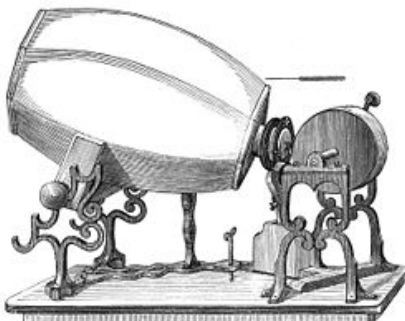


Johnson Lin
Mr. Kerins
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Audio Engineering

Sound is part of our daily life, it is one of our 5 senses, and it can be hard to imagine life without it. Nowadays, it is common to hear sound coming out of an electronic device, like a T.V., a radio, or a cell phone. However, that was only developed recently, because of audio engineering. Audio engineering is about recording sound and reproducing the same sound. This engineering field has come a long way and is now common in our everyday lives. Some of us cannot even live without our precious phones, iPods, or TVs. This field also has room to grow. Replicating sound has been perfected, but it has not been made completely convenient yet. But not only that, there are more sounds to be created, sounds unimaginable right now, because they have yet to be played. Music was introduced many centuries ago, and there are still new things to be done.

Sound engineering dates back to the 1850's with a phonautograph invented by Édouard-Léon Scott de Martinville, would then evolve into a phonograph. The phonograph is perfected by Edison. Afterwards, the phonograph continues to grow, with Edison introducing an electric motor-driven phonograph in the year 1888. About 7 years later, Marconi experiments with wireless telegraphy system, in which in 1901, he was able to successfully transmit a signal from across the Atlantic ocean in Cornwall, UK all the way to St. John's in Newfoundland. Then, in 1898, Vlademar Poulsen patents the Telegraphone, that records magnetically on a steel wire. He proceeds to reveal said invention in 1900 at the Paris Exposition. This was just the beginning to audio engineering, but within 30 years, they took big steps in being able to record sound and reproduce it.



The Phonautograph. The invention that marked the beginning of audio engineering

Soon after, in 1906, Lee DeForest invents a triode vacuum tube, which happens to be the first electronic signal amplifier. The year 1910, marks the first live broadcast in the Metropolitan Opera, in New York City. This leads to Major Edwin F. Armstrong issue a patent for a regenerative circuit, helping radio reception become more practical. Next, in 1913, Edison demonstrates the first talking movie using Kinetophone process, a cylinder player that is mechanically synchronized to a film projector. Edison then proceeds to do live versus recording demonstrations in Carnegie Hall, NYC in 1916. Soon there are huge advances in radio, as the Radio Corporation of America is founded in 1919. Then the first commercial AM radio is broadcasted by KDKA in Pittsburgh, PA, in the year 1921. After these advances in radio, technology other areas begin to take huge jumps.

The year 1927, is when "The Jazz Singer" is released as the first commercial talking picture. Then in that same year, the well known Columbia Broadcasting System (CBS) is formed. A year later, Dr. Georg Neumann starts a company in Germany to manufacture the condenser mics he invented with the first product being named CMV 3. 1929 was very important in which Harry Nyquist publishes the sampling theorem as a basis for all digital audio processing. Not only that, but the "Blattnerphone" is developed and is a magnetic recorder using steel tape. Stereo is patented by Alan Blumlein in 1931. The very first cardioid ribbon mic is patented by Dr. Harry F. Olson which uses a field coil as opposed to a permanent magnet in 1932. In 1933, magnetic recording on steel wire is commercially developed.

Soon after, in that same year, Snow, Fletcher, and Steinberg at Bell Labs transmit the first audio program with an inter-city stereo. The BASF records a symphony concert for the first time during a visit by the London Philharmonic Orchestra in 1936. 2 Years later, Benjamin B. Bauer engineers the Unidyne, Model 55, a mic element that produces a cardioid pickup pattern. This becomes the basis for the well known SM57 and SM58 mics. Other inventions that came out that year were the 44B ribbon bidirectional mics and 77B ribbon unidirectional mics designed by Leslie J. Anderson.

Next, is a major step in which engineers from all over the world independently discover and develop AC biasing for magnetic recording. Along with the first motional feedback, vertical-cut disk recording

head, designed by Western Electric. Lastly, the first experimental FM broadcast happens thanks to Major Armstrong, the inventor of the FM radio, all in 1939. Then, the renowned Fantasia by Disney is released, notably with an eight-track stereophonic sound in the year 1940. The year after that, commercial FM broadcast begins in America. 1942, standards are set, the RCA LC-1 loudspeaker to be the reference for control-room monitor. Also, the very first stereo tape recordings are made that year at German Radio in Berlin by Helmut Kruger. A few years later, stereo tape recordings are put on the market by Webster-Chicago.

This is when the ball really gets rolling for Audio engineering. A Magnetophon is being manufactured, the Model 200, Ampex's first tape recorder, is produced, there are huge improvements in the disk-cutting technology, and the first issue of Audio Engineering is published. A year later, in 1948, the Audio Engineering Society, also known as the AES, is formed in New York City. The LP, a long-play vinyl record, is introduced by Columbia Records. A technique known as the "hot stylus" is brought into the disk recording business in 1951. That same year, an "ultra-linear" amplifier circuit is thought up and brought up as an idea by Hafler and Keroes. The first active program equalizer known as the EQP-1 is introduced by Pultec. At Bell Laboratories, the Germanium transistor is developed.

Roughly 2 years later, the Christmas release of "The Robe" is engineered in CinemaScope with surround sound by Ampex. EMT, a company from Germany, invents the electromechanical reverberation plate. The first pocket transistor radios are introduced by the well known company Sony. There is a live-versus-recorded demonstration in London's Royal Festival Hall, staged by G.A. Briggs. A polydirectional ribbon microphone, known as the 77DX, is introduced by RCA. Lastly, in the year of 1954, the first commercial 2-track stereo tapes are released.

Audio overdubbing becomes much more practical in 1955, thanks to Ampex, developing the "Sel-Sync". The famous guitarist puts it to use the next year, making the first 8-track recordings. Louis and Bebe Barron compose the very first all-electronic film score for the movie Forbidden Planet. Then in 1958, the first commercial stereo disk recordings are available. More standards are set as the FCC selects the Zenith/GE multiplexing method for FM stereo broadcasting in 1961. Then in the next year, the Society of Motion Picture and Television Engineers, also known as the SMPTE, set the time code format

standard.

The events coming next were the defining points that led us to our future. Things like the Compact Cassette tape was invented and offered worldwide by Philips. A full-range sound system was built for The Beach Boys to benefit their music concert tour. Two years later, in 1965, a noise reduction system known as Dolby Type A is introduced. Robert Moog begins to experiment with "synthesizers". Eltro invents a pitch/tempo shifter involving a rotating head assembly to mimic a moving magnetic tape. Then, in 1967, the first electronic music recording is released of Morton Subotnick's Silver Apples of the Moon. The first large rock musical festival occurs, known as the Monterey International Pop Festival. The famous Broadway musical, Hair, uses a high-powered sound system. A year later, CBS releases a polyphonic multitacking of Moog's early music synthesizer called "Switched-On Bach".

Afterwards, in 1969, experiments with digital tape recording occur thanks to Dr. Thomas Stockham. The next important event happens in 1974, when D.B. Keele pioneers the design of constant-directivity using high-frequency horns. In that same year, DuPont creates a chromium dioxide cassette tape. The year after that professional audio studios begin to use digital tape recording. This leads to the invention of a "Walkman in 1980, created by Sony. Then the year after that, Philips introduces the Compact Disc, or what we call nowadays, a CD. Sony continues to be on top of things by releasing a digital adaptor for VCRs, and the first CD player in 1982.

After all of this, we are brought into practically today's technologies. Computers are marketed, consoles appear, and these all have audio thanks to the advances in audio engineering, allowing the user to fully grasp the experience. Home theater systems become a reality, a write-once CD-R is released, and Quicktime is released, a multimedia format. These products continue to improve, including DVDs and CDs, which bring us into today, with things like Blu-Ray and iPods.

It is clear that audio engineering has brought us to where we are today. Where a teenager can listen to music freely, and with a wide range of music to listen to as well, with each song at the touch of their finger. Where people can experience what someone else has recorded for their entertainment, where one gets sucked into a nonexistent world, but one that feels so real with not only the

display, but the replication of sounds. Audio engineering has impacted today's society so much, that it is hard to imagine what it would be like if we could not replicate sounds. Videos would be silent, phone calls would be impossible, and you could only listen to your favorite band by going to one of their concerts, but even then, audio replication is a big thing in bands that use synths or other sounds that would be practically impossible to replicate in real life.

Now, it is hard to imagine what the future for audio engineering will be like. It feels as if its job is done. We have found how to record and replicate sounds, which is what audio engineering was made for. But there are still things to be created, and the ideas lie in future generation's heads. You can't even begin to imagine what it's like because they have yet to be thought up yet. Inventions that will outdo the iPod in a portable music player, inventions that will make nearly perfect recording affordable, inventions that will make new sounds or new instruments, they are the future of audio engineering.

Audio engineering today, involves going to university, and studying one of the two fields it is split into. The first category is a newer one with a promising future, that involves a creative use of sound. This includes creating new sounds, just like how synthesizers were invented. The other category is more of a traditional audio engineering. This involves inventing technologies to record sound. Along with that education, it is recommended, almost required, that you have a bachelor's degree or higher in acoustics, physics, computer science, or other engineering disciplines. All of that to get a job and receive an average salary of \$91,000 a year.

*A complex sound
system involving
sliders in order
to effectively
mix audio used
commonly today
by audio
engineers*

This field of engineering was always of an interest to me. I am a huge fan of music and it is all thanks to audio engineering that I can listen to it freely whenever I can, as I always carry with me my iPod and some earphones. Creating new sounds have always sounded impossible to me, but would be a dream to achieve. To invent something where people can hear sounds that they have not before would be a big accomplishment for me. I have always thought about going into the field of engineering to invent new technologies that will benefit me in how I listen to music constantly, and benefit others like me. That is why I decided to write this paper on audio engineering.

Resources

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