Audio in Music Libraries

By Carl Rahkonen
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When Thomas Edison patented his phonograph in 1877, the way we listen to music changed forever. Before that time we could only hear music in live performance, but after the invention of sound recording, music could be captured and listened to at any time and in almost any place. Sound recordings eventually became just as important as scores to music libraries. For the discussion below, please refer to the History of Recorded Sound Timeline.

Edison's phonograph recorded on wax cylinders. The machine was purely mechanical, not needing electricity, and it was quite portable. This made it ideal for use in ethnographic fieldwork. The earliest cylinders of music recorded in this fashion were made by Jesse Walter Fewkes and date from the 1880s. Cylinders had several disadvantages. First, the maximum recording time on each cylinder was around three minutes. So to record even a movement of a symphony would take multiple cylinders. They were far better suited to recording popular songs and ethnographic examples rather than classical music. Second, cylinders were a fragile medium. They were made of wax, or similar materials and were prone to breaking, sensitive to high temperatures, and wore down as they were being played. For these reasons, early music libraries generally did not establish large cylinder collections. Today most of the large cylinder collections are found in ethnographic sound archives, like the American Folklife Center at the Library of Congress, and the Archives of Traditional Music at Indiana University, Bloomington.

Emil Berliner invented and patented the gramophone in 1887, which used disks rather than cylinders. Disks offered a medium that could be more readily developed. Early disk recordings were heavy and bulky, but they were less bulky and easier to store than cylinders, making sound recording collection more practical for libraries. Although earlier 78 rpm disks played for about three minutes, the same as a cylinder recording, eventually record players were developed where one could stack disks and play them one after another in sequence. This facilitated listening to lengthy classical works. For these reasons disks won out over cylinders in the war of competing formats, but because Edison continued to support the cylinder format it did not become totally obsolete until the 1930s.

The most significant technological advances were applied to disk recordings. These advances included making disks from new materials that were less heavy, bulky and fragile, using electrical microphones for recording and amplifiers for playback (adapted from radio) and an electric lathing process. Eventually advances included using "microgroves" and slowing the speed to 33 1/3 rpm, which increased the recording time

to more than 20 minutes per side. These disks were called LPs (for Long Playing records) and they soon featured significantly improved sound quality with high fidelity and stereo. The LP disk became the most widely collected sound recording medium by libraries.

In the 1930s, magnetic sound recording was developed in Germany. These recordings were originally made on steel bands, but soon they were made on wire or magnetic tape. Early magnetic tape was backed with paper and was a fragile medium which could tear or lose its magnetic surface. After the Second World War, magnetic tape continued to be developed in the United States, especially by the 3M Corp., the makers of Scotch tape. Their magnetic tape was made of newly invented plastics and offered a more permanent medium. A ¼ inch width became standard, which could be recorded with one, two or four tracks. A 7" reel of magnetic tape of 1200 feet (1.5 mil.) played at 7 ½ inches per second would record approximately 30 minutes of music. Wire recording had an advantage in that the wire could be much longer, so at standard recording speeds a wire could hold up to a couple of hours of music. But wire had a distinct disadvantage that if it ever broke, you would end up with a tangled mess! Your only option to repair a broken wire was to tie the ends in a square knot and hope it would not get stuck going over the recording heads. Plastic tape, on the other hand, could be easily repaired by splicing. Magnetic tape won over wire in the competing magnetic recording formats.

The ability to splice tape, and also to record parallel tracks simultaneously, changed the recording industry forever. Almost all original studio recordings were made on some form of magnetic tape. Such recordings were built up a track at a time and in many cases differed significantly from what could be done in live performances.

In the early 1960s, the Phillips Corp. of the Netherlands developed the cassette tape. The standard tape was 1/8" wide and moved at a speed of 1 7/8 ips. Initially the audio quality of cassette tapes was far less that that of LPs and reel-to reel recordings, so they were used primarily for voice recording, such as in dictating machines. In the 1970s, eight-track tape cartridges, with ¼ inch wide tape, became the first portable recorded medium widely used in automobiles. But these were soon supplanted by cassette tapes, as technological advances in recorders and players significantly improved cassette audio quality. The cassette tape eventually became the most widely used recording medium in the world. With such inventions as the Walkman®, cassette tapes were being made and listened to in the remotest regions of the world. [Footnote to *What is World Music*; *Cassette Culture*, …]

Magnetic tape also made possible the recording of video. Video recorders and players featured a rotating steel head that produced a recording of much higher quality, equivalent to a much faster tape speed. The home recording video market also had two competing formats, Betamax from Sony and VHS from JVC. VHS eventually became the standard format for home video recording, even though it was bulkier and not as technically advanced as Betamax, partially because VHS tapes could record up to six hours of video, compared to only one hour for Betamax. This longer time made possible the recording of a feature length film on a single VHS cassette.

Music libraries did not fully embrace collecting magnetic recordings, except for VHS tapes, and stuck to LP disks for their collections, since they offered higher quality audio and a permanent medium that could not be recorded over. Reel-to reel tapes, which were more cumbersome to use than LPs, were found in more professional applications such as studio recording, ethnographic field recording, and by audiophiles. Cassette tapes, and to a lesser extent eight-track tapes, were collected primarily by public libraries for their circulating audio collections.

In the late 1970s, a century after Edison's first patent, digital recording was commercially developed. The digital compact disk (CD) was invented jointly by Phillips and Sony. They avoided the major mistake they made with the cassette tape, in that CDs would be a permanent recorded medium, like LPs. Cassette tapes were used for personal home recordings, but they were also used for years to make bootleg recordings of LPs. During the final two decades of the 20th century, the CD replaced the LP as the default pre-recorded music medium.

In the early 1980s, the Phillips and Sony also developed Digital Audio Tape (DAT) the first form of digital recording available to the general public. The DAT tape was a bit smaller than an analog audio cassette and it worked using the same technology as video recorders, a rotating recording and playback head. The DAT format never really caught on with the public due to the lack of availability of these machines, partially brought about by legal battles between the developers and the music industry in the United States.

Back in the early 1990s no one could have anticipated the coming of the Internet revolution, which has caused the greatest advance in human communication since the invention of the printing press. This began with the development of the Personal Computer (PC) in the 1970s, and as millions of these computers became networked, with ever increasing transmission and computing speeds, the Internet, particularly the World Wide Web (WWW), came into its own in the 1990s. No technology has ever had a faster adoption by the general public. [lots of articles on this] The Internet made possible the easy recording and sharing of digital audio files. The most significant movement in this regard was Napster, a WWW site that facilitated the sharing of audio files. One could find literally millions of sound recordings, both legal and illegal under copyright laws, and download them onto their own personal computers. The Recording Industry Association of America (RIAA) sued Napster and won. Now Napster works with the recording industry and charges a fee for each digital file, somewhere around $1 at the present time, which has become the industry standard.

The future of recorded sound will be the digital file. The CD may be around for a while, but eventually everyone will be listening to music on their computers and on portable devices, such as the I-Pod. Libraries have adapted to this revolution by subscribing to digital listening services, such as Napster, the Classical Music Library from Alexander Street Press, and the Naxos Music Library from the Naxos Record Corp. These listening services feature hundreds of thousands of digital tracks of music, far beyond the ability of most music libraries to provide by purchasing CDs. Libraries subscribe annually for a

fee which allows their patrons unlimited listening to these databases, but not the downloading of files. Many of these recordings are available for purchase on CD, or as digital files. Even the cyber industry giant Amazon makes many of these recording files available for purchase on their web-site.

Music libraries will continue to have LP and CD collections, as well as collections of recorded magnetic tape in various formats. The challenge in keeping these collections valid and useful is two fold: preservation and access. An LP is a great medium for preservation; even disks sixty years old or older will play well if not worn or scratched. But how many libraries still have working turntables? And what about finding parts for them, such as drive belts and needles? These things are increasingly hard to find. Also, many of the younger patrons have never even seen a record played, let alone playing one themselves (they need to be instructed on how to put the tone arm on the record!). Magnetic tape formats are becoming even more obsolete, especially in finding working machines to play them. For these reasons, many libraries are digitizing their analog collections for purposes of preservation and access, such as the Variations Project of the Cook Music Library at Indiana University, Bloomington.

We need to consider preservation even for digital formats. The oldest CDs are now thirty years old. They can be subject to oxidation and damage from wear and tear. The DAT tape format is a notoriously poor preservation medium. These digital media need to be migrated to newer digital formats to keep them useful. Sound recording archivists had a kind of summit at the Library of Congress in 2001, which took into consideration problems of access, preservation and intellectual property for folk heritage sound recording collections. [*Folk Heritage Collections in Crisis*, CLIR, 2001.] Their conclusions can be easily applied to general library collections.

The future of sound recording looks very much like the past. The history of sound recording has been characterized by competing formats, and we still have competing formats today. Digital files can be in Win, RealAudio, MP3 and I-Pod formats, to name just the more common competing formats. There is absolutely no guarantee that today's audio file will play on a computer even five years from now, let alone into the foreseeable future. All digital file sound recordings, just like other computer media, will have to be migrated to newer formats as they are developed and become the standard for that time.

History of Recorded Sound Timeline:

1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

Cylinder _____ _ _ _

Analog Disk _____ _ _ _

Magnetic _____ _ _ _

Digital Disk _____ _ _ _

Digital File _____→