Introduction

Recorded sound is surely one of the great conveniences of modern life. We can conjure up sounds at will from a talking machine, not just the sound of our own voices but the finest music ever made, and all with the convenience of a touch of a button. In a world oppressed by the consequences of progress, the phonograph and its descendants have provided us with cheap and plentiful distraction in the comfort of our own homes. It has made living in small, windowless, air-conditioned rooms a little easier, replacing the shared Victorian pleasures of bandstand and music hall with the solitary delight of a private world of sound.

The novelty of hearing a recording of one's voice is a little over 100 years old. In November 1877 Thomas Edison invented the phonograph in his Menlo Park laboratory, a feat which earned him worldwide fame and the nickname of "The Wizard of Menlo Park." Although the term *phonograph* had been coined years before, this famous invention marked the real beginning of recorded sound technology. To the millions of Americans and Europeans who marvelled at what they thought was a great scientific achievement, Edison's phonograph perfectly represented the new machines which were changing their lives: the telephone, electric light, safety razor, street car, camera, and automobile. The phonograph provided a service which had been unimaginable to its listeners before 1877 – it was truly a modern technology.

In the late nineteenth century, it was not only inventors who looked into the future and saw a marvelous new age created by machines. In 1888 the writer and social reformer Edward Bellamy published *Looking Backward, 2000–1887*, a view of a future society "so simple and logical" in which many of the burdens of industrial America had been lifted. One of the features of this utopia was that the finest music was piped into homes by telephone wires from special studios where professional musicians played around the clock. Bellamy anticipated re-

corded sound when he described "An arrangement for providing everybody with music in their homes, perfect in quality, unlimited in quantity, suited to every mood, and beginning and ceasing at will."[1]

Thomas Edison was also a visionary, a man who made it his business to see into the future, and who often made reckless claims about the potential of his inventions well before he had even made them work. Flushed with the pride of inventing the phonograph, he made the most astounding claims for it, which anticipated Bellamy's prophecies. Edison thought it would become commonplace, one of life's universal pleasures. The beautiful music which was the preserve of the very rich, available to only a few lucky city dwellers, was to become a mass-produced consumer good – a sound recording – which would be cheap enough to be available to all. The talking machine would be as useful as the telephone.

From the vantage point of the late twentieth century, all these wild predictions now seem obvious: the talking machine has become an essential part of life in an industrial society. In 1877 Edison dreamed that one day in the distant future there would be a talking machine in every home. A hundred years later, the average house would contain two or three. In 1977 there was hardly a living room or den in the United States and Western Europe which did not have a home "stereo" made up of amplifier, record player, radio, and tape recorder. Most homes also had a smaller system, a portable record or tape player, in the childrens' rooms or in the kitchen.

By the 1970s the universal medium of recorded sound was the compact tape cassette. No less an engineering wonder than the microgroove long-playing disc it superseded, the cassette had the advantages of small size and easy handling. The recorded sound of a cassette tape emerges from countless transistorized machines, from the wake-up call in the bedside alarm clock to the telephone answering machine. It can be found in numerous child's toys, in the dashboard of the car in the garage, and even in a waterproofed unit in the shower. The tape cassette has replaced the revolving disc as the most widely used format for recorded sound. It can be heard all over the globe. In the developing nations of Africa and Asia, it is an eagerly adopted Western technology. In advanced industrial societies, there are more cassette players than there are households.[2]

Recorded sound has expanded well beyond the phonograph invented by Edison. It is a major source of the programs heard on the

radio, for the tradition of live broadcasting declined after World War II. The same is true for television, which abandoned live programs very quickly. Most of its programs are recorded, and the video tape which saves the image also saves the sound, including the commercial messages and the "canned" laughter, which is an indispensable part of television entertainment.

It is easy to forget that recorded sound played a major role in motion pictures, another modern technology that began in Thomas Edison's fertile laboratory. He followed the invention of the phonograph with that of the motion picture camera; his idea was for recorded sound and images to go together. They still do. Sound is an integral part of the movie experience, and film sound has often been at the leading edge of recorded sound technology. The latest sound-reproducing systems are introduced to the public in film theaters. Stereophonic sound was developed for use in theaters in the 1930s. Quadrophonic sound was first experienced at the movies. The technologies developed to make movies talk have been successfully applied to the recording of popular music. Our home stereos are scaled-down versions of the mighty sound systems found in film theaters.

Recorded sound is not confined to the home or places of entertainment. The drive to work is usually not done in silence because the car radio, cassette, or compact disc player comes as standard equipment in the American automobile. Recorded sound also soothes the brow of the office worker as he or she takes the elevator to one of the numerous floors of the skyscraper – the typical work place of the twentieth century. Working in America is often done to the accompaniment of recorded music, which is very carefully chosen to ensure the productivity of the listener.

The widespread broadcast of recorded sound in the work place began in World War II, when it was discovered that music decreased the boredom associated with continuous, repetitive assembly-line work. The British government commissioned an important study on "Fatigue and Boredom in Repetitive Work," which found that the man watching the bottle-capping machine or the woman soldering connections became tired not only from physical exertion but because of boredom. Music distracted the workers from their tasks without taking their eyes off the job.

Employers who played music in factories found that instead of leav-

ing their benches or machines, workers were more apt to be found whistling or singing while they worked. The management took special care to fit the tempo of the music to the pace of the work. Martial and "peppy" music was used to get employees ready for work, while slow, sentimental ballads were never played on rainy days. The main qualification was for music to be "easily recognized, easily sung, easily heard."[3] This was the beginning of the insidious "easy listening" music which awaits us in elevators and restaurants and fills in the time while we wait to be connected to telephone lines.

Background music came of age during World War II. By decreasing fatigue and raising morale, it made significant contributions to productivity, and some estimates found it increased output by as much as 25 percent.[4] This revelation was to have enormous impact on the history of recorded sound. In the short run it brought music into the factory and office; in the long run it completely altered the sonic environment in America, leading to the omnipresence of canned music in every aspect of life. In the past, manual labor in the United States had been eased by work songs, the chants of the slaves, field hollers, or whistling while you worked in a textile mill. In the twentieth century the anonymous sounds of the talking machine usurped this function.

In both public and private places, the tyranny of recorded sound is hard to escape. Eating, shopping, and travelling are discretely serenaded by endless loops of magnetic tape. It is difficult to think of a place that does not have a concealed loudspeaker issuing forth the soothing sounds of recorded music. Even churches have succumbed to using tape-recorded bells in place of the real thing.

Edison and the other inventors of recorded sound were so enthusiastic about their achievements because the real thing in the 1870s was restricted to the great concert halls in a few major cities and music rooms in the homes of the very rich. Although the technology of recorded sound was international in nature – it came about as the result of the transatlantic movement of men and ideas – its development occurred in the United States. What especially pleased Edison was that it democratized entertainment. It was fitting that Yankee ingenuity should provide the means to put opera into the parlors of working men (as Edison always liked to claim) and make good music an affordable consumer good.

Yet Edison could not have predicted, or even imagined, that re-

corded sound would be so omnipresent in twentieth-century industrial society. Recorded music is a constant in the home, the work place (whether in office or factory), and in public places. It is heard in supermarkets, malls, trains and planes. This constant background noise, often called *Muzak* after the company that pioneered recorded music in the work place, has led some unwilling listeners to question the benefits of recorded sound. It was "synthetic music," as Aldous Huxley called it in *Brave New World*, which could just as easily pacify as enlighten the masses. What had started as a machine to bring beautiful music to silent places, to bring the art of the concert hall into the living room, became corrupted into a device which saturated the senses with an unremitting bombardment of recorded sounds. And Edison, who happily retreated behind the wall of silence brought by his deafness, would probably have been one of the first to denounce it.

Business and technology

The growth of the technology of recorded sound and the business enterprise based upon it exceeded even Edison's grandiose plans for the phonograph. Putting a talking machine into every home and supplying it with records became a big business in America. One hundred years after the thin sheet of tin foil was teased and tortured into retaining sounds of speech, a vast international industry produced players and recordings by the millions.

In the United States alone, about $3 billion worth of recordings were sold in 1977 (at retail prices). These were played on an estimated 75 million record players (playback units) in American homes. In 1976 over 3 million portable and table phonographs were sold by American manufacturers, and over 2 million phonographs and 17 million tape recorders were imported into the United States.[5] As the centennial of Edison's invention approached, Americans purchased 273 million long-playing records, 190 million 45-rpm singles, and over 127 million cassette and eight-track tapes.

This book is an account of the growth of this industry, a history which by necessity reflects the technological development of recorded sound, from the tin foil wrapped around Edison's phonograph to the compact disc. This is a story primarily of change, for the industry built on the phonograph was driven forward by the constant disrup-

tion of innovation: new materials for records, new systems of recording, new kinds of machines, and new types of recorded music. In an intensely competitive business, one invention after another arrived to upset the fragile balance between the great companies and change the relationships of the old powers with the new.

The industry of recorded sound reflects the broad themes of American business history. The small, independent companies founded by the inventors evolved into big businesses at the turn of the century, when three large companies dominated the industry. These organizations became even larger during the 1920s and 1930s when dramatic advances in recording technology made it easier to establish entertainment empires. Some of the most powerful and innovative American companies were players in this drama, such as AT&T, General Electric, RCA, and Warner Bros. Their mastery of the technology of recording made it possible for them to dominate several branches of the immensely profitable business of popular entertainment.

American industrial dominance came to an end in the postwar decades, and Japanese companies proved to be fierce competitors in the consumer electronics market. Companies like Sony and Matsushita were responsible for many critical innovations. Big Business grew ever bigger in the 1970s and 1980s as a wave of mergers produced vast, integrated media empires. Multinational organizations such as Sony and Philips then dominated a global business in which recorded-sound products were but one element in the mechanization of entertainment.

The technological history of the phonograph breaks down into three parts, each reflecting a different method of recording sound. The acoustic era began in 1877 with Edison's invention of the phonograph and ended in the late 1920s when a new system of electrical recording superseded it. The electrical era of the 1930s and 1940s was represented by the 78-rpm shellac disc and the vacuum-tube phonograph or radio/phonograph combination. Its technological high point was reached in the 1950s and 1960s with microgroove vinyl discs (the 45-rpm single and the 33-rpm long player) and the record player (based on transistors instead of vacuum tubes). By the 1970s magnetic tape slowly overtook the revolving disc as the main form of recording sound. The 1977 sales year reflected the rapid growth of sales of prerecorded cassette tapes and pointed to the dominance of this for-

mat in the years that followed. The digital era began in 1982 with the commercial introduction of the compact disc (CD).

The technological history of recorded sound also covers the history of motion pictures. The electrical era began with the first sound pictures. The techniques and equipment perfected in film studios for use in the "talkies" slowly spread to recording studios. In the 1950s magnetic tape was used to save television pictures as well as sound. The first digital recording equipment of the 1970s was based on video recorders for television.

The development of recorded-sound technology was often the result of the diffusion of ideas and techniques between film makers and record companies. This is a critical factor in the rapid advance of a technology which has brought so many new products in the relatively short time period of a hundred years. In many cases the recording engineers in film studios and their counterparts involved in producing popular songs were all working for the same business organization. The integrated, multinational corporation with interests in many different areas was the ideal vehicle to develop new technology.

The history of recorded sound provides us with an ideal case study of the causes and consequences of technological change. One thing that the tumultuous story of the phonograph tells us about technological change is that it is rarely absolute and final. Threatened men live long, and so-called obsolete technologies have managed to survive in the face of clearly superior competitors for long periods. For example, years after the microgroove record replaced the shellac 78-rpm disc, companies continued to press them and make the little steel styli which were needed to play them. And over 10 years after the CD appeared, the microgroove disc showed no sign of disappearing. This endangered species of vinyl continued to be pressed, purchased, and cherished in the 1990s. It has a small but vociferous band of supporters who refuse to accept that digital technology provides a better sound:

> CDs are to records what videos are to movies: sampled, scanned, and coarse, missing huge chunks of information. . . . If you want fake, processed, artificial, lifeless, dimensionless sound . . . go spend $15 for the privilege and buy CDs.[6]

The history of recorded sound technology is not therefore a catalogue of one smashing innovation following another, a procession of

new and improved machines with each one superior to the one it replaced. If there is one lesson a businessperson might learn from this history, it is that technology does not count for everything in this high-tech industry. Emphasizing the machine and putting technical considerations above artistic ones was the mistake made by Thomas Edison, and it proved fatal for his phonograph. Time and time again it was the mass appeal of the music recorded and not performance of the record or player that was critical in achieving commercial success.

Buying a stereo system is often an ordeal by high technology, a baffling initiation into a highly complex area of mysterious machines and puzzling acronyms: db, THD, S/N, kHz, and so on. No matter how many technical considerations are included in the analysis of sound reproduction, the enjoyment of recorded music is purely a subjective affair – there is no real way to prove that one machine or record sounds superior, other than listening to it, and everybody hears the music differently. Whatever the technical advances incorporated into the stereo, appreciating it is still relative.

There are still many people enjoying cylinder phonographs today. Devotees of acoustic recording can be found all over the world, playing their 2- and 4-minute records on well-oiled phonographs. Allen Koenigsberg's *Antique Phonograph Monthly* has a subscription list of over 2,000. Most enthusiasts use their machines to play back the sounds of the past, but several of them still use theirs to record music. The first recording studio established by Edison in his West Orange laboratory has been revived to record with acoustic phonographs. In a fine country house just outside of London, Brian Thorne and Dominic Combe use the same type of machines, and the same kind of techniques, in an acoustic recording studio. They would not claim that their recordings are superior to the compact discs made by Denon or Deutsche Grammophon, only that they get more enjoyment listening to the old cylinders. And surely that is the point.

Technology and history

The novelty of the phonograph was that it could preserve a part of life that had previously been a fleeting experience. Live music lasts only as long as the performance, for that short time when one hears the music, and after that it is just a memory. With proper care, a recording can last a lifetime or even longer, preserving the perform-

Figure 0.1. Victor stresses the permanence of its recordings. (Courtesy of General Electric)

ance for many years after the musician is dead. The noun *record* is therefore an appropriate term for the product of the recording industry. It is not just a consumer product but an artifact of a time gone by.

The sound recording has brought us more than the enjoyment of music, for it is as good a piece of evidence about the past as a primary source document from an archive or a faded old photograph. Amer-

icans living in the last decades of the nineteenth century found themselves in the unique position of being able to save small slices of their existence, to capture their images on photographic film and their voices on wax cylinders. Edison and the other inventors involved in making talking machines imagined that they would be able to create libraries of sounds, not just great pieces of classical music but also messages from the important men of the day and records of the great speeches of "our Washingtons, our Lincolns, our Gladstones" which would help in the preservation of language and national values.[7] They recorded poets and politicians as well as opera singers and pianists.

A sound recording is a piece of historical evidence. It has an impact that goes well beyond the written word or photographic image. Records enable us to listen in on history, to hear it again as it happened. The crash of the airship *Hindenburg* in New Jersey in 1937 is well preserved on film, but it is the spoken account of the disaster which brings the event to life and stirs the emotions. While only Lord Carnarvon was lucky enough to accompany Howard Carter when he entered the tomb of Tutankhamen, we can still hear Carter's dramatic account of the great moment against the swish and crackles of a worn 78-rpm disc. The recent discovery of some phonograph cylinders reputed to be of the poet Walt Whitman caused great excitement, for it was suddenly possible to hear the poems as the poet intended them.

Businesspeople have been using dictating machines to preserve their correspondence since the 1880s. Presidents as far back as Franklin Roosevelt placed recording machines in the White House to provide an exact record of historic decision making. In 1971 President Richard Nixon made a fateful decision to install tape recorders in the White House. The Secret Service planted voice-activated machines in the Oval Office, Lincoln Sitting Room, Cabinet Office, Nixon's private suite in the Executive Office Building, and the Presidential retreat at Camp David.

When the presence of the Nixon tapes was first made known in July 1973, at the height of the Watergate scandal, 4,000 hours of conversations had been recorded on 950 reels of tape. These tapes did more than provide undeniable evidence that the President had ordered the cover-up of the Watergate break-in; they gave a detailed and intimate picture of the Presidency with the stark honesty that other records had not been able to reveal. Although many of the expletives were deleted when transcripts of the tapes were released to