his prior successes into the British television show *Pop Idol*, then into *American Idol*, and—ultimately—the worldwide franchise. These were not simple talent shows like *The Gong Show* and *Star Search* in the United States or *Opportunity Knocks* and *New Faces* in the UK.² Those, prior, knockout-competitions did not focus solely on music and there was no grooming of the artists by the shows, no behind-the-scenes footage, and, apart from very short on-camera conversations between the host and the artist, no extended development of the artists' profiles or personality. Voting, on these shows, was by a panel of judges, with the exception of *Opportunity Knocks* where the public would mail in their votes. The viewers' relationship with the other three shows was passive; they had no input that could influence the results and there was no specific plan for the winners' after-show career.

The genius of the *Idol* franchise is that its intrinsic marketing works on many levels. It is highly targeted, seeking pop singers of the specific type (if not genre) with which (founding) judge and record producer Simon Cowell³ and Fuller had enjoyed previous success. The buildup and early selection process, featuring behind-the-scenes footage of dramatic expectations and denigrating humor, leading to the gladiatorial eliminations, appears to satisfy a primal spectatorial need.⁴

As the group of early finalists coalesces, their names, faces, and personalities become familiar to the TV audience. The TV audience interaction via mobile phone text voting⁵ is a phenomenal revenue generator,⁶ and a form of mobile Web 2.0 interactivity that allows viewers a sense of involvement in picking the winners. Fox

Television cross-markets the show ferociously, allotting advertising during other prime-time shows. The marketing coup de grâce is the tie-in on the *Fox News* morning show, after the previous evening's episode. There the anchors discuss winners and losers alongside news items, feigning a casual discussion about the previous evening's show. By the time the winner is chosen, their first release has been selected, recorded, tested, and pre-marketed on the show. By the last show, the winner and other contestants have become household names familiar, in some detail, to millions of viewers and often known, if only for a time, by first name only. Winners reap the benefit of this hypermarketing machine and, in many seasons, other finalists have had successful if, in some cases, short-lived careers.⁷ As well as being a seemingly unstoppable marketing powerhouse, the show is the most definitive of A&R sources for 19 Recordings.

To enter the selection process, contestants must sign a contract allowing use on the show of any footage of them, and committing to a first-option deal with Sony-BMG via 19 Recordings, as well as management and merchandising deals with Fuller's companies.⁸ The various layers of companies that now own the show reap the rewards from the shows, ancillary deals, and from the subsequent sales of recordings by the winners and runners-up. Having test-marketed the artist and material with consumers, the company releases a single and album in the marketplace coincident with the close of the season, capitalizing on momentum from the show.⁹ This almost guarantees a hit for the producers of the debut recordings; previous winners having sold tens of millions of albums in total.

Downloads

I talked about downloads in chapters 12 and 16, but the subject warrants further discussion under this chapter heading. While the debate continues, many believe that free downloads via Napster and its scions caused the decline in industry revenues. Digital downloads were not intrinsically causative of the collapse. The industry failed to accept the need to move to digital delivery and did not create a business model or an infrastructure to monetize the inevitable shift. It was not until six years after MP3.com and four years after Napster—but, by any measure, well into the era of digital distribution that Apple's iTunes launched. It became somewhat of a financial savior replacing some but not all of the lost revenues from physical sales. Inexplicably, allowing Apple to instigate and dominate digital distribution went against prior music business practice and directly contradicted industry comments as quoted in the previous chapter from Robert Burnett's book.

On the one hand, downloads in general and iTunes as a business model effectively dismantled many axiomatic aspects of music delivery. The half-century sanctity of the album was violated, every track becoming available for individual purchase. Pricing dropped, something that no prior format change had done. Proximity to a large music retail store became irrelevant; consumers online in the

back of beyond could instantaneously purchase from the same massive inventory as those in a major metropolis. While gross revenues are down, the net business income for many companies has not fallen as much and may have even risen. From a label's perspective, downloads represent cleaner income; there are no costs for manufacturing, warehousing, shipping, handling, and inventory. With physical product, returns are a constant risk to the bottom line and they do not exist with digital delivery. Staffing costs can also be lower. The 70/30 split with iTunes is slightly better than the wholesale/retail split for physical goods. Small indie labels can enjoy comparable margins to those of a major label. Artists and producers who own their own labels can increase their net share of revenues by several hundred percent.

On the other hand, downloads simply moved the sale/ownership model out of the physical domain into the digital. Many parameters remained much the same, including the bases for artist and performance royalties. This is true for both the sound recording and on the publishing side. Mechanical royalties for downloads are treated as they are for the physical purchase of a CD or vinyl.

Although authorized downloads have helped compensate for losses in physical sales, overall gross revenues are still below the 1999 peak of \$14.6 billion, having fallen eight percent per year to \$6.3 billion a decade later. Over the same period, dollars spent on recorded music fell from \$71 to \$26 per capita.¹⁰ *CNN Money* claimed that "A decade of iTunes singles killed the music industry."¹¹ They base this assertion on the 1.4 billion "digital singles"¹² sold in 2012, which outstripped CD sales by 700 percent. *CNN* went on to say, "Not since the vinyl era has the single been this popular."¹³ However, there is a fundamental difference between digital downloads and physical goods. With digital delivery, the consumer is not limited to tracks that the label decides to issue as singles. Every track on an album is available for individual download (unless the label blocks that option). The numbers overwhelmingly show that consumers prefer being able to buy only the tracks they want.

US industry revenues had already dropped from \$14.6 billion to \$11.8 billion by the time iTunes launched. This is usually attributed to the free download sites such as Napster. For iTunes to have launched without offering single-track downloads would have undermined their ability to compete with the illegal sites. By 2003, consumers had been able to get just the tracks they wanted for four years, without buying (or even downloading for free) a whole album. When music fans have a free alternative, the wisdom of forcing consumers to buy albums, at more than ten times the price and full of tracks they don't want, is questionable. As mentioned in chapter 12, this major label policy resulted in the syndrome of albums containing two radio singles (that consumers could not buy) and a lot of filler tracks. A quick Google search for "filler tracks" still produces many pages of returns, even though, thanks to digital delivery, this is now a practice that is passing into history.

It is almost certainly an oversimplification to attribute continuing industry woes to the popularity of track downloads, or to any other singular cause. Unauthorized downloading did not end when iTunes launched. Nine years on, in

2012, the *Telegraph* reported that, in the prior six months, there were 96,868,398 files shared illegally in the United States over the BitTorrent network (43,314,568 in the UK).¹⁴ In the first half of that year, “Rihanna’s album *Talk That Talk* was the world’s most pirated release, with Musicmetric tracking 1,228,313 downloads.”¹⁵ Also confusing the issue, we have models of music delivery including interactive streaming services such as Spotify (more below), non-interactive streams like SiriusXM, and hybrid non-interactive models like Pandora. These require massive audience uptake in order to compensate for lost sales, but they are still early in their development curve.

Streaming Audio

Like downloads, the advent of online streaming media depended on sufficient development of the Web, adequate bandwidth, and workable business models. As mentioned there are two types of streaming audio: Non-interactive and interactive. Both earn revenues from subscriptions and/or ad support, although many depend on venture capital for years. If we view all the services that deliver music to be listened to but not owned as part of the same continuum, then the US royalty rates appear idiosyncratic. This is especially true if we include over-the-air (terrestrial) radio, which is simply a non-interactive stream in the electromagnetic spectrum. As Michael Robertson puts it, there is a “spectrum bias.”¹⁶ He pointed out in a TechCrunch article that royalty payments range from zero on up depending on the station’s spectrum. In the 30–300 MHz (FM radio) range, the royalty rate is zero. Satellite radio (2,332.50–2,345.00 MHz like SiriusXM) pays 15 percent of total revenues whereas services operating in internet, wifi, or cellular phone frequencies pay a per-stream penny rate (a fraction of a cent per stream).¹⁷ Robertson commented that these per-stream rates will cause net radio to “die a slow death in the U.S.” Unfortunately, artists and producers have already seen their ability to make a living severely diminished, at first by piracy and now by miniscule per-stream rates.

This is a complex issue wrapped in passionate rhetoric that is clouded by the fact that some parties are not acting in good faith. The players who have the greatest negotiating power are not treating the recording industry as a single ecosystem that needs to sustain all, beginning with the creative artists and producers, through the funding entities and the delivery mechanisms, all the way to the end users. For instance, major labels are demanding large advances from services that will exceed royalties due from the service. The difference between what the service would have paid a label (at the end of the accounting period) and the advance is known as (euphemistically and inaccurately) digital breakage. This money tends to find its way to the bottom line of the label rather than be split with the artists and producers. The majors also siphon revenues away from artists and producers by negotiating an equity position in the technology companies. There is no indication that any value or income from that equity will be shared with artists and producers. These

types of practices reinforce the oligopolistic nature of the industry, diminishing the open and competitive nature of the market, which disadvantages independent artists, labels, and producers.

Streaming services are trying to negotiate lower royalty rates while artists, musicians, and producers are watching their ability to make a living disappear. As David Byrne pointed out in his recent *Guardian* article, a band of four on a 15 percent royalty, would need “236,549,020 [Spotify] streams for each person to earn a minimum wage of \$15,080 (£9,435) a year.”¹⁸ He went on to say, “It seems obvious that some people are making a lot of money on this deal, while the artists have been left with meagre [*sic*] scraps.”¹⁹ It is often speculated that streaming audio is the future of music delivery. If so, the artists, musicians, engineers, and producers who create the recordings need to be compensated for their creativity, time, and expertise as well as the economic value they have infused into their works. This is the value that is converted by delivery services into audience, sales, subscriptions, and advertising dollars. People don’t pay \$120 per year for Spotify because of the technology; they are paying for access to the music. Likewise, with free services like radio, they don’t listen for the ads; by selling ads the stations are monetizing the listeners’ interest in the music. As we saw with radio, the early years were financially uncertain until the user base expanded sufficiently to support the advertising business model. Radio corporations undoubtedly argued that they could not afford royalties. However, radio became a multibillion-dollar industry and for nearly a century (in the United States) it has resisted dozens of attempts to establish a reasonable performance royalty for the exploitation of the sound recording.

Non-Interactive Streams

As mentioned, non-interactive streams are analogous to radio broadcasts and include parallel Web streams or simulcasts of terrestrial radio station programming, satellite radio, digital cable and satellite services, and internet-based stations. Pandora is also regarded as non-interactive even though its thumbs down (reject or jump past a track) or thumbs up (mark it for future play) feature offers a degree of control to the listener. It is considered non-interactive because consumers cannot choose the next track. Payments from these services are made according to the Digital Millennium Copyright Act (in the United States) and conform to the Copyright Tribunal Board’s rates. Payouts are distributed by SoundExchange (in the United States) except if the label has struck a direct deal with the station and does its own accounting. SoundExchange is negotiating to distribute artists’ royalties from some direct deals. As mentioned in chapter 12 under the subheading of “digital radio,” producers, engineers, mixers, and remixers will only receive their share of these royalties by contractual agreement with the artist, and direct payment from SoundExchange can only be made by filing an artist signed letter of direction with the PRO. Other territories have different arrangements for the producer share

of performance revenues. In the UK, producers who are classified as “performing producers” can receive their rightful share of performance income from PPL.

Streaming on Demand

Interactive streaming services enable users to play whatever tracks they want to hear in whatever order they want to hear them. Such services include Rhapsody, Spotify, MOG, and Rdio. Most of these services offer some type of freemium model with either free trial periods or an ad-supported option for which access is limited to certain devices and a lower bit rate (inferior audio quality). Listeners can choose from millions of tracks in most genres. Users never own the tracks, and the service pays artists and record labels a tiny fraction of a penny every time a track is streamed. The appeal is the huge library of music, available from anywhere with an internet or mobile phone connection. Typically, a certain amount of offline listening is also permitted. The advantage to artists, producers, and labels is the “rental” fee paid for every listen. There is no limit to how much music a subscriber can listen. This removes the cost hurdle to listening to new or unfamiliar music, which should benefit less well-known artists, producers, and labels. As mentioned earlier under the general subheading of “Streaming Audio,” there is much debate over whether the fractions of pennies will add up to enough money, for labels, artists, and producers, to make the model viable. With the number of mobile devices exceeding the number of people on the planet, combined with internet penetration, if enough people use these types of services, revenues could eventually become substantial. As discussed, the question will be whether these revenues will be divided fairly among the stakeholders.

Rhapsody began streaming in 2001. It started from an idea in 1998 that became TuneTo.com, which was acquired by Listen.com and then RealNetworks. It spun off as a standalone company in 2010. After a decade in business, it expanded by buying the revamped subscription Napster services. Music streaming services are growing and, at the time of writing, Spotify accounts for a significant percentage of music revenue in its home territory of Scandinavia. The *San Francisco Business Times* reported that, in the United States, subscription revenue from streaming services had increased from \$212 million in 2010 to \$241 million in 2011. Users totaled 1.8 million, up from 1.5 million over the same period.²⁰

Web 2.0, Social Networking, and Social Media

Web 2.0, social networking, and social media are three of a number of fuzzily defined terms that describe the nature of the digital realm in the first decade of the new millennium. Tim O'Reilly and Dale Dougherty coined the term Web 2.0 in a “conference brainstorming session.”²¹ As O'Reilly later described: “Web 2.0 is the

business revolution in the computer industry caused by the move to the internet as platform, and an attempt to understand the rules for success on that new platform. Chief among those rules is this: Build applications that harness network effects to get better the more people use them.” (This is what I’ve elsewhere called “harnessing collective intelligence.”)²² Clearly *Wikipedia* fits O’Reilly’s last criterion having been built into the world’s largest wiki (a concept invented and named by Ward Cunningham²³) entirely by crowdsourcing.

The term “social network” was used by J. A. Barnes in his 1954 paper, “Class and Committees in a Norwegian Island Parish,” well before the advent of personal computers and the Internet.²⁴ In his paper Barnes describes “cross cutting ties and groupings in which not only friends and enemies but also leaders and followers, are inextricably mixed.” A case can be made that Compuserve (1969), the bulletin board system (BBS—1978), Usenet (1979), Prodigy (1984), AOL (1985), and Tripod (1992) all had a social component. I used Compuserve, BBSs, and Usenet in the eighties as a means to locate and share information. Geocities, an online community that began in 1994, also loosely fit under this category. However, it was 1997 when SixDegrees launched with user profiles as well as friend finding and management features that came to characterize the social networking fever that was to come.

There have been and are now far too many sites to list, each with its specializations. Some prominent milestones of the past decade include LinkedIn and Myspace from 2003, then Facebook, YouTube, and Twitter (launched 2004/5/6, respectively). Social media has had far-reaching effects in society and on the music industry at many levels. Labels and producers discover artists using it, perhaps the most successful examples being Justin Bieber and his stablemate PSY, both discovered by manager Scooter Braun. More recently, sixteen-year-old New Zealand artist Lorde was signed to US label Lava Records, just a few months after making her five-song EP available for free on SoundCloud. Within a year she had been nominated for four Grammy awards, two of which she won less than fourteen months after her free posting on SoundCloud. Artists, producers, and labels use social media as marketing, promotion, and even distribution tools. The low cost and ease of doing so has been another factor in democratizing the industry’s processes with the potential for impact at any stage in a career.

Commonalities

If there is a common factor with each of these trends it is that they represent a shift in methodologies that the recording industry developed over more than a century. The archetypes upon which *American Idol* is based date back decades. However, the level and breadth of direct and ancillary monetization that the business has achieved—inspired by sports sponsorship deals—is relatively new to the

recording industry. Revenues have grown even as the show's television audience has diminished.²⁵

Making money in the recording industry, especially as a producer, is considerably more complex than it was. Revenue streams now come from many sources and producers can only access certain of them by contractual agreement and with letters of direction. Promotional outlets abound but are labor intensive to reach and usually have less individual impact than traditional media. A tailored approach to each project, creatively combining and leveraging both new and familiar technologies as well as business methods, will most likely reap greater rewards than clinging to older *modus operandi*.

The Unfinished Work

Sampling, Mash-ups, and Remixes

“In 1959 the poet and artist Brion Gysin claimed that writing was fifty years behind painting.”¹ To resolve this shortcoming, he and William Burroughs applied modernist collage or montage techniques from the visual arts to written texts and audio recordings. Aside from their influence on lyricists, some view this as “prefiguring sampling or ‘mash-ups’ in popular music.”² However, there were many examples of music embodying collage techniques prior to Gysin and Burroughs’s work. As early as 1906 Charles Ives composed “Central Park in the Dark,” an impressionistic combination of sounds of nature, the city, and snippets from popular tunes of the day that some consider to be the first sound collage. Even before that, classical composers used fragments of other’s material. An obvious example is Tchaikovsky’s *1812 Overture*, written in 1880, featuring strains of *La Marseillaise* (the French national anthem), which had been written eighty-eight years earlier during the French Revolution (1792) by Claude-Joseph Rouget de Lisle. Clearly these were not montages of recordings—the borrowed and found content was described on manuscript. Pierre Schaffer’s “Railroad Study,” composed in 1948 is the first piece of *musique concrète*—a collage assembled using sound recordings of trains.

Using Records as Raw Material

It was in Jamaica that finished records began to be used as “raw material” for montages of new music.³ Sound systems (or “sounds”) were, in effect, “mobile discotheques”⁴—with their huge speaker cabinets and powerful amplifiers that performed at outdoor arenas known as “lawns.” This culture became established in 1940s and ’50s Jamaica where, at that time, many people could not afford a record player, so DJs or “selectors” would play records for dancing. Initially, the records were mostly American R&B imports that were able to be heard on jukeboxes throughout Jamaica and on southern American stations that could be picked up on the island.

Some say it was as early as 1950 and others as late as 1956, but sometime during that period, Winston Cooper, professionally known as Count Machuki (spelled

Matchuki or Machukie on some records), began “adding spoken word improvisations”⁵ or “toasting”⁶ over records being played on sound systems. He said he did it, “to take away the drabness, to make the sound system sound different from a jukebox.”⁷ In doing so Machuki changed the role of the Jamaican DJ from that of simply the “selector of the material.”⁸ He “extended African oral traditions into an electronic realm”⁹ and introduced the influence of American radio DJs’ jive patter. Machuki even anticipated the human beatbox of rap by a couple of decades when he added what he called “peps” to pep up records that he thought sounded weak.¹⁰ He spawned a new school of Jamaican DJs who began toasting and influenced the later Jamaican dancehall DJs. Among other antecedents there is a connection from toasting to rap through hip hop’s first DJ, Kool Herc, who was a Jamaican immigrant to the South Bronx.

Toasting over a record does more than change the way that record is perceived by the audience: it creates a new piece of music with joint creative authorship, although the law does not support this characterization. Toasting over an existing recording is not so different from synchronizing an a cappella vocal from one artist with the backing track from another—as many post-millennial mash-ups do. It was not long before the sound systems, in an effort to retain some exclusivity in the music they were playing, began creating custom-made records. By 1959 several Jamaican DJs were releasing homegrown productions on labels such as Coxsone Dodd’s Studio One and Duke Reid’s Trojan. Out of sound system culture came the instrumental “version” (ubiquitous in late 1960s Jamaica) that, “in one account... was created when Treasure Isle studio engineer Byron Smith erroneously omitted the vocal track from a test pressing or ‘dubplate’ (acetates for live use) created for Ruddy Redwood’s SRS sound system.”¹¹ Allegedly when Redwood played the mix the crowd sang the vocal part, and the instrumental version, a sound system staple, was born. Versions did not use any additional mix techniques but DJs would toast over them live at the dancehall and commercial singles began including versions on the B-side. Pioneered by U-Roy (then DJ with King Tubby’s Home Town Hi-Fi sound system) in the early 1970s, DJs also became recording stars, toasting over rhythm tracks.

There is debate over whether Herman Chin Loy’s *Aquarius Dub* or Lee “Scratch” Perry’s *Blackboard Jungle Dub* (both 1973) was the first dub album. Nevertheless, it was King Tubby who introduced the radically deconstructed and reconstructed dub mixes we associate with reggae. Not only did he drop parts in and out but he used heavy electronic processing including pronounced reverb and echo.¹² Dub developed in a recursive process of serving the sound systems for the purpose of dancing. As Mike Alleyne says in his authoritative book, *The Encyclopedia of Reggae*, the producers and engineers on these dub versions became “more important than the artist whose work was being remixed.”¹³ Dub is the progenitor of dance remixing: The electronic recomposition of a recording for specific use in dance venues. Many producers and remixers, including Larry Levan, François Kevorkian, and myself (with early Spandau Ballet and King remixes in particular), were directly influenced by Tubby’s mixes. Independent of prior musical artworks, dub was a

conceptual shift away from the idea of a record as a finished product toward the notion that its parts can and should be recycled, reprocessed, and reshaped to fit the specific needs and uses of an intended audience.

Disco

Live bands usually understand the need to adjust their material for a particular audience, adapting set lists, often stretching out, and changing arrangements on the fly. Short track lengths and the lack of malleability of the material (other than what to play next) were problematic for club DJs playing for dancers anywhere. For years all they had were 45s that typically ran less than three or four minutes and no DJ wants the floor to clear while they are changing from one record to the next. Terry Noel, DJ at New York's swanky sixties club Arthur, is said to have been the first to mix records live, stitching together disparate records, genres and grooves into seamless sets while mixing in elements from one record, over another. Noel is reported as saying, "People would come up to me and say, 'I was listening to the Mamas and Papas and now I'm listening to the Stones and I didn't even know.'"¹⁴

However, it was Francis Grasso who began spinning a few years later (in 1968 at the Sanctuary in New York City) who is said to have perfected some of what would become standard DJ techniques such as the slip cue, extending parts of a song by playing two copies of the same record then mixing between them, and beat matching (running two records in synch at the same time). These were more than clever technical or performance tricks; as Brewster and Broughton point out, "Before him, people had played records as if they were discrete little performances; Francis treated them like movements in a symphony: continuous elements in a grand whole."¹⁵ This is a critical conceptual difference, insofar as the most successful DJs from this point on elicited an audience response by adding creative elements beyond stringing together the latest and most popular records along with a few requests. Using finished, often well-known hit records as their primary raw material, their sets became creative collages in interaction with the audience. This required selection, juxtaposition, transition, and superimposition, along with an understanding of key and tempo relationships, all of which had to be adjusted in response to the audience.

Some DJs began re-editing tracks on quarter-inch tape. These kinds of techniques developed in parallel to Jamaican dub and, in establishing the utility of longer mixes for dancing, were also influential on later club remixes and led to twelve-inch dance releases. Initially, these "mixes" were simply copied and edited sections of the master two-track, emulating the extension techniques DJs had developed by playing two copies of the same record on two turntables. Inevitably, creative impetus moved the methodology to full multitrack remixes with new treatments and effects (often influenced by dub mixes). With the specific needs of the dance floor in mind (as opposed to radio, for which the original mix was created) remixers began to

add and change parts. At this point, remixes began to musically disassociate from the original, eventually to the extent of becoming an almost completely new production. Additionally, the inclusion—on twelve-inch vinyl releases—of bonus parts such as a cappella vocals and breakdowns of parts of the track allowed DJs to construct their own mixes live in the club. BPM markings began to appear on labels to help DJs keep their sets flowing.

Hip Hop

Less than ten miles uptown from the sites of disco's beginnings, and while it was still evolving, a radically different form of music debuted. Like dub and disco it would be based on manipulating what had been thought to be finished records, to enhance the experience for dancers. Clive Campbell, aka DJ Kool Herc—a Jamaican immigrant to the South Bronx—launched a groundbreaking new genre of music. What became an international subculture had modest beginnings on August 13, 1973, in the recreation room of the building at 1520 Sedgwick Avenue, in the South Bronx, where Herc and his family lived. He was trying to raise some money for his sister's birthday so she could buy some clothes downtown, not far from where disco had begun just a few years earlier.¹⁶

Herc acknowledges seeing huge sound system speakers loaded into a Trenchtown dance hall in Jamaica. Some of his turntable techniques were similar to the disco DJs but Brewster and Broughton report that “the highly influential rhyming style that he and his MCs used was clearly based on Jamaican toasting rather than the elaborate couplets of the rapping disco DJs.”¹⁷ He also used an echo chamber like the Jamaican DJs and favored heavy bass sounds. What made him fundamentally different and his influence so far-reaching was his decision to “spin the percussion breakdown from two copies of the same record one after the other, effectively replaying the break and extending it.”¹⁸ He called this technique “the merry-go-round.”¹⁹ He also put the best parts or breaks from several records together and tried “to make it sound like a record,”²⁰ adding, “Place went beserk.”²¹ This introduced the “concept of breakbeats,”²² which, when it collided with the technological innovation of samplers, led to “loop based composition technique[s].”²³ He told Angus Batey, in 1997, “When I extended the break, people were ecstatic, because that was the best part of the record to dance to, and they were trippin’ off it.” As with dub, Herc was creating new or at least drastically deconstructed and reconstructed music using fragments of finished sound recordings and his own, electronically treated, verbal interjections. He focused on the most exciting parts or breaks that worked for the crowd. Grandmaster Flash, Afrika Bambaataa, and Grand Wizard Theodore would refine and extend Herc's elemental contribution, but DJ Kool Herc is the originator of the music we came to know as hip hop.

Adapting Compositions

Various artists including Picasso and Stravinsky have been credited with saying “The good borrow; the great steal,” and musicians have long used previous works in their compositions. Classical composers such as Aaron Copland, Béla Bartók, and Tchaikovsky are among many who have acknowledged folk melodies in their own pieces. Bob Dylan, Pete Seeger, and Woody Guthrie all adapted previous material for their own compositions using the “folk process.” This term is often attributed to Pete Seeger’s father, musicologist Charles Seeger (1886–1979), but the concept dates back much further. Cecil Sharp (1859–1924), English folk song collector, outlined three criteria: continuation, variation, and selection, for the transmission and evolution of folk songs. However, Sharp took a romanticized and isolationist view of traditional folk music as being untouched by the influence of popular music of the time.²⁴ A fundamental feature of much contemporary popular music composition involves borrowing ideas from elsewhere. Nevertheless, some publishers and writers aggressively pursue what they perceive as plagiarism and vice versa with wrongful allegations. Recently, this was seen in the Robin Thicke “Blurred Lines” controversy. Numerous swing and bebop compositions are contrafacts, where a new melody is superimposed over a chord sequence from a famous tune. “I Got Rhythm” is the most widely used sequence (termed “rhythm changes”) on which many jazz tunes are based. Like the twelve-bar blues, contrafacts give musicians a familiar sequence to solo over. Furthermore, the writer of the new melody can claim the songwriting and publishing royalties for the new composition rather than paying the original composer (George Gershwin in the case of “I Got Rhythm”).

Adapting Recordings

There are creative ways to use recorded sound as raw material but, in most cases, current copyright law does not legitimate public distribution of the results without prior explicit permission from the copyright owner. No permissions are required if a recording is in the public domain, where no third party can legally claim ownership, or if the legal owner has chosen a creative commons license that specifically permits such reuse. By contrast, the laws governing the underlying composition are more accommodating. Any performer can make and release a recording of a song by another composer with some exceptions and limitations. The song must have been previously recorded and distributed, it must be a non-dramatic work (not an opera or musical, etc.), and it must not be an audiovisual recording such as a video or DVD. If the song has not been previously recorded and distributed publicly with permission from the copyright owner, permission must be sought from that owner and the same is true for a dramatic work. In the case of an audiovisual recording, a synchronization license must be obtained from the copyright owner. Furthermore,

in recording a cover version, substantial changes to the song, including changing the melody or lyrics creates a derivative work, as does a translation, and these require permission from the copyright holder. Likewise, working recognizable fragments of a copyrighted melody or lyric into a new composition requires permission from the copyright owner. (Samples, in addition to obligations to the sound recording copyright owner, also create a derivative work and require permission from the owners of the composition.) Additionally, it is important to note that copyright laws are not the same in every country. While it may be legal to use a work in a certain way in one territory, an international release can raise legal issues under another nation's laws. Even after the first mechanical license has been issued, the copyright owner must still be notified of your intent to claim a compulsory mechanical license and the applicable fee must be paid (in the United States, 9.1 cents per track or 1.75 cents per minute, whichever is greater). However, if all these conditions are met, the copyright owner cannot refuse the mechanical license.

As limited and convoluted as the compulsory license requirements are, this law has enabled a thriving reuse market for copyrighted songs that has handsomely rewarded many composers and has been a creative boon for artists and producers. No such compulsory license exists for sound recordings. The use of any part of a copyrighted sound recording, unless negotiated directly with the copyright owner, is illegal and leaves any artist or producer who does so vulnerable to a lawsuit and loss of revenue from the sale and use of the new work. We are now many decades into the era of the recycling of recorded performances and there is still much misunderstanding in the creative community as to what is legal. As the law stands, any unlicensed reuse of a copyrighted sound recording, no matter how greatly transformed or difficult to identify, should be regarded as being vulnerable to legal challenge. This means that producers have to be aware of the original source of every sound that goes into their productions. Since the eighties, producers have been required by major labels and many independents to assert, via their contracts, that the finished production contains no uncleared samples and to indemnify the label against any lawsuits should any be found.

DJs can hone their sets to levels of perfection, using techniques that are characteristically theirs, but they cannot legally make the material that comprise those sets available for sale (or for free) without clearing the tracks with the sound recording copyright owners, even though they may be entitled to some rights in the sequence. Understandable confusion regarding the necessity for clearances is exacerbated by the unchallenged circulation of many mixtapes and mash-ups as well as sample-based recordings. Someone else "getting away with it" is no legal protection.

Mash-ups have proliferated rapidly since the beginning of the new millennium. They signify the interactive component of the web embraced by millennials. Having grown up with expectations of technology, many are no longer satisfied to be passive consumers. They want to participate creatively. Most make these montage works as a pastime, although some, like artist Girl Talk (DJ Greg Gillis), perform and record professionally. Gillis fills good-sized venues with his frenetic live performances that

are a cross between a party, DJing, and live mash-up performance art using a laptop. Sampling of other artists is nothing new, but most sampling musicians pay a license fee to those they sample; Gillis does not. He uses hundreds of uncleared samples and makes his albums available for download online using the pay-what-you-want model. He told Anthony Wing Kosner of *Forbes* recently, “I basically believe in that idea [of Fair Use], that if you create something out of pre-existing media, that’s transformative, that’s not negatively impacting the potential sales of the artist you’re sampling, if it’s not hurting them in some way, then you should be allowed to make your art and put it out there. I think, even in the years of doing this, the conversation has shifted a good bit.”²⁵ Interestingly, according to the *Forbes* article, “no artist that has been sampled by Girl Talk has ever complained.”²⁶ For every Gillis there are hundreds, and maybe thousands, of kids uploading mash-ups that use not only copyrighted music but also video content. All occupy a gray area between what has become accepted public practice and legal permission that leaves them, and the copyright owners, in an unsatisfactory position.

Perhaps ironically, US copyright law embodied in the constitution was based on the English “Statute of Anne” with a similar term of fourteen years renewable for a further fourteen. The US Constitution states that the purpose of copyright is, “To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.” Every subsequent copyright act has broadened the scope of copyright law. In 1998 the Sonny Bono Copyright Term Extension Act was signed into law by President Clinton. It extended the term of copyright to life of the author plus seventy years, and corporate authorship to 120 years after creation or ninety-five years after publication. Protecting copyright for the life of the author enables artists to realize the value in the work they created, which can be seen to meet the Constitutional objective to promote the progress of the useful arts. It is difficult to see how protection beyond the life of the creator and a century or thereabouts of protection for corporate copyrights promotes creativity or progress in the arts.

This chasm between what the law permits on the one side, versus what the market is demanding and technology is capable of delivering on the other, leaves artists who recycle or reuse copyrighted material, as well as the original copyright creators and owners, all dissatisfied and vulnerable in one way or another. An efficient means of channeling a fair share of any revenues to all the creators and owners free of cumbersome clearance processes could benefit everybody.

The Question of Creativity

There many ways recorded material is reused, recycled, and remixed. Some mash-up producers combine the complete track from one recording with the complete vocal from another. At the other end of the scale, it has been common, since the advent of hip hop and (subsequently) samplers, to use tiny, sometimes

unrecognizable, fragments such as a single drum sample or horn hit. There is debate regarding whether the use of long and even complete pieces are less creative than the shorter, processed, chopped, and combined fragments. (Examples of longer uses often debated include the mash-ups, “A Stroke of Genius” by Freelance Hellraiser and *The Gray Album* by Dangermouse, as well as sampled tracks by P Diddy and Kanye West.) Like beauty, creative value is very much in the eye of the beholder and can be complicated by conceptual considerations. After all, Marcel Duchamp’s artwork entitled “Fountain,” was simply a “Bedfordshire” model porcelain urinal that he purchased at a plumbing supplier and signed “R. MUTT 1917.” It became “one of the most influential art works of the 20th century.”²⁷ A year after the piece’s inauspicious debut, as reported by Martin Gayford, “The avant-garde magazine called *The Blind Man*,”²⁸ said, “Whether Mr. Mutt made the fountain with his own hands or not has no importance. He CHOSE it. He took an article of life, placed it so that its useful significance disappeared under the new title and point of view—created a new thought for that object.”²⁹ Of course, not all found or conceptual art is significant or interesting and so it is with sampling and mash-ups. However, it can be argued that the market (public or expert) will determine the question of value as it does in the case of any creative work.

Having achieved some level of market approval, Gregg Gillis’s work, interestingly, rejects basic tenets of composition and production, in particular that of repetition. His mash-ups do not repeat sections, themes, or sounds; they flow through the many hundreds of samples, never harking back. Listener familiarity comes not from use of a standard song form, thematic reference, variations, or by balancing expectation and change. Rather, it comes from tantalizingly recognizable yet evanescent component parts, each only a few bars long. The craft and creativity are hard to deny given the huge number of samples, the juxtapositions, superimpositions, manipulations, alignments, and choices necessary. The overall effect is that of a warp speed DJ set that sonically symbolizes a mislaid evening of infinitely hyperlinked meanderings across the Web.

Of course, there can be no resolution to questions regarding creative value. History is strewn with critical condemnations of works that are later regarded as foundational and influential. Many important works have been completely overlooked in their time and, perhaps, the most contemporaneous praise has been heaped upon the historically insignificant. Time will tell—maybe.

The Question of Legality

Copyright law is inconsistent. US artists, labels, and producers have no statutory performance right for the exploitation of the sound recording on terrestrial radio, which deprives them of considerable revenues from worldwide airplay. Lacking representation during negotiations, producers were even omitted from the Digital

Millennium Copyright Act. They now experience difficulty collecting their rightful share of digital airplay royalties from sound recordings they co-created.

We live in a time when our copyright laws relating to sound recordings are not aligned with common practice, consumer needs, technological capability, international standards, or the law related to the underlying composition. As discussed earlier in this chapter, those who work with samples and mash-ups often function outside the law. Even if they would prefer to do so, there is no affordable means by which to reward the original creators in proportion to the reuse. All too often, existing market and legal relationships between creators and copyright owners are economically, and thus functionally, asymmetric. As outlined earlier, a statutory right allows us to rerecord anyone else's, previously recorded, song while rewarding the copyright creator and owner. Yet, there are legal and economic barriers to using even a tiny sliver of someone else's sound recording. If, as I and many others have suggested, a sound recording is simply a sonic composition, it would make sense to align the laws that protect creators and owners of sound recordings with those protecting composers and publishers. Permitting the legal reuse of recorded material could financially benefit all parties. The prevailing philosophy appears to be to challenge any reuse that becomes financially successful or very visible, and ignore the rest.

A law that obviated onerous clearance costs and funneled a small percentage of revenues generated (through advertising, sale, subscription, or otherwise) to the original copyright owners would liberate creativity and expand an income stream. It is hard to imagine that Dolly Parton was not happy about Whitney Houston covering "I Will Always Love You." Aerosmith embraced Run DMC's adaptation of "Walk This Way" and benefited greatly. Many successful artists have approved reuse and adaptation of their recordings. The existing clearance process is cumbersome and expensive. It needs to be streamlined and disintermediated to take advantage of, what are now, well-established social trends and technological means.

Some legal and economic relationships that were viable and symbiotic business models in the physical domain (and to some extent on digital download platforms) have no business parallel in a world of digital streaming—for instance, the creation and ownership of a compilation comprising titles licensed from other labels. An existing commercial compilation can be uploaded as a user-generated playlist with the music being sourced from the original labels that are paid for the plays. The effort, expense, and expertise that went into creating the compilation go unrewarded. Some of these streamed compilation playlists have used the original compiler's brand without permission—as in the UK's 2013 *Ministry of Sound v. Spotify* case.³⁰ Even without use of the brand, the lack of protection for compilation rights in this environment disavows any creative and economic contribution by the compiler and disincentivizes commercial compilation producers. Of course this is a complex issue. Some compilations are entirely uncreative, and others are labor-intensive, expensive works of art requiring great expertise. Currently, the value-added materials, such as liner notes and images

that artists and the best compilation producers often provide, are not available on digital streaming services or, in many cases, with downloads. There does appear to be an upswing of interview and oral materials available on streaming services, which may be compensatory.

We are vastly expanding the use of music via mobile devices, which now outnumber people on the planet. It may only be a matter of time before all revenues generated for producers will be from some form of digital streaming use rather than physical or even digital sales. As the law stands, producers are only paid from these sources of revenue by contractual agreement. In the United States, producers contract with the artist. Labels and SoundExchange both pay producers via letters of direction signed by artists. With respect to royalties paid through SoundExchange, the letter of direction system has not worked well for producers.

As mentioned in Chapter 12, ASCAP, BMI, and SESAC are the performing rights organizations (PROs) collecting income generated by the public performance of a song on behalf of songwriters and publishers. They represent all entities that write and publish music, including lyricists, composers, songwriters, and publishers. SoundExchange is the PRO that collects income generated by the public performance of the sound recording. It represents record labels, artists, musicians, and singers, but does not represent the producers, engineers, mixers, and remixers who are co-creators or co-authors of the sound recording.

The point has been made that producers are normally paid by contract and that should continue. However, labels also only pay artists royalties in accordance with their contracts. Musicians and singers are paid under collective bargaining agreements. Under the DMCA, artists, musicians, and singers are paid by statutory right. Only producers, engineers, mixers, and remixers are still being required to individually negotiate expensive and time-consuming contractual agreements in order to receive their entitlement to this income. For many producers of recorded material that predates the DMCA and SoundExchange, retroactively negotiating letters of direction can be difficult or impossible.

Copyright in the underlying composition now extends seventy years beyond the life of the creator and covers all manner of public performances. It is difficult to understand why creators (and owners) of sound recordings still receive no legal protection or financial reward for public performances of their works in many of the places that songwriters and publishers do. Rewarding creativity encourages it. The current state of affairs rewards the corporate sequestering of copyrights as assets without obligation for them to be made available to the public. Copyright laws need to be revised and (as much as possible) aligned internationally. They need to provide for equitable and accessible systems that do not encourage the hoarding of intellectual property. They should reflect the democratization of the creative and distributive mechanisms, making all copyrights publicly available with the potential to reward all creators and owners of the sound recording.

Conclusion

Edison's 1877 invention of the phonograph has had an immeasurable impact on the field of music. Initially conceived as little more than a stenographic aid, the faint sounds from this elementary but ingenious machine transformed the way we make, experience, and communicate music. Its technological simplicity is striking and its determinedly mechanical nature seems almost ironic given Edison's contribution to electric light and the power grid. Even so, Edison's phonograph and all recording and playback machines for more than four decades had entirely acoustic and mechanical signal paths. By contrast, we passed through the electromechanical period in little more than twenty years to spend nearly a half century in the electromagnetic recording phase. We are now more than thirty years into the digital era. There have been many subphases within these periods and considerable overlap between them. These major technological shifts, and many of the lesser ones, enabled significant changes in production methodologies.

Simple as its beginnings were, it took unknown numbers of great thinkers to prepare the way for the phonograph and the developments that would follow. Many who contributed died before their work was implemented and some would not live to hear a recorded sound played back. Joseph Fourier solved theoretical problems that, among other important applications, would come to bear on the digitization of music, sampling, synthesis, and pitch correction almost two hundred years later.

Music producers are usually prodigious consumers of recorded music and for more than a century our primary end-user playback media were either cylinders or discs with undulating or wavy grooves cut in them. These conformed to principles demonstrated in Edison's first cylinder and Scott, Duhamel, and Young's prior experiments, going back as far as 1807. The CD is also a disc but one that is encoded differently. The audio is embedded as binary code on an optical disc that is read by laser before being converted back to an analog electrical signal. Regardless, all of these media were physical products that needed to be manufactured, shipped, and sold. We are now firmly in the digital age, not only for recording and playback but also for distribution—in its diverse guises. Digital recording, playback, and distribution have, in many ways, been liberating forces for artists, producers, and consumers of music. They have also presented challenges.

Examination of the history of music production exposes some short-term thinking by powerful stakeholders that caused long-term damage to the industry. Two examples come to mind. One is the way the recording industry repeatedly denied itself (and artists, producers, musicians, and singers) revenues from

profit-making uses of music by commercial entities such as radio. Publishers did not make this mistake. The other was the industry's failure to anticipate and prepare for the inevitable shift to digital delivery in the 1990s.

The multifaceted roles producers play in the recording process have changed considerably since the late nineteenth century. Nonetheless, from Fred Gaisberg on, their skills have been central to the business of recording music. Contemporary music producers continue to be well positioned, in the post-millennial industry, with expertise that covers the gamut. This is evidenced by the number of producers in executive roles at major labels, running their own labels, leading teams of junior producers and writers, and acting in entrepreneurial and staff A&R capacities. Digital technologies have opened access to the entire production, marketing, and distribution chain for almost anyone who has the time, and can afford a computer with relatively inexpensive software. Of course, access is no guarantee of success, but it represents opportunity for the enterprising and perseverant few.

As mentioned in chapter 1, music producers manage the intersection of technology, art, people, and commerce. At times technology has led the way. There were no producers urging Edison to invent the phonograph. Nevertheless, it was (by action if not by title) a producer who co-opted the machine to record music—an unintended consequence as far as Edison was concerned. Stretching equipment and media beyond its intended use is standard practice for most producers and almost a *raison d'être* for some. A few producers (like Les Paul), in attempting to satisfy their creative needs, have force-bred technologies into existence through modification, invention, or by persuading others to devise solutions.

Beyond technological change, producers such as Frances Densmore, the Lomaxes, and Ralph Peer recognized the value of recording technology and brought us music and artists we might, otherwise, never have heard and whose echoes persist in today's recordings. John Hammond, Brian Wilson, George Martin, Quincy Jones, and innumerable others contributed to musical and interpersonal methodologies. Different kinds of artists and different kinds of music require different approaches to production. In my companion book, *The Art of Music Production: The Theory and Practice*, 4th Edition, I outline six functional typologies of producers that have evolved over the past 137 years to accommodate these differences. Many non-producers, some technical, some musical, and others conceptual, have contributed to the art and history of music production. Kool Herc never produced a successful recording but, through his innovative misuse of consumer technology to adapt others' recordings, and by drawing on his Jamaican roots, he spawned a musical and, ultimately, cultural movement. Hip hop, through its productions and refinements by many others, continues to reverberate around the planet forty years on.

Music production has taken many turns. It began as a one-person process of identifying artists and music, then optimizing the performance, the balance, and the acoustic and mechanical technology of the phonograph during the recording session. The physical product sold to the end user was the same cylinder that was

recorded at the session. They could only be made in small quantities, sometimes one at a time and rarely more than ten. Each batch of cylinders cut comprised a unique performance. Today, DAWs offer levels of creative manipulation inconceivably far beyond those available to Fred Gaisberg or even Peer, Hammond, Paul, Miller, Phillips, Spector, Macero, and so forth. Thanks to technologies largely developed since the 1970s, successful recordings are being made by people with minimal or no performance ability as musicians, no formal music theory or technical training, and limited financial resources.

Harold Hildebrand's Auto-Tune further eroded the boundary between reality and artificiality, by allowing pitch correction of vocals and monophonic instruments. Celemony, a Munich-based company founded by Peter Neubäcker, released Melodyne in 2001. Its monophonic pitch and time-stretching capabilities with few audible artifacts were impressive but when later versions enabled manipulation of pitch and tempo for polyphonic files it put a powerful new tool in the hands of producers.

For more than a decade, with Yamaha's Vocaloid and other technologies, a growing number of producers have forged further into the posthuman era in which even lead and background vocals are digital constructs. Virtual star Hatsune Miku from Japan may be the most successful example. These Vocaloid and other voices are drawn from a library of real voice fragments. Producers can enter lyrics, notes, and rhythm, then select a voice and synthesize a vocal part complete with dynamics, breaths, attack, and vibrato to produce increasingly lifelike vocal tracks. No singer needed.

Looking back over the history of music production, simple mechanical tasks that once demanded great focus and expertise have morphed into complex digital processes that are easy to execute with help from today's machines. Initially performed by one person—including mixing, mastering, manufacturing, and more—the entire production process gradually splintered into myriad parts requiring specialized expertise. Nonetheless, an increasing number of productions are again being managed by one person (sometimes including the distribution and marketing operations). Regardless of the budget or the team—and well into the second century of the history of music production—producers' aims remain much the same, even though the means and methodologies have been revolutionized beyond anything Edison would recognize. In all its permutations, music production is—at its essence—an art form, whose goal is to produce a unique sonic artifact that captures the vision of its creators, the imaginations of its audience, and that will serve the needs of its stakeholders.

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ABOUT THE AUTHOR

Richard James Burgess has produced, recorded, and performed on many gold, platinum, and multiplatinum albums. He authored *The Art of Record Production* in 1997 and its subsequent, retitled, second and third editions. The fourth edition, *The Art of Music Production: The Theory and Practice*, was published by Oxford University Press in September 2013.

Beginning as a musician, Burgess's professional recording career began in the early 1970s at HMV studios in Wellington, New Zealand. He subsequently recorded in many of the world's great analog and digital studios with numerous notable producers and engineers. He has been a major label recording artist and composer with hit records in his own right. He was classified as an A-list studio musician by PPL, and worked internationally for most major labels and many independents as a producer, engineer, mixer, remixer, and manager of artists and producers. In between recording commitments, he toured with his own bands as well as others', and presented drum clinics for the Pearl drum company. Burgess is known for his pioneering work with synthesizers, computers, and sampling in popular music and as an inventor of the SDSV drum synthesizer. He is credited with coining the term "New Romantic" to describe the British cultural movement that emerged in the early 1980s, of which he was the first music producer.

Formally educated at Christchurch Polytechnic Institute of Technology, Berklee College of Music, Boston, and Guildhall School of Music and Drama, London, he earned his doctorate from the University of South Wales (previously the University of Glamorgan). Burgess has lectured on music production and the music industry at universities all over the world. He is joint editor-in-chief of the *Journal on the Art of Record Production* (London College of Music) and is a member of the national steering committee for the Producer and Engineer Wing of the Recording Academy (United States). He is a lifetime member of the Music Producers Guild (UK) and sits on the board of A2IM (the American Association of Independent Music). Burgess was co-director of the Smithsonian Music executive committee and is Associate Director of Business Strategies for Smithsonian Folkways Recordings in Washington, DC. He was co-producer, co-executive producer, and project director for *Jazz: The Smithsonian Anthology*, a seven-year project chronicling more than a century of jazz.

As a young musician, he played with the National Youth Jazz Orchestra (UK) and won awards from Music Week, the British Arts Council, the Park Lane Group, and the Greater London Arts Association.

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