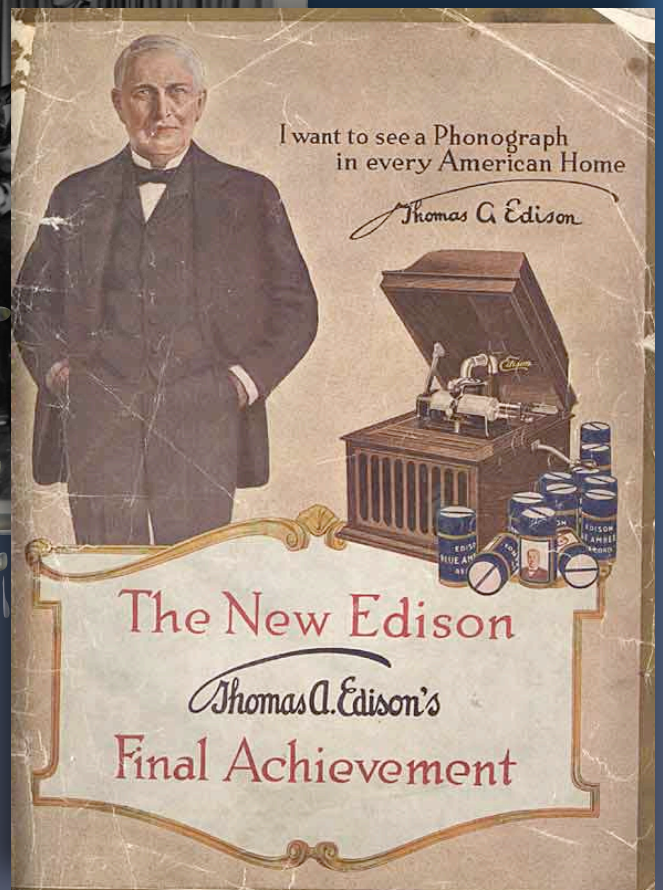
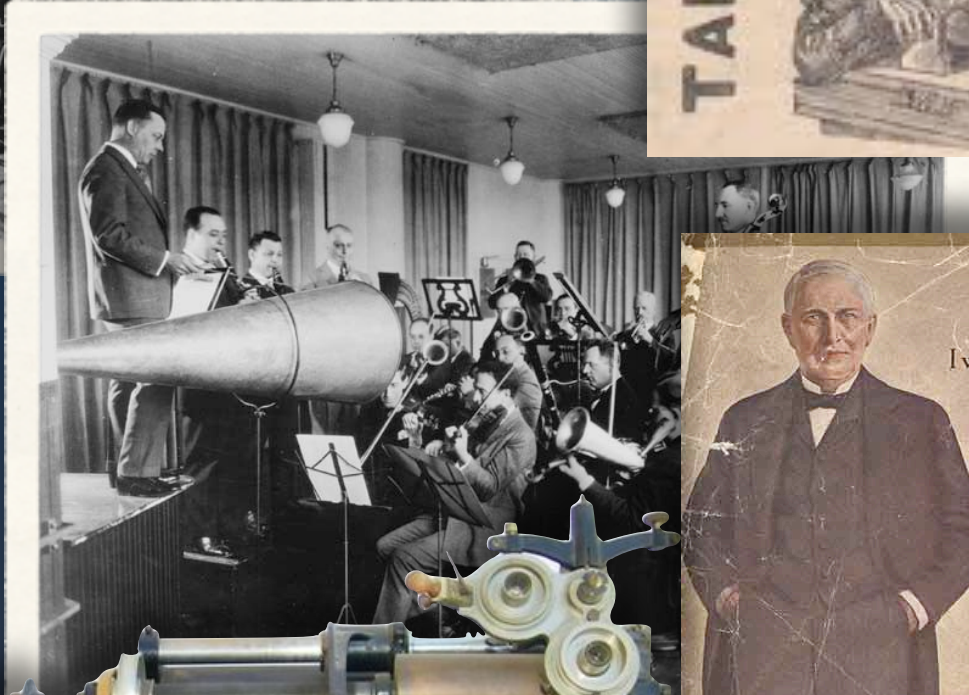


RECORDING HISTORY

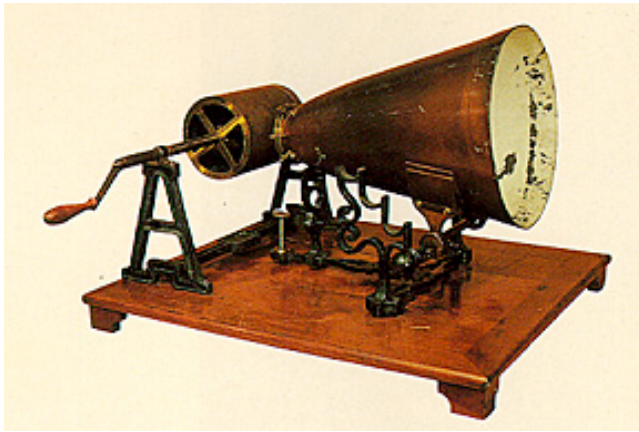


Recording History

THE HISTORY OF RECORDING TECHNOLOGY

Before the Phonograph

There was sound recording before the phonograph, but not sound reproduction. In 1856 or '57, years before the invention of the phonograph, French inventor Leon Scot demonstrated the Phonoautograph system for recording sounds. It used a diaphragm sensitive enough to respond to strong sound waves, attached to a fine stylus, which pressed against a moving glass cylinder (later flat glass plates would be used by others) The glass cylinder was coated with black carbon (smoke) and rotated, recorded sound as a wavering line. (Read more about and listen to this early recording.)



Leon Scot's Phonoautograph

In April of 1877, a few months before Edison's invention, Frenchman Charles Cros wrote a description of a machine that he said could record and reproduce sounds. Although he failed to patent or demonstrate the device, he deserves credit for the insight that the phonautograph's recording process could be modified to play back sounds.

Edison's Invention of the Phonograph

In July of 1877, Edison filed his first patent in Great Britain on a sound recording and reproduction of sound. A full specification for the phonograph was filed in April, 1878. In the meantime, his associate John Krusei constructed a device that looked much like the Phonautograph, but with a sheet of heavy tin foil wrapped around the cylinder. By cranking the handle and shouting into the horn, the machine recorded the

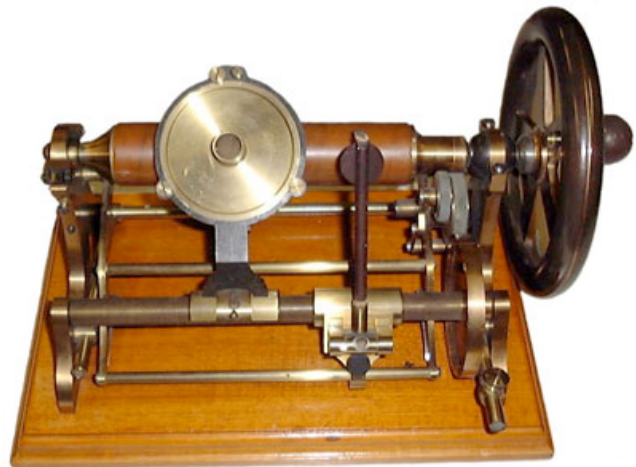
voice in the form of indentations in a spiral path on the tinfoil. But putting the stylus back into the groove at the beginning of the recording and cranking the handle, the machine reproduced the voice.

During 1878, the first 600 or so tin foil phonographs were made by several small machine shops at Edison's request. These were distributed to demonstrate the principle of phonography. A German company licensed the patent rights and attempted to build a talking doll. The dolls did not work very well and most were returned by unhappy customers. Following this, Edison moved on to work on other projects and paid little attention to the phonograph for almost a decade.

Edison's First Rivals

Alexander Graham Bell, his cousin Chichester Bell, and assistants including Charles S. Tainter in 1880 began investigating the nature of sound in a new laboratory in Washington, D.C. The next year, they developed what would become known as the Graphophone, an improved form of the phonograph, and deposited a prototype with the Smithsonian Institution.

The main difference between phonograph and graphophone, at least at first, was that the graphophone used wax as the recording medium rather than tin foil, and the recording was cut or chiseled into the wax rather than being embossed. In fact, the graphophone deposited with the Smithsonian appears to have been an Edison phonograph (or a copy) with the grooves in the cylinder filled with wax rather than wrapped with tin foil.



Bell Graphophone

The inventors delayed several years and then filed for patents, which were granted in 1886. By this time, they had developed a replaceable recording medium consisting of a cardboard tube with a thick coating of wax.

Representatives of the firm set up to commercialize the graphophone approached Edison about a cooperative agreement as early as 1885. Instead, the inventor returned to his work in 1886 and had made numerous patent applications for phonograph improvements by 1888.

Both the graphophone and the phonograph were being marketed by 1890 as office dictation machines. Neither was generating much money, but local distributors discovered a more lucrative way to use the machines as public amusements. Coin-operated record players soon became common in public arcades. In response, Edison continued to make improvements to the phonograph, began working toward an inexpensive home record player, and went into the business of making records. Bell, Tainter and company faded from view, but other inventors improved the graphophone.

There were numerous problems with “compatibility” in the 1890s and early 1900s. Phonograph and graphophone records were not interchangeable. Both companies introduced variations on the basic technology (longer-playing cylinders or larger diameter cylinders) that could not be played on older machines. Also, new inventors were springing up to try to cash in. Some built

their players according to phonograph or graphophone standards, but others did not.

First Phonographs and Graphophones, and then Gramophones

As the arcade phonograph business was growing in 1893, Edison was moving into the business of manufacturing records (either made in-house or sent to him by his regional phonograph operating companies), and he appeared to be planning to establish the phonograph as a home entertainment device.

[\(Listen to dozens of Edison cylinder recordings from the early 1900s.\)](#)

[\(Listen to five tunes on records produced by the Edison company between 1919 and 1926.\)](#)

In 1894 or 95, a German immigrant to the U.S. named Emile Berliner introduced a commercial version of the record player he had been developing since about 1887. The player used a disc instead of a cylinder (although Edison, Tainter, Cros, and others had anticipated the use of the disc). The record was made on a zinc disc coated with wax. Once a recording was carved into the wax, the disc was dipped in an acid solution, which ate away the disc under the groove and etched the recording into the surface of the zinc. Then, using an electroplating process, the zinc disc was turned into a stamper that could be used to produce the final recordings in large numbers by pressing the stamper into a ball of “Vulcanite” (hard rubber). He called it the “gramophone.”

Beside the advantages of mass production, gramophone records could produce a higher volume than the phonograph or graphophone records of the day. That’s



An Edison coin-operated phonograph



Berliner Gramophone

because the volume of a record was directly related to how hard the tonearm was pressed into the groove—the harder you pressed, the more sound came out, but at some point the pressure damaged the recording. For a few years at least, before the phonograph was improved, the Berliner disc could produce a loud, room-filling sound. He set up a small recording studio in 1896 and by 1897 had developed an improved phonograph. The disc business was off and running.

The Victor Talking Machine Company, formed in 1901, commercialized the gramophone based on Berliner's patents, while in the U.K., the Gramophone Company had been formed in 1897 to do much the same thing. Berliner, a native German, also formed the Deutsche Grammophon company with his brother in 1898.



Electrical Recordings

Technical change was afoot. During World War I, radio technology was greatly accelerated in part by military sponsorship. By the end of the war, the vacuum tube was commercially available for use in low-cost radios as well as radio transmitters and all sorts of other devices. It was not long before various inventors returned to the idea of using an electrical signal from a microphone to drive an electromagnetic disc recording device. With the addition of the vacuum tube, the microphone's weak signal could be stepped up to drive the cutter. While

there were numerous proposals to do this, the technical problems were considerable.

Edison (who was one of the first to experiment with electrical recording technology, lagged behind his competitors but eventually introduced this electrical recording system for studio use.

The Western Electric Company (whose research activities were soon to be taken over by the Bell Telephone Laboratories) developed an electronically amplified, electromagnetic disc cutter of high quality in the early 1920s, as well as a conventional-looking but improved acoustic phonograph on which to play the resulting records. The new device was marketed to phonograph and record manufacturers (and also became the basis of talking films and "transcription" recorders used in radio stations).

In October, 1924, Columbia Phonograph Company experimented with this new "electrical" recording equipment developed by Western Electric. The new records sounded different than those recorded by the acoustic process, and consumers responded well to them. The trade-name "Orthophonic" was attached to both the recording process and the record player.

Victor released its last phonograph discs made by the original acoustic process in 1925.

Edison meanwhile had announced a long-playing, 12 inch disc capable of holding 20 minutes of music per side. While this format did not become a commercial success, the next year the company marketed its first electrically-recorded "diamond" discs. Struggling, Edison in 1927 offered a phonograph capable of reproducing either Edison vertical cut discs or his competitors' more popular lateral cut discs. Finally, in 1929 Edison ceased production of records and pulled out of the home phonograph business.

"Transcription" recorders like the one here were a later variation of the basic electrical recording technology. In this type of recorder, electrical signals are delivered to the electromagnetic cutting head, which is carried in a lathe-like mechanism (the operator has his right hand on the lathe).



By 1906, Victor Talking Machine Company was already a major force in the music industry when it introduced its first “Victrola,” a disc player with the horn inside the cabinet instead of outside it. This and subsequent generations of Victrolas became top-sellers, and “Victrola” became a generic term for the record player in the U.S.

The success of the disc was such that in 1912, Edison at last began offering disc-type phonographs and records for sale in recognition of the large number of disks on the market. Cylinder machines and records, however, were still produced until the demise of Edison’s Entertainment Phonograph division in 1929.

Rise, Fall and Death of the ‘78

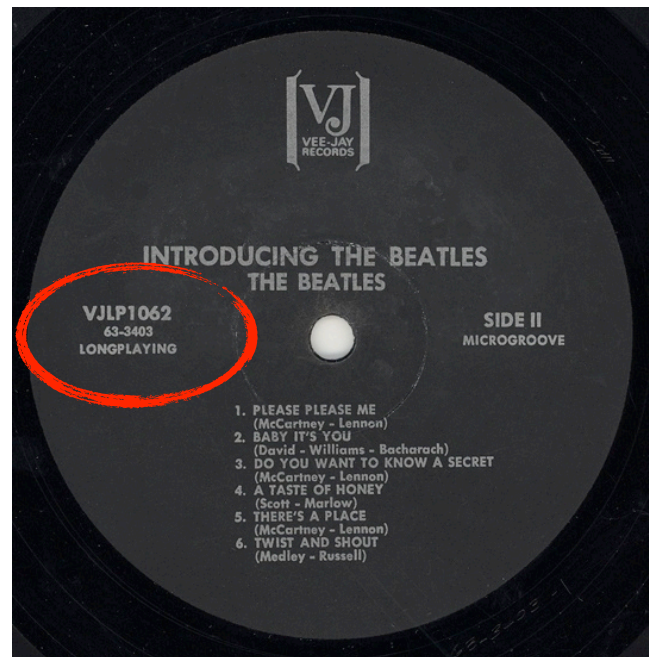
During the 1930s and 1940s, there were all sorts of experiments with the phonograph. Western Electric’s “electrical” recording technology briefly became the basis of talking pictures in the late 1920s before finding a place in radio stations, where it was called the transcription recorder. Columbia in 1931 introduced the first “long playing” record. Resembling the later LP, these 12-inch diameter discs had finely spaced grooves and turned at just 33 1/3 rpm. There were even experiments with stereo. But through all this, the standard 10- and 12-inch, shellac-based discs remained the top sellers.



It was not until after World War II that new technologies displaced the old. A new disc introduced by RCA in the late 1940s began selling well. This 45-rpm disc doomed the older records, which were now known, like the ‘45’ by their speed of rotation-- 78 rpm. Many people hung on to their record collections, and most re-

cord players had a ‘78’ setting until the 1980s. However, sales of 78-rpm discs fell off during the 1950s, and the last records were issued by about 1960.

The date of the very last 78-rpm record is not known, although some claim that the last one issued in the U.S. was Chuck Berry’s “Too Pooped to Pop” (Chess 1747), released in February 1960. There were almost certainly later released on small labels, and there are documented cases of 78 discs released as late as 1961 in Finland. According to one source, 78s were deleted from the EMI catalogs in 1962.



Magnetic recording

The era of the phonograph also saw the introduction of an alternative recording technology that was little seen by the public but increasingly used in studios. Magnetic recording, which is today used for video and audio tape, was first introduced around 1899-1900 by the Danish inventor Valdemar Poulsen.

Poulsen envisioned that it would be useful for office dictation and telephone recording, but his “telegraphone,” manufactured in the U.S. and Europe by various firms, never took off. It was virtually forgotten in the U.S., but inventors in Germany and England persisted.

The earliest version of the telegraphone looked a bit like a cylinder phonograph. For simplicity’s sake, the inventor wrapped the wire (onto which the recording was made) around a cylinder. The recording head tracked the wire along the surface.



The pallophotophone was an early audio recorder created by GE researcher Charles Hoxie (seated in the photo) in 1922. Rather than using magnetic wire or lacquer disks, the device captured audio waveforms on sprocketless 35 mm film as a series of 12 parallel tracks reflected from a vibrating mirror. It was used to record some of the world's oldest surviving radio broadcasts on Schenectady, New York radio station WGY between 1929 and 1931.

The advent of electronic amplifiers for the telephone in the 1920s and the introduction of an oxide-coated tape in place of the solid steel wires and bands used before resulted in steady improvements in sound quality. The BBC, the CBC, and the RRG (the German broadcasting agency), among others, used steel-band magnetic recorders extensively all through the 1930s.

By the end of the decade, the German companies AEG and I. G. Farben had improved the tape recorder and its coated-plastic recording medium to the point where it could approach the best disc recorders in sound quality. Its ability to make very long recordings and recordings under conditions of vibration and shock helped make the “magnetophon” popular for field and telephone surveillance recordings as well. For radio broadcasting, the best studio magnetophons rivaled or exceeded high quality American and British disc recorders by the time Berlin fell in the spring of 1945.

This AEG magnetophon was one of several versions of the technology developed in Germany between the early 1930s and 1945. Like modern audio and video recorders, it employed a plastic tape coated with a layer of extremely fine iron powder (modern recorders use different mixtures of iron and other materials).

The era of tape recording

Despite its quiet start, it was tape recording that would eventually displace both the phonograph and optical recording methods. Eventually. Captured German recorders were widely copied, improved upon, and re-introduced by Ampex, EMI, and other firms in the late 1940s. Engineers used to editing optical film found it easy to learn to edit tape, and tape represented real improvements over optical recording in terms of convenience and low cost. In radio, record, and movie studios, tape was almost universally adopted by the early 1950s.

The first consumer magnetic recorders also appeared in this period. Inexpensive wire recorders, developed more-or-less independently of the Europeans, were introduced around 1946 and proved to be a short-lived hit. When the first cheap tape recorders appeared around 1948, they quickly stole the market.

Millions of them were sold during the 1950s as part of a boom in “hi-fi,” although many owners reported that they made little use of them. Record companies were willing to sell recorded tapes, but they could not compete in price with records, especially the LP record introduced in 1948 by CBS.

Stereo in the home

Engineers in the 1930s had discovered that a two-channel (or more) recording, utilizing two microphones, two amplifiers, and two loudspeakers, gave aurally pleasing results. The “stereo effect” as it was called was often described as “realistic,” because human hearing has the capacity to identify the location of a sound source based on the slight time delay in the reception of sound in each ear.

An early “portable” tape recorder



The first stereo recordings available to the public were in the form of reel-to-reel tape. Then in 1957-8 RCA introduced a recorder with a super-compact tape head that stacked four heads in the place of just two, allowing a stereo tape to be flipped over and played on both sides like a mono tape.

Cassette Culture

This small, two-reel cartridge was introduced by Phillips in Europe and Norelco in the U.S. It quickly became the technology of choice for those interested in making copies of records for use in battery operated portables or in-car tape players. In terms of pre-recorded cassettes, sales overtook LPs in the early 1980s. For a time in the 1980s, the cassette was the most popular home music format for both home recording and pre-recorded listening applications.



The 90-minute tape became the best-selling blank tape, reflecting the fact that two full albums could usually be recorded on a single 90-minute cassette. The format spawned an ever-wider variety of portable and home recorders and players. Following on the heels of its successful line of home VCRs, Sony Corporation in 1977-8 introduced its Walkman line of battery operated radios and tape players. Copycats jumped into the market the next year, and soon there was a bewildering variety of personal audio products. The CD-walkman was available by mid-decade, and the trend persists today with small MP3/4 players.

Digital Recordings and the CD

Digital audio began in the telephone industry, where it was used to digitize telephone conversations and, in effect, compress them so that more conversations could be handled on existing lines. Since the bandwidth of a telephone line is very narrow, the sound quality issues were focused on basic intelligibility of speech rather than realism and detail. However, the basic techniques could be applied to high quality recording.

The earliest experiments with digital recording of high quality audio were probably those undertaken in Japan in the 1960s. Following the introduction of Betamax VCRs, which used a technology for video similar to what was needed to make digital audio recordings, Sony briefly offered an audio-only Betamax recorder, capable of recording audio digitally. This pioneering effort was largely forgotten by the time digital audio tape was reintroduced in the 1980s.

In the meantime, Phillips and Sony (among others) had been working on ways to record TV signals with a laser onto a reflective disc. As with the Betamax, some of the features of video recording are applicable to digital audio recording, so it was not a great leap from the early, analog laser videodiscs introduced in 1978 and later to the compact audio disc, introduced in 1982-3.

The CD was not an immediate hit, and it took nearly a decade for it to displace the audio cassette, but in the 1990s it became the most popular home format. Recordable CDs were not generally available until the mid-1990s, and few were sold before about 2000, when their sales took off. There were numerous variations of the CD and digital tape during the 1990s, few of which survived the decade. Today, the CD is being challenged by the DVD (which is also used for video), but it is unclear whether either of these formats will survive the challenge of media-free audio/video technologies such as MP3/4.