

Care and feeding of a digital library

How did this occur?

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The Phonautograph was the first recording device. “Invented by Frenchman Édouard-Léon Scott de Martinville, it was patented on March 25, 1857.[1] It transcribed sound waves as undulations or other deviations in a line traced on smoke-blackened paper or glass. Intended solely as a laboratory instrument for the study of acoustics, it could be used to visually study and measure the amplitude envelopes and waveforms of speech and other sounds, or to determine the frequency of a given musical pitch by comparison with a simultaneously recorded reference frequency.” (Wikipedia, Phonautograph Article). Using a stylus, it recorded sound wave undulation on smoke covered paper or glass.

Twenty years later an idea for playback was presented by Charles Cros where the scribes were etched into a groove pattern and playback with a stylus reversing the original process. Thomas Edison patented the phonograph in 1877 before Cros’s idea could be put into practice.

The era of analog sound begins. Music could be enjoyed without being at a live event. The complete history of analog sound is very fascinating. Inventions of similar design were taking place simultaneously around the world, often, within months or days of each other.

It advanced quickly, taking advantage of every technological development relative to sound recording and playback and the invention of the transistor. The groove and stylus approach improved and expanded. The Stereophonic vinyl record came in 1957 and a, short lived, Quadraphonic vinyl record in 1971. Vinyl records continue to survive today. Many artists are releasing an accompanying LP to their CD.

The first analog magnetization wire recording was done in 1898. This became the predecessor for tape recordings: Reel-to-reel, tape cartridges, cassette tapes, 4-track, and 8-track. Dolby Stereo became the choice for cinema surround sound in 1976. I took to tape readily. I was able to record my LPs and have a “music library” sans the weight. My truck still has a cassette player. Tape players remained popular until the mid ’90s.

The digital era began in 1978 with the LaserDisc and Compact Disc (CD\_DA). There were digital audio tapes and digital cassettes available. Dolby Digital Theatre and Dolby Digital Audio were developed in 1997. These digital products have not changed that much to date. Digital audio was available for playback, but inexpensive recording and converting to digital files would have to wait until the home computer arrived.

What is the distinction between digital audio and analog audio? The answer is an A/D

(analog to digital converter) and, of course, the data format. The electrical analog signal is converted to a 16-bit sample at 44.1 kbps. The analog electrical signal is digitized into 65,536 discrete voltage levels (bits) between the maximum and minimum input levels for the specific A/D. No more cutting and splicing of tapes. Signal processing can now be done with a computer.

There's one more piece of the puzzle to unify audio, in general. Without going into a treatise, a standard reference value for the analog electrical voltage level was needed. The Acoustical Society of America standardized the volume unit (VU) meter, a device displaying a representation of the signal level in audio equipment in 1942. The decibel (dB) is this reference value. It is a logarithmic value of the ratios of signal amplitudes. All I need to understand is that 0 dB is unity gain and -60 dB is a signal 1,000 times less amplitude, -20 dB is one tenth. This is one case where keeping it between the lines is to my benefit. I do not want to confuse this standard reference with volume. These VU levels allow the movement for playback and recording between various electronic devices. Volume refers to the non-distorted amplification of these electronic signals. 60 dB would be 1,000 times the amplitude of the input signal. Probably best to keep it between -60 dB and 60 dB.

To clarify, "Care and Feeding of a Digital Music Library," will concentrate on A/D recording, digital music files for recording, digital signal processing, D/A conversion for playback. It will also include a discussion of library organization.

[1] "1860 'Phonautograph' Is Earliest Known Recording". *NPR.org*. Retrieved 2017-09-19.