A **gramophone record**, (**phonograph record** in [American English](http://en.wikipedia.org/wiki/American_English)), **vinyl record**, commonly known as "a **record**", is an [analog](http://en.wikipedia.org/wiki/Analog_signal) [sound](http://en.wikipedia.org/wiki/Sound) [storage medium](http://en.wikipedia.org/wiki/Recording_medium) in the form of a flat [polyvinyl chloride](http://en.wikipedia.org/wiki/Polyvinyl_chloride) (previously [Shellac](http://en.wikipedia.org/wiki/Shellac)) disc with an inscribed, modulated [spiral](http://en.wikipedia.org/wiki/Spiral) groove. The groove usually starts near the periphery and ends near the center of the disc. Phonograph records are generally described by their [diameter](http://en.wikipedia.org/wiki/Diameter) in inches (12", 10", 7"), the [rotational speed](http://en.wikipedia.org/wiki/Rotational_speed) in [rpm](http://en.wikipedia.org/wiki/Revolutions_per_minute) at which they are played (331⁄3, 45, 78), and their time capacity resulting from a combination of those parameters (LP − long playing, SP − single, EP − 12" single); their reproductive quality or "[fidelity](http://en.wikipedia.org/wiki/Fidelity)" ("high fidelity", "orthophonic", "full-range", etc.), and the number of audio channels provided ("[mono](http://en.wikipedia.org/wiki/Monaural)", "[stereo](http://en.wikipedia.org/wiki/Stereophonic_sound)", "[quadro](http://en.wikipedia.org/wiki/Quadraphonic_sound)", etc.).

[Phonograph](http://en.wikipedia.org/wiki/Phonograph) records were the primary medium used for [music](http://en.wikipedia.org/wiki/Music) reproduction until late in the 20th century, replacing the [phonograph cylinder](http://en.wikipedia.org/wiki/Phonograph_cylinder), with which it had co-existed, by the 1920s. By the late 1980s, [digital media](http://en.wikipedia.org/wiki/Digital_audio), in the form of the[Compact Disc](http://en.wikipedia.org/wiki/Compact_Disc) or CD, had gained a larger market share, and the vinyl record left the mainstream in 1991.[[1]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-1)[[2]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-2) They continue to be manufactured and sold in the 21st century. In 2009, 3.5 million units shipped in the United States, including 3.2 million albums, the highest number since 1998[[3]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-3) and the format retains a niche market. They are especially used by [DJs](http://en.wikipedia.org/wiki/DJ) and many [audiophiles](http://en.wikipedia.org/wiki/Audiophile) for many types of music.

Early history[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=1" \o "Edit section: Early history)]

The [phonautograph](http://en.wikipedia.org/wiki/Phonautograph), patented by [Léon Scott](http://en.wikipedia.org/wiki/%C3%89douard-L%C3%A9on_Scott_de_Martinville) in 1857, used a vibrating [diaphragm](http://en.wikipedia.org/wiki/Diaphragm_(acoustics)) and stylus to graphically record sound waves as tracings on sheets of paper, purely for visual analysis and without any idea of playing them back. These tracings can now be scanned and digitally converted into audible sound. [Phonautograms](http://en.wikipedia.org/wiki/Phonautogram) of singing and speech made by Scott in 1860 were played back as sound for the first time in 2008. Along with a tuning fork tone and unintelligible snippets recorded as early as 1857, these are the earliest known recordings of sound.

In 1877, [Thomas Edison](http://en.wikipedia.org/wiki/Thomas_Edison) invented the [phonograph](http://en.wikipedia.org/wiki/Phonograph). Unlike the phonautograph, it was capable of both recording and reproducing sound. Despite the similarity of name, there is no documentary evidence that Edison's phonograph was based on Scott's phonautograph. Edison first tried recording sound on a wax-impregnated paper tape, with the idea of creating a "[telephone](http://en.wikipedia.org/wiki/Telephone) repeater" analogous to the "[telegraph](http://en.wikipedia.org/wiki/Telegraph) repeater" he had been working on. Although the visible results made him confident that sound could be physically recorded and reproduced, his notes do not indicate that he actually reproduced sound before his first experiment using tinfoil as a recording medium several months later. The tinfoil was wrapped around a grooved metal cylinder and a sound-vibrated stylus indented the tinfoil while the cylinder was rotated. The recording could be played back immediately. The [*Scientific American*](http://en.wikipedia.org/wiki/Scientific_American) article that introduced the tinfoil phonograph to the public mentioned Marey, Rosapelly and Barlow as well as Scott as creators of devices for recording but, importantly, not reproducing sound.[[4]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-Scientific_American_1877-4) Edison also invented variations of the phonograph that used tape and disc formats.[[5]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-TAED-5) Numerous applications for the phonograph were envisioned, but although it enjoyed a brief vogue as a startling novelty at public demonstrations, the tinfoil phonograph proved too crude to be put to any practical use. A decade later, Edison developed a greatly improved phonograph that employed a hollow wax cylinder instead of a foil sheet. This proved to be both a better-sounding and far more useful device. The wax [phonograph cylinder](http://en.wikipedia.org/wiki/Phonograph_cylinder) created the recorded sound market at the end of the 1880s and dominated it through the early years of the 20th century.

Lateral-cut disc records were developed in the [United States](http://en.wikipedia.org/wiki/United_States) by [Emile Berliner](http://en.wikipedia.org/wiki/Emile_Berliner), who named his system the "gramophone", distinguishing it from Edison's wax cylinder "phonograph" and [Columbia's](http://en.wikipedia.org/wiki/Columbia_Records) wax cylinder "[graphophone](http://en.wikipedia.org/wiki/Graphophone)". Berliner's earliest discs, first marketed in 1889, but only in Europe, were 5 inches (13 cm) in diameter, and were played with a small hand-propelled machine. Both the records and the machine were adequate only for use as a toy or curiosity. In the United States in 1894, under the [Berliner Gramophone](http://en.wikipedia.org/wiki/Berliner_Gramophone) trademark, Berliner started marketing records with somewhat more substantial entertainment value, along with somewhat more substantial gramophones to play them. Berliner's records had poor sound quality compared to wax cylinders, but his manufacturing associate [Eldridge R. Johnson](http://en.wikipedia.org/wiki/Eldridge_R._Johnson) eventually improved them. Abandoning Berliner's "Gramophone" trademark for legal reasons, in 1901 Johnson's and Berliner's separate companies reorganized to form the [Victor Talking Machine Company](http://en.wikipedia.org/wiki/Victor_Talking_Machine_Company), whose products would come to dominate the market for many years.[[6]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-life-6)

In 1901, 10-inch disc records were introduced, followed in 1903 by 12-inch records. These could play for more than three and four minutes respectively, while contemporary cylinders could only play for about two minutes. In an attempt to head off the disc advantage, Edison introduced the Amberol cylinder in 1909, with a maximum playing time of 41⁄2 minutes (at 160 rpm), which in turn were superseded by [Blue Amberol Records](http://en.wikipedia.org/wiki/Blue_Amberol_Records), which had a playing surface made of [celluloid](http://en.wikipedia.org/wiki/Celluloid), a plastic, which was far less fragile. Despite these improvements, during the 1910s discs decisively won this early format war, although Edison continued to produce new Blue Amberol cylinders for an ever-dwindling customer base until late in 1929. By 1919 the basic patents for the manufacture of lateral-cut disc records had expired, opening the field for countless companies to produce them. Analog disc records would dominate the home entertainment market until they were gradually supplanted by the digital[compact disc](http://en.wikipedia.org/wiki/Compact_disc), introduced in 1983.

### Early speeds[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=3" \o "Edit section: Early speeds)]

Early disc recordings were produced in a variety of speeds ranging from 60 to 130 rpm, and a variety of sizes. As early as 1894, [Emile Berliner](http://en.wikipedia.org/wiki/Emile_Berliner)'s United States [Gramophone Company](http://en.wikipedia.org/wiki/Gramophone_Company) was selling single-sided 7-inch discs with an advertised standard speed of "about 70 rpm".[[7]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-7)

One standard audio recording handbook describes speed regulators or "[governors](http://en.wikipedia.org/wiki/Governor_(device))" as being part of a wave of improvement introduced rapidly after 1897. A picture of a hand-cranked 1898 Berliner Gramophone shows a governor. It says that spring drives replaced hand drives. It notes that:

The speed regulator was furnished with an indicator that showed the speed when the machine was running so that the records, on reproduction, could be revolved at exactly the same speed...The literature does not disclose why 78 rpm was chosen for the phonograph industry, apparently this just happened to be the speed created by one of the early machines and, for no other reason continued to be used.[[8]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-8)

By 1925, the speed of the record was becoming standardized at a [nominal](http://en.wikipedia.org/wiki/Real_versus_nominal_value) value of 78 rpm. However, the standard was to differ between countries with their [alternating current](http://en.wikipedia.org/wiki/Alternating_current) electricity supply running at 60 cycles per second (now [hertz](http://en.wikipedia.org/wiki/Hertz)) and the rest of the world. The 78 speed within regions with 60 hertz mains was 78.26 rpm, the speed of a 3600 rpm synchronous motor reduced by 46:1 gearing. Throughout other countries, 77.92 rpm was adopted, the speed of a 3000 rpm synchronous motor powered by a 50 Hz supply and reduced by 77:2 gearing.

### "Acoustical" recording[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=4" \o "Edit section: \"Acoustical\" recording)]

Early recordings were made entirely acoustically, the sound being collected by a horn and piped to a [diaphragm](http://en.wikipedia.org/wiki/Diaphragm_(acoustics)) which vibrated the cutting stylus. Sensitivity and frequency range were poor, and frequency response was very irregular, giving acoustic recordings an instantly recognizable tonal quality. A singer practically had to put his face in the recording horn. Lower orchestral instruments such as [cellos](http://en.wikipedia.org/wiki/Cello) and [double basses](http://en.wikipedia.org/wiki/Double_bass) were often doubled (or replaced) by louder wind instruments, such as [tubas](http://en.wikipedia.org/wiki/Tuba). Standard [violins](http://en.wikipedia.org/wiki/Violin) in orchestral ensembles were commonly replaced by [Stroh violins](http://en.wikipedia.org/wiki/Stroh_violin) which became popular with recording studios.

Contrary to popular belief, if placed properly and prepared-for, drums could be effectively used and heard on even the earliest jazz and military band recordings. The loudest instruments stood the farthest away from the collecting horn. [Lillian Hardin Armstrong](http://en.wikipedia.org/wiki/Lillian_Hardin_Armstrong), a member of [King Oliver's Creole Jazz Band](http://en.wikipedia.org/wiki/King_Oliver%27s_Creole_Jazz_Band) that recorded at [Gennett Records](http://en.wikipedia.org/wiki/Gennett_Records) in 1923, remembered that at first Oliver and his young second trumpet, [Louis Armstrong](http://en.wikipedia.org/wiki/Louis_Armstrong), stood next to each other and Oliver's horn could not be heard. "They put Louis about fifteen feet over in the corner, looking all sad."[[9]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-9)[[10]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-10)

For level fading instrumental parts in and out while recording, some performers were placed on a moveable platform, which could draw the performer(s) nearer or further away as required.

### "Electrical" recording[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=5" \o "Edit section: \"Electrical\" recording)]

During the first half of the 1920s, engineers at [Western Electric](http://en.wikipedia.org/wiki/Western_Electric), as well as independent inventors such as [Orlando Marsh](http://en.wikipedia.org/wiki/Orlando_R._Marsh), developed technology for capturing sound with a [microphone](http://en.wikipedia.org/wiki/Microphone), amplifying it with [vacuum tubes](http://en.wikipedia.org/wiki/Vacuum_tube), then using the amplified signal to drive an electromagnetic recording head. Western Electric's innovations resulted in a greatly expanded and more even frequency response, creating a dramatically fuller, clearer and more natural-sounding recording. Distant or feeble sounds that were impossible to record by the old method could now be captured. Volume was limited only by the groove spacing on the record and the limitations of the intended playback device. Victor and Columbia licensed the new "[electrical](http://en.wikipedia.org/wiki/Electrical)" system from Western Electric and began issuing electrically recorded discs in 1925. The first classical recording was of [Chopin](http://en.wikipedia.org/wiki/Chopin) impromptus and Schubert's Litanei by [Alfred Cortot](http://en.wikipedia.org/wiki/Alfred_Cortot) for Victor.[[11]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-11)

A 1926 [Wanamaker's](http://en.wikipedia.org/wiki/Wanamaker%27s) ad in [*The New York Times*](http://en.wikipedia.org/wiki/The_New_York_Times) offers records "by the latest Victor process of electrical recording."[[12]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-12) It was recognized as a breakthrough; in 1930, a *Times* music critic stated:

"... the time has come for serious musical criticism to take account of performances of great music reproduced by means of the records. To claim that the records have succeeded in exact and complete reproduction of all details of symphonic or operatic performances ... would be extravagant ... [but] the article of today is so far in advance of the old machines as hardly to admit classification under the same name. Electrical recording and reproduction have combined to retain vitality and color in recitals by proxy."[[13]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-13)

Electrical recording preceded electrical home reproduction because of the initial high cost of the new system. In 1925, the Victor company introduced the [Victor Orthophonic Victrola](http://en.wikipedia.org/wiki/Victor_Orthophonic_Victrola), an acoustical record player that was specifically designed to play electrically recorded discs, as part of a line that also included electrically reproducing "Electrolas." The acoustical Orthophonics ranged in price from US$95 to US$300, depending on cabinetry; by comparison, the cheapest Electrola cost US$650, the price of a new Ford automobile in an era when clerical jobs paid about $20 a week.

The Orthophonic had an interior folded exponential horn, a sophisticated design informed by impedance-matching and [transmission-line](http://en.wikipedia.org/wiki/Loudspeaker_enclosure#Transmission_line) theory, and designed to provide a relatively flat frequency response. Its first public demonstration was front-page news in the New York Times, which reported that:

"The audience broke into applause ... [John Philip Sousa](http://en.wikipedia.org/wiki/John_Philip_Sousa) [said]: '[Gentlemen], that is a band. This is the first time I have ever heard music with any soul to it produced by a mechanical talking machine' ... The new instrument is a feat of mathematics and physics. It is not the result of innumerable experiments, but was worked out on paper in advance of being built in the laboratory ... The new machine has a range of from 100 to 5,000 [cycles], or five and a half octaves ... The 'phonograph tone' is eliminated by the new recording and reproducing process."[[14]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-14)

Gradually, electrical reproduction entered the home. The spring motor was replaced by an electric motor. The old "sound box" with its needle-linked diaphragm was replaced by an electromagnetic "pickup" that converted the needle vibrations into an electrical signal. The "tone arm" now served to conduct a pair of wires, not sound waves, into the cabinet. The exponential horn was replaced by an amplifier and a loudspeaker.

### 78 rpm materials[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=6" \o "Edit section: 78 rpm materials)]

The earliest disc records (1889–1894) were made of various materials including hard [rubber](http://en.wikipedia.org/wiki/Rubber). Around 1895, a shellac-based compound was introduced and became standard. Exact formulas for this compound varied by manufacturer and over the course of time, but it was typically composed of about one-third shellac and about two-thirds "mineral filler", which meant finely pulverized rock, usually [slate](http://en.wikipedia.org/wiki/Slate) and [limestone](http://en.wikipedia.org/wiki/Limestone), with an admixture of cotton fibers to add tensile strength, carbon black for color (without this, it tended to be a "dirty" gray or brown color that most record companies considered unattractive), and a very small amount of a lubricant to facilitate mold release during manufacture. Some makers, notably Columbia Records, used a laminated construction with a core disc of coarser material or fiber. The production of shellac records continued until the end of the 78 rpm format (*i.e.*, the late 1950s in most developed countries, but well into the 1960s in some other places), but increasingly less abrasive formulations were used during its declining years and very late examples in truly like-new condition can have as low noise levels as vinyl.

Flexible or so-called "unbreakable" records made of unusual materials were introduced by a number of manufacturers at various times during the 78 rpm era. In the UK, Nicole records, made of [celluloid](http://en.wikipedia.org/wiki/Celluloid) or a similar substance coated onto a cardboard core disc, were produced for a few years beginning in 1904, but they suffered from an exceptionally high level of surface noise. In the United States, Columbia Records introduced flexible, fiber-cored "Marconi Velvet Tone Record" pressings in 1907, but the advantages and longevity of their relatively noiseless surfaces depended on the scrupulous use of special gold-plated Marconi Needles and the product was not a success. Thin, flexible plastic records such as the German Phonycord and the British Filmophone and Goodson records appeared around 1930 but also did not last long. The contemporary French Pathé Cellodiscs, made of a very thin black plastic which uncannily resembles the vinyl "sound sheet" magazine inserts of the 1965-1985 era, were similarly short-lived. In the United States, [Hit of the Week Records](http://en.wikipedia.org/wiki/Hit_of_the_Week_Records), made of a patented blend of transparent plastic on a heavy brown paper base called Durium, were introduced in early 1930. A new issue came out every week and they were available at newsstands like a weekly magazine. Although inexpensive and moderately popular at first, they soon fell victim to the [Great Depression](http://en.wikipedia.org/wiki/Great_Depression) and production ceased in the United States in 1932. Related [Durium](http://en.wikipedia.org/wiki/Durium) records continued to be made somewhat later in the UK and elsewhere, and as remarkably late as 1950 in Italy, where the name "Durium" survived far into the [LP](http://en.wikipedia.org/wiki/LP_record) era as a trademark on ordinary vinyl records. Despite all these attempts at innovation, shellac compounds continued to be used for the overwhelming majority of commercial 78 rpm records during the lifetime of the format.

In 1931, RCA Victor introduced their vinyl-based "Victrolac" compound as a material for some unusual-format and special-purpose records. By the end of the 1930s vinyl's advantages of light weight, relative unbreakability and low surface noise had made it the material of choice for prerecorded radio programming and a number of other uses. When it came to ordinary 78 rpm records, however, the much higher cost of the raw material, as well as its vulnerability to the heavy pickups and crudely mass-produced steel needles still commonly used in home record players, made its general substitution for shellac impractical at that time. During the Second World War, the United States Armed Forces produced thousands of 12-inch 78 rpm [V-Discs](http://en.wikipedia.org/wiki/V-Discs) for use by the troops overseas, as well as 16-inch 33 1/3 rpm War Department [radio transcriptions](http://en.wikipedia.org/wiki/Transcription_disc), all of which were made of vinyl.[[15]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-15) After the war, the wider use of vinyl became more practical as new record players with lightweight ceramic pickups and precision styli made of [sapphire](http://en.wikipedia.org/wiki/Sapphire) or a very hard and durable [osmium](http://en.wikipedia.org/wiki/Osmium) alloy started to proliferate. Victor issued some classical music on transparent red vinyl "De Luxe" 78s at a *de luxe* price, and Decca introduced vinyl "Deccalite" 78s, but other labels confined their use of vinyl to the special thin vinyl DJ pressings of 78s commonly mailed to radio stations during the late 1940s and early 1950s.[[16]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-16)

### 78 rpm disc size[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=7" \o "Edit section: 78 rpm disc size)]

In the 1890s, the [recording formats](http://en.wikipedia.org/wiki/Recording_formats) of the earliest (toy) discs were mainly 12.5 cm (nominally five inches) in diameter; by the mid-1890s, the discs were usually 7 in (nominally 17.5 cm) in diameter. By 1910 the 10-inch (25.4 cm) record was by far the most popular standard, holding about three minutes of music or other entertainment on a side. From 1903 onwards, 12-inch records (30.5 cm) were also sold commercially, mostly of [classical music](http://en.wikipedia.org/wiki/European_classical_music) or [operatic](http://en.wikipedia.org/wiki/Opera) selections, with four to five minutes of music per side. Victor, Brunswick and Columbia also issued 12-inch popular medleys, usually spotlighting a Broadway show score. However, other sizes did appear. Eight-inch discs with a 2-inch-diameter (51 mm) label became popular for about a decade in Britain, but they cannot be played in full on most modern record players because the tone arm cannot play far enough in toward the center without modification of the equipment.

### 78 rpm recording time[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=8" \o "Edit section: 78 rpm recording time)]

The playing time of a phonograph record depended on the turntable speed and the groove spacing. At the beginning of the 20th century, the early discs played for two minutes, the same as early cylinder records.[[17]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-Millard-17) The 12-inch disc, introduced by Victor in 1903, increased the playing time to three and a half minutes.[[18]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-Welch-18) Because a 10-inch 78 rpm record could hold about three minutes of sound per side and the 10-inch size was the standard size for popular music, almost all popular recordings were limited to around three minutes in length.

For example, when [King Oliver](http://en.wikipedia.org/wiki/Joe_%22King%22_Oliver)'s Creole Jazz Band, including [Louis Armstrong](http://en.wikipedia.org/wiki/Louis_Armstrong) on his first recordings, recorded 13 sides at [Gennett Records](http://en.wikipedia.org/wiki/Gennett_Records) in Richmond, Indiana, in 1923, one side was 2:09 and four sides were 2:52–2:59.[[19]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-19)

By 1938, when [Milt Gabler](http://en.wikipedia.org/wiki/Milt_Gabler) started recording on January 17 for his new label, [Commodore Records](http://en.wikipedia.org/wiki/Commodore_Records), to allow longer continuous performances, he recorded some 12-inch records. [Eddie Condon](http://en.wikipedia.org/wiki/Eddie_Condon) explained: "Gabler realized that a jam session needs room for development." The first two 12-inch recordings did not take advantage of the extra length: "Carnegie Drag" was 3:15; "Carnegie Jump", 2:41. But at the second session, on April 30, the two 12-inch recordings were longer: "Embraceable You" was 4:05; "Serenade to a Shylock", 4:32.[[20]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-20)[[21]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-21)

Another way around the time limitation was to issue a selection on both sides of a single record. Vaudeville stars [Gallagher and Shean](http://en.wikipedia.org/wiki/Gallagher_and_Shean) recorded "Mr. Gallagher and Mr. Shean", written by Irving and Jack Kaufman, as two sides of a 10-inch 78 in 1922 for [Cameo](http://en.wikipedia.org/wiki/Cameo_Records).[[22]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-22)

An obvious workaround for longer recordings was to release a set of records. An early multi-record release was in 1903, when [HMV](http://en.wikipedia.org/wiki/HMV) in England made the first complete recording of an opera, [Verdi](http://en.wikipedia.org/wiki/Verdi)'s [*Ernani*](http://en.wikipedia.org/wiki/Ernani), on 40 single-sided discs.[[23]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-23) In 1940, Commodore released [Eddie Condon](http://en.wikipedia.org/wiki/Eddie_Condon) and his Band's recording of "[A Good Man Is Hard to Find](http://en.wikipedia.org/wiki/A_Good_Man_Is_Hard_to_Find)" in four parts, issued on both sides of two 12-inch 78s.

This limitation on the duration of recordings persisted from 1910 until the invention of the [LP record](http://en.wikipedia.org/wiki/LP_record), in 1948.

In popular music, this time limitation of about 3:30 on a 10-inch 78 rpm record meant that singers usually did not release long pieces on record. One exception is [Frank Sinatra](http://en.wikipedia.org/wiki/Frank_Sinatra)'s recording of [Rodgers](http://en.wikipedia.org/wiki/Richard_Rodgers) and [Hammerstein](http://en.wikipedia.org/wiki/Oscar_Hammerstein_II)'s "[Soliloquy](http://en.wikipedia.org/wiki/Soliloquy_(song))", from [*Carousel*](http://en.wikipedia.org/wiki/Carousel_(musical)), made on May 28, 1946. Because it ran 7:57, longer than both sides of a standard 78 rpm 10-inch record, it was released on [Columbia](http://en.wikipedia.org/wiki/Columbia_Records)'s Masterwork label (the classical division) as two sides of a 12-inch record.[[24]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-24) The same was true of [John Raitt](http://en.wikipedia.org/wiki/John_Raitt)'s performance of the song on the [original cast album](http://en.wikipedia.org/wiki/Original_cast_album) of *Carousel*, which had been issued on a 78-rpm album set by American [Decca](http://en.wikipedia.org/wiki/Decca_Records) in 1945.

In the 78 era, classical-music and spoken-word items generally were released on the longer 12-inch 78s, about 4–5 minutes per side. For example, on June 10, 1924, four months after the February 12 premier of [*Rhapsody in Blue*](http://en.wikipedia.org/wiki/Rhapsody_in_Blue), [George Gershwin](http://en.wikipedia.org/wiki/George_Gershwin) recorded a drastically shortened version of the seventeen-minute work with [Paul Whiteman](http://en.wikipedia.org/wiki/Paul_Whiteman) and His Orchestra. It was released on two sides of Victor 55225 and ran for 8:59.[[25]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-25)

### Record albums[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=9" \o "Edit section: Record albums)]

Such 78 rpm records were usually sold separately, in brown paper or cardboard sleeves that were sometimes plain and sometimes printed to show the producer or the retailer's name. Generally the sleeves had a circular cut-out allowing the record label to be seen. Records could be laid on a shelf horizontally or stood upright on an edge, but because of their fragility, many broke in storage.

German record company [Odeon](http://en.wikipedia.org/wiki/Odeon_Records) is often said to have pioneered the "album" in 1909 when it released the [*Nutcracker Suite*](http://en.wikipedia.org/wiki/Nutcracker_Suite) by [Tchaikovsky](http://en.wikipedia.org/wiki/Tchaikovsky) on 4 double-sided discs in a specially designed package.[[26]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-26) (It is not indicated what size the records are.) However, [Deutsche Grammophon](http://en.wikipedia.org/wiki/Deutsche_Grammophon) had produced an album for its complete recording of the opera [*Carmen*](http://en.wikipedia.org/wiki/Carmen) in the previous year. The practice of issuing albums does not seem to have been widely taken up by other record companies for many years; however, [HMV](http://en.wikipedia.org/wiki/HMV) provided an album, with a pictorial cover, for the 1917 recording of[*The Mikado*](http://en.wikipedia.org/wiki/The_Mikado) ([Gilbert & Sullivan](http://en.wikipedia.org/wiki/Gilbert_%26_Sullivan)).

By about 1910[[note 1]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-27) bound collections of empty sleeves with a [paperboard](http://en.wikipedia.org/wiki/Paperboard) or [leather](http://en.wikipedia.org/wiki/Leather) cover, similar to a photograph album, were sold as "[record albums](http://en.wikipedia.org/wiki/Record_albums)" that customers could use to store their records (the term "record album" was printed on some covers). These albums came in both 10-inch and 12-inch sizes. The covers of these bound books were wider and taller than the records inside, allowing the record album to be placed on a shelf upright, like a book, suspending the fragile records above the shelf and protecting them.

Starting in the 1930s, record companies began issuing collections of 78 rpm records by one performer or of one type of music in specially assembled albums, typically with artwork on the front cover and liner notes on the back or inside cover. Most albums included three or four records, with two sides each, making six or eight [tunes](http://en.wikipedia.org/wiki/Musical_composition) per album. When the 12-inch vinyl LP era began in 1949, the single record often had the same or similar number of tunes as a typical album of 78s, and was still often referred to as an "album".

### 78rpm releases in the microgroove era[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=10" \o "Edit section: 78rpm releases in the microgroove era)]

For collectable or nostalgia purposes, a small number of 78 rpm records have been released since the major labels ceased production. In 1968, [Reprise](http://en.wikipedia.org/wiki/Reprise_Records) planned to release a series of 78 rpm singles from their artists on their label at the time, called the "Reprise Speed Series". Only one disc actually saw release, [Randy Newman](http://en.wikipedia.org/wiki/Randy_Newman)'s "I Think It's Going to Rain Today", a track from his [self-titled](http://en.wikipedia.org/wiki/Randy_Newman_(album)) debut album (with "The Beehive State" on the flipside).[[27]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-28) Reprise did not proceed further with the series due to a lack of sales for the single, and a lack of general interest in the concept.[[28]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-29)Guitarist & vocalist [Leon Redbone](http://en.wikipedia.org/wiki/Leon_Redbone) released a promotional 78 rpm record in 1978 featuring two songs ("Alabama Jubilee" and "Please Don't Talk About Me When I'm Gone") from his [*Champagne Charlie*](http://en.wikipedia.org/wiki/Champagne_Charlie_(album)) album.[[29]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-30) In 1980 [Stiff Records](http://en.wikipedia.org/wiki/Stiff_Records) in the [United Kingdom](http://en.wikipedia.org/wiki/United_Kingdom) issued a 78 by [Joe "King" Carrasco](http://en.wikipedia.org/wiki/Joe_Carrasco)containing the songs "Buena" ('good" in Spanish, with the alternate spelling "Bueno" on the label) and "Tuff Enuff". Underground comic cartoonist and 78 rpm record collector [Robert Crumb](http://en.wikipedia.org/wiki/Robert_Crumb) released three discs with his [Cheap Suit Serenaders](http://en.wikipedia.org/wiki/R._Crumb_%26_His_Cheap_Suit_Serenaders) in the 1980s. [Rhino Records](http://en.wikipedia.org/wiki/Rhino_Records) issued a series of boxed sets of 78 rpm reissues of early rock and roll hits, intended for owners of vintage [jukeboxes](http://en.wikipedia.org/wiki/Jukebox). As a special release for [Record Store Day](http://en.wikipedia.org/wiki/Record_Store_Day) 2011, Capitol re-released [The Beach Boys](http://en.wikipedia.org/wiki/The_Beach_Boys) single *"*[*Good Vibrations*](http://en.wikipedia.org/wiki/Good_Vibrations)*"* in the form of a 10" 78 rpm record (b/w *"Heroes and Villains"*). More recently, [The Reverend Peyton's Big Damn Band](http://en.wikipedia.org/wiki/The_Reverend_Peyton%27s_Big_Damn_Band) has released their tribute to blues guitarist [Charley Patton](http://en.wikipedia.org/wiki/Charley_Patton) *Peyton on Patton* on both 12-inch LP and 10-inch 78 rpm.[[30]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-31) Both are accompanied with a link to a digital download of the music, acknowledging the probability that purchasers may be unable to play the vinyl recording.

## New sizes and materials[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=11" \o "Edit section: New sizes and materials)]

Both the *microgroove* [LP](http://en.wikipedia.org/wiki/LP_record) 331⁄3 rpm record and the [45 rpm single](http://en.wikipedia.org/wiki/45_rpm_single) records are made from vinyl plastic that is flexible and unbreakable in normal use. The vinyl records are easier to scratch or gouge, and much more prone to warping.

In 1931, [RCA Victor](http://en.wikipedia.org/wiki/RCA_Records) (which evolved from the Johnson and Berliner's Victor Talking Machine Company) launched the first commercially available vinyl long-playing record, marketed as "Program Transcription" discs. These revolutionary discs were designed for playback at 331⁄3 rpm and pressed on a 30 cm diameter flexible plastic disc, with a duration of about ten minutes playing time per side. In Roland Gelatt's book *The Fabulous Phonograph*, the author notes that RCA Victor's early introduction of a long-play disc was a commercial failure for several reasons including the lack of affordable, reliable consumer playback equipment and consumer wariness during the [Great Depression](http://en.wikipedia.org/wiki/Great_Depression).[[31]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-32) Because of financial hardships that plagued the recording industry during that period (and RCA's own parched revenues), Victor's "long playing" records were discontinued by early 1933.

There was also a small batch of "longer playing" records issued in the very early 1930s: Columbia introduced 10-inch "longer playing" records (18000-D series), as well as a series of double-grooved or longer playing 10-inch records on their Harmony, Clarion & Velvet Tone "budget" labels. All of these were phased out in mid-1932.

Vinyl's lower surface noise level than [shellac](http://en.wikipedia.org/wiki/Shellac) was not forgotten, nor was its durability. In the late 1930s, [radio commercials](http://en.wikipedia.org/wiki/Radio_commercial) and pre-recorded radio programs being sent to disc jockeys started being stamped in vinyl, so they would not break in the mail. In the mid-1940s, special DJ copies of records started being made of vinyl also, for the same reason. These were all 78 rpm. During and after [World War II](http://en.wikipedia.org/wiki/World_War_II), when shellac supplies were extremely limited, some 78 rpm records were pressed in vinyl instead of shellac, particularly the six-minute 12-inch (30 cm) 78 rpm records produced by [V-Disc](http://en.wikipedia.org/wiki/V-Disc) for distribution to United States troops in World War II. In the 1940s, radio transcriptions, which were usually on 16-inch records, but sometimes 12-inch, were always made of vinyl, but cut at 33⅓ rpm. Shorter transcriptions were often cut at 78 rpm.

Beginning in 1939, [Dr. Peter Goldmark](http://en.wikipedia.org/wiki/Peter_Carl_Goldmark) and his staff at [Columbia Records](http://en.wikipedia.org/wiki/Columbia_Records) undertook efforts to address problems of recording and playing back narrow grooves and developing an inexpensive, reliable consumer playback system. The 12-inch (30 cm) Long Play ([LP](http://en.wikipedia.org/wiki/LP_record)) 33⅓ rpm *microgroove*record album was introduced by the [Columbia Record Company](http://en.wikipedia.org/wiki/Columbia_Records) at a New York press conference on June 18, 1948.

Unwilling to accept and license Columbia's system, in February 1949 RCA Victor released the first 45 rpm single, 7 inches in diameter with a large center hole. The 45 rpm player included a changing mechanism that allowed multiple disks to be stacked, much as a conventional changer handled 78s. The short playing time of a single 45 rpm side meant that long works, such as symphonies, had to be released on multiple 45s (rather than a single LP), but RCA claimed that the new high-speed changer rendered side breaks so brief as to be inaudible or inconsequential. Early 45 rpm records were made from either vinyl or [polystyrene](http://en.wikipedia.org/wiki/Polystyrene).[[32]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-33) They had a playing time of eight minutes.[[33]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-Williams-34)

Another size and format was that of radio transcription discs beginning in the 1940s. These records were usually vinyl, 33 rpm, and 16 inches in diameter. No home record player could accommodate such large records, and they were used mainly by radio stations. They were on average 15 minutes per side and contained several songs or radio program material. These records became less common when tape recorders began being used for radio transcriptions around 1949.

On a few early phonograph systems and [radio](http://en.wikipedia.org/wiki/Radio) transcription discs, as well as some entire albums, the direction of the groove is reversed, beginning near the center of the disc and leading to the outside. A small number of records (such as [*The Monty Python Matching Tie and Handkerchief*](http://en.wikipedia.org/wiki/The_Monty_Python_Matching_Tie_and_Handkerchief)) were manufactured with multiple separate grooves to differentiate the tracks (usually called "NSC-X2").

### Speeds[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=12" \o "Edit section: Speeds)]

#### The 'Shellac' era[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=13" \o "Edit section: The 'Shellac' era)]

The earliest rotation speeds varied widely. Most records made in 1900–1925 were recorded at 74–82 [revolutions per minute](http://en.wikipedia.org/wiki/Revolutions_per_minute) (rpm). [Edison Disc Records](http://en.wikipedia.org/wiki/Edison_Disc_Record) consistently ran at 80 rpm.

One early attempt at lengthening the playing time should be mentioned. At least one manufacturer in the early 1920s, World Records, produced records that played at a [constant linear velocity](http://en.wikipedia.org/wiki/Constant_linear_velocity), controlled by [Noel Pemberton Billing](http://en.wikipedia.org/wiki/Noel_Pemberton_Billing)'s patented add-on governor device.[[34]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-35) As these were played from the outside to the inside, the rotational speed of the records increased as reproduction progressed. This action is similar (although in reverse) to that on the modern [Compact Disc](http://en.wikipedia.org/wiki/Compact_Disc) and the CLV version of its predecessor, the [Philips](http://en.wikipedia.org/wiki/Philips) [Laser Disc](http://en.wikipedia.org/wiki/Laser_Disc).

In 1925, 78.26 rpm was chosen as the standard because of the introduction of the electrically powered synchronous turntable motor. This motor ran at 3600 rpm, such that a 46:1 [gear ratio](http://en.wikipedia.org/wiki/Gear_ratio) would produce 78.26 rpm. In parts of the world that used 50 Hz current, the standard was 77.92 rpm (3,000 rpm with a 77:2 ratio), which was also the speed at which a strobe disc with 77 lines would "stand still" in 50 Hz light (92 lines for 60 Hz). After [World War II](http://en.wikipedia.org/wiki/World_War_II) these records were [retroactively known](http://en.wikipedia.org/wiki/Retronym) as*78s*, to distinguish them from other newer disc record formats. Earlier they were just called *records*, or when there was a need to distinguish them from [cylinders](http://en.wikipedia.org/wiki/Phonograph_cylinder), *disc records*.

The older 78 format continued to be mass-produced alongside the newer formats using new materials until about 1960 in the U.S., and in a few countries, such as India (where some [Beatles](http://en.wikipedia.org/wiki/The_Beatles) recordings were issued on 78), into the 1960s. For example, [Columbia Records](http://en.wikipedia.org/wiki/Columbia_Records)' last reissue of [Frank Sinatra](http://en.wikipedia.org/wiki/Frank_Sinatra) songs on 78 rpm records was an album called *Young at Heart*, issued November 1, 1954.[[36]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-ReferenceA-37) As late as the 1970s, some children's records were released at the 78 rpm speed. In the United Kingdom, the 78 rpm single lasted longer than in the United States and the 45 rpm took longer to become popular. The 78 rpm was overtaken in popularity by the 45 rpm in the late 1950s, as [teenagers](http://en.wikipedia.org/wiki/Teenager) became increasingly affluent.

Some of [Elvis Presley](http://en.wikipedia.org/wiki/Elvis_Presley)'s early singles on Sun Records may have sold more copies on 78 than on 45. This is assumed because the majority of those sales in 1954-55 were to the "hillbilly" market in the South and Southwestern United States, where replacing the family 78 rpm player with a new 45 rpm player was a luxury few could afford at the time. By the end of 1957, RCA Victor announced that 78s accounted for less than 10% of Presley's singles sales, essentially announcing the death throes of the 78 rpm format. The last Presley single released on 78 in the United States was RCA Victor 20-7410, "I Got Stung"/"One Night" (1958), while the last 78 in the UK was RCA 1194, "A Mess Of Blues"/"Girl Of My Best Friend" (1960).

#### The microgroove & vinyl era[[edit](http://en.wikipedia.org/w/index.php?title=Gramophone_record&action=edit&section=14" \o "Edit section: The microgroove & vinyl era)]

After World War II, two new competing formats came on to the market and gradually replaced the standard "78": the 331⁄3 rpm (often just referred to as the 33 rpm), and the 45 rpm (see above). The 331⁄3 rpm LP (for "long play") format was developed by[Columbia Records](http://en.wikipedia.org/wiki/Columbia_Records) and [marketed](http://en.wikipedia.org/wiki/Marketing) in 1948. [RCA Victor](http://en.wikipedia.org/wiki/RCA) developed the 45 rpm format and marketed it in 1949, in response to Columbia.[[37]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-Popular_Science_1949-38) Both types of new disc used narrower grooves, intended to be played with smaller stylus—typically 0.001 inches (25 µm) wide, compared to 0.003 inches (76 µm) for a 78—so the new records were sometimes called *Microgroove*. In the mid-1950s all [record companies](http://en.wikipedia.org/wiki/Record_industry) agreed to a common recording standard called [RIAA equalization](http://en.wikipedia.org/wiki/RIAA_equalization). Prior to the establishment of the standard each company used its own preferred standard, requiring discriminating listeners to use pre-amplifiers with multiple selectable equalization curves.

Some recordings were pressed at 162⁄3 rpm. [Prestige Records](http://en.wikipedia.org/wiki/Prestige_Records) released jazz records in this format in the late 1950s, for example two of their [Miles Davis](http://en.wikipedia.org/wiki/Miles_Davis) albums were paired together in this format. Peter Goldmark, the man who developed the 331⁄3 rpm record, developed the [Highway Hi-Fi](http://en.wikipedia.org/wiki/Highway_Hi-Fi) 162⁄3 rpm record to be played in Chrysler automobiles, but poor performance of the system and weak implementation by Chrysler and Columbia led to the demise of the 162⁄3 rpm records. Subsequently, the 162⁄3 rpm speed was used for narrated publications for the blind and visually impaired, and were never widely commercially available, although it was common to see new turntable models with a 16 rpm speed setting produced as late as the 1970s.

[Seeburg Corporation](http://en.wikipedia.org/wiki/Seeburg_Corporation) introduced the [Seeburg Background Music System](http://en.wikipedia.org/wiki/Seeburg_1000) in 1959, using a 162⁄3 rpm 9-inch record with 2-inch center hole. Each record held 40 minutes of music per side, recorded at 420 grooves per inch.[[38]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-39)

The commercial rivalry between RCA Victor and Columbia Records led to RCA Victor's introduction of what it had intended to be a competing vinyl format, the 7-inch (175 mm) 45 rpm disc. For a two-year period from 1948 to 1950, record companies and consumers faced uncertainty over which of these formats would ultimately prevail in what was known as the "War of the Speeds". (See also [format war](http://en.wikipedia.org/wiki/Format_war).) In 1949 Capitol and Decca adopted the new LP format and RCA gave in and issued its first LP in January 1950. The 45 rpm size was gaining in popularity, too, and Columbia issued its first 45s in February 1951. By 1954, 200 million 45s had been sold.[[39]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-40)

Eventually the 12-inch (300 mm) 331⁄3 rpm LP prevailed as the predominant format for musical albums and 10-inch LPs were no longer issued. The last [Columbia Records](http://en.wikipedia.org/wiki/Columbia_Records) reissue of any [Frank Sinatra](http://en.wikipedia.org/wiki/Frank_Sinatra) songs on a 10-inch LP record was an album called *Hall of Fame*, CL 2600, issued on October 26, 1956, containing six songs, one each by [Tony Bennett](http://en.wikipedia.org/wiki/Tony_Bennett), [Rosemary Clooney](http://en.wikipedia.org/wiki/Rosemary_Clooney), [Johnnie Ray](http://en.wikipedia.org/wiki/Johnnie_Ray), [Frank Sinatra](http://en.wikipedia.org/wiki/Frank_Sinatra), [Doris Day](http://en.wikipedia.org/wiki/Doris_Day), and [Frankie Laine](http://en.wikipedia.org/wiki/Frankie_Laine).[[36]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-ReferenceA-37) The 10-inch LP however had a longer life in the [United Kingdom](http://en.wikipedia.org/wiki/United_Kingdom), where important early [British rock and roll](http://en.wikipedia.org/wiki/British_rock_and_roll) albums such as [Lonnie Donegan](http://en.wikipedia.org/wiki/Lonnie_Donegan)'s [*Lonnie Donegan Showcase*](http://en.wikipedia.org/w/index.php?title=Lonnie_Donegan_Showcase&action=edit&redlink=1) and [Billy Fury](http://en.wikipedia.org/wiki/Billy_Fury)'s [*The Sound of Fury*](http://en.wikipedia.org/wiki/The_Sound_of_Fury_(album)) were released in that form. The 7-inch (175 mm) 45 rpm disc or "single" established a significant niche for shorter duration discs, typically containing one item on each side. The 45 rpm discs typically emulated the playing time of the former 78 rpm discs, while the 12-inch LP discs eventually provided up to one half hour of recorded material per side.

The 45 rpm discs also came in a variety known as [extended play](http://en.wikipedia.org/wiki/Extended_play) (EP) which achieved up to 10–15 minutes play at the expense of attenuating (and possibly compressing) the sound to reduce the width required by the groove. EP discs were cheaper to produce, and were used in cases where unit sales were likely to be more limited or to reissue LP albums on the smaller format for those people who had only 45 rpm players. LP albums could be purchased 1 EP at a time, with four items per EP, or in a boxed set with 3 EPs or 12 items. The large center hole on 45s allows for easier handling by [jukebox](http://en.wikipedia.org/wiki/Jukebox) mechanisms. EPs were generally discontinued by the late 1950s as three- and four-speed record players replaced the individual 45 players. One indication of the decline of the 45 rpm EP is that the last [Columbia Records](http://en.wikipedia.org/wiki/Columbia_Records) reissue of [Frank Sinatra](http://en.wikipedia.org/wiki/Frank_Sinatra) songs on 45 rpm EP records, called *Frank Sinatra* (Columbia B-2641) was issued on December 7, 1959.[[36]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-ReferenceA-37) The EP lasted considerably longer in Europe, and was a popular format during the 1960s for recordings by artists such as [Serge Gainsbourg](http://en.wikipedia.org/wiki/Serge_Gainsbourg) and [the Beatles](http://en.wikipedia.org/wiki/The_Beatles).

In the late 1940s and early 1950s, 45 rpm-only players that lacked speakers and plugged into a jack on the back of a radio were widely available. Eventually, they were replaced by the three–speed record player.

From the mid-1950s through the 1960s, in the U.S. the common home "record player" or "stereo" (after the introduction of stereo recording) would typically have had these features: a three- or four-speed player (78, 45, 331⁄3, and sometimes 162⁄3 rpm); with changer, a tall spindle that would hold several records and automatically drop a new record on top of the previous one when it had finished playing, a combination cartridge with both 78 and microgroove styli and a way to flip between the two; and some kind of adapter for playing the 45s with their larger center hole. The adapter could be a small solid circle that fit onto the bottom of the spindle (meaning only one 45 could be played at a time) or a larger adaptor that fit over the entire spindle, permitting a stack of 45s to be played.[[35]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-spindle-36)

RCA 45s were also adapted to the smaller spindle of an LP player with a plastic snap-in insert known as a "[spider](http://en.wikipedia.org/wiki/45_rpm_adapter)".[[35]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-spindle-36) These inserts, commissioned by RCA president [David Sarnoff](http://en.wikipedia.org/wiki/David_Sarnoff) and invented by Thomas Hutchison,[[40]](http://en.wikipedia.org/wiki/Gramophone_record#cite_note-41) were prevalent starting in the 1960s, selling in the tens of millions per year during the 45 rpm heyday. In countries outside the U.S., 45s often had the smaller album-sized holes, e.g., Australia and New Zealand, or as in the United Kingdom, especially before the 1970s, the disc had a small hole within a circular central section held only by three or four "lands" so that it could be easily punched out if desired (typically for use in jukeboxes).

  [Privacy policy](http://wikimediafoundation.org/wiki/Privacy_policy)

 [About Wikipedia](http://en.wikipedia.org/wiki/Wikipedia:About)

 [Disclaimers](http://en.wikipedia.org/wiki/Wikipedia:General_disclaimer)

 [Contact Wikipedia](http://en.wikipedia.org/wiki/Wikipedia:Contact_us)

 [Developers](https://www.mediawiki.org/wiki/Special:MyLanguage/How_to_contribute)

 [Mobile view](http://en.m.wikipedia.org/wiki/Gramophone_record)