

The background features a dark, textured surface with several horizontal lines of varying colors: red, green, yellow, and purple. These lines are composed of small, irregular segments, giving them a digital or pixelated appearance. A vertical white line runs down the center of the image. The text "Digital Audio" is centered in a stylized, orange-brown font with a slight shadow effect.

Digital Audio

WHAT IS SOUND ?

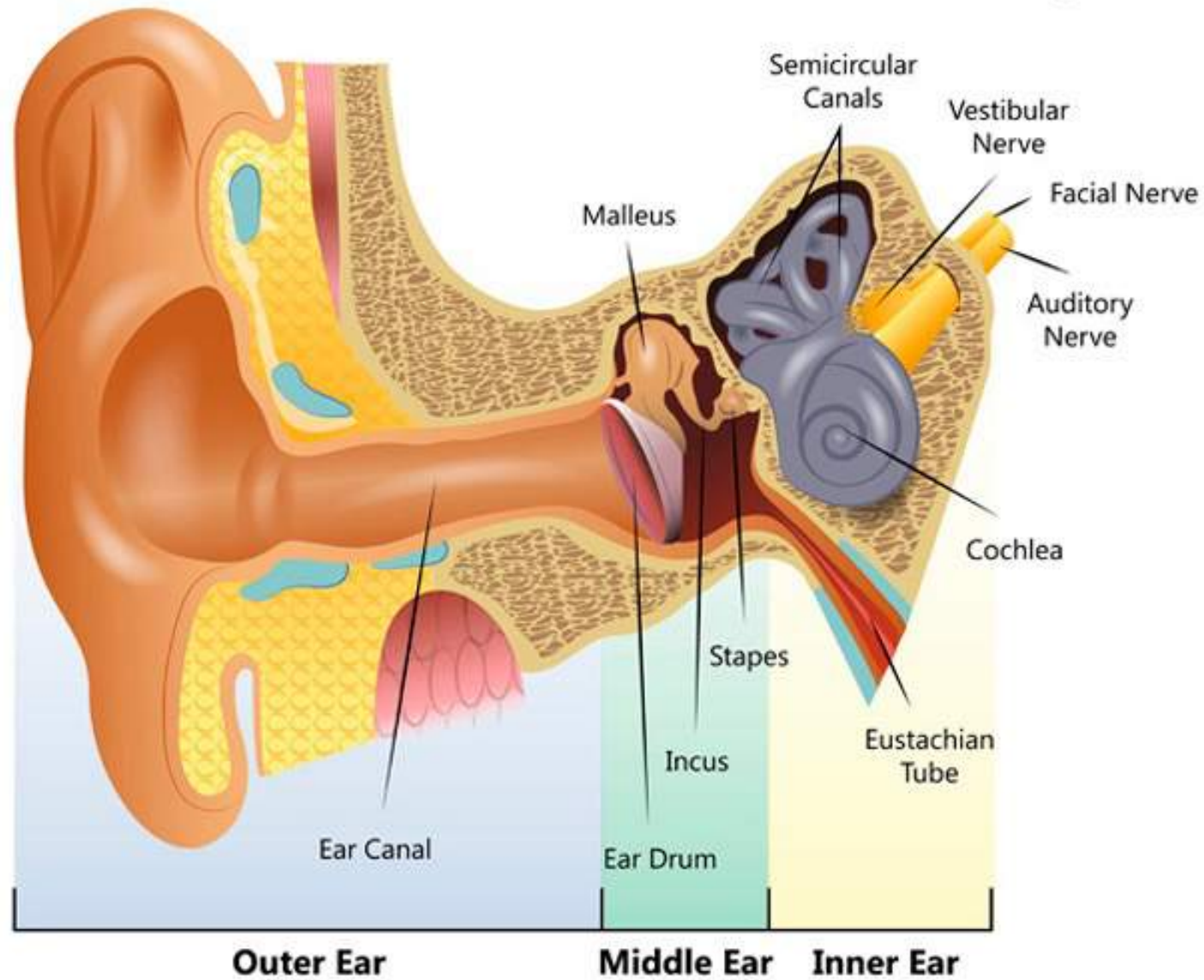
Sound is a pressure wave which is created by a vibrating object.

This vibrations set particles in the surrounding medium (typical air) in vibrational motion, thus transporting energy through the medium.

Some are pleasant and desirable, such as speech and music, while others are unwanted and annoying, such as machinery and road noise.



How does Ear Work



A bit of a history of sound recording....

In recent studies it was found that Sound recording was invented twice

First by inventor Edouard-Léon Scott de Martinville in 1857 France

Second 20 years later in 1877 by Thomas Alva **Edison** in the United States

The Phonograph

Invented by Thomas Edison, in 1877.



The phonograph was designed to record and play back a message.

The audio was imprinted on a tin-foil cylinder whose indentations were interpreted by the phonograph to accurately reproduce the recorded

Sound. It was a mechanical process.



The Turntable, also known as The Gramophone

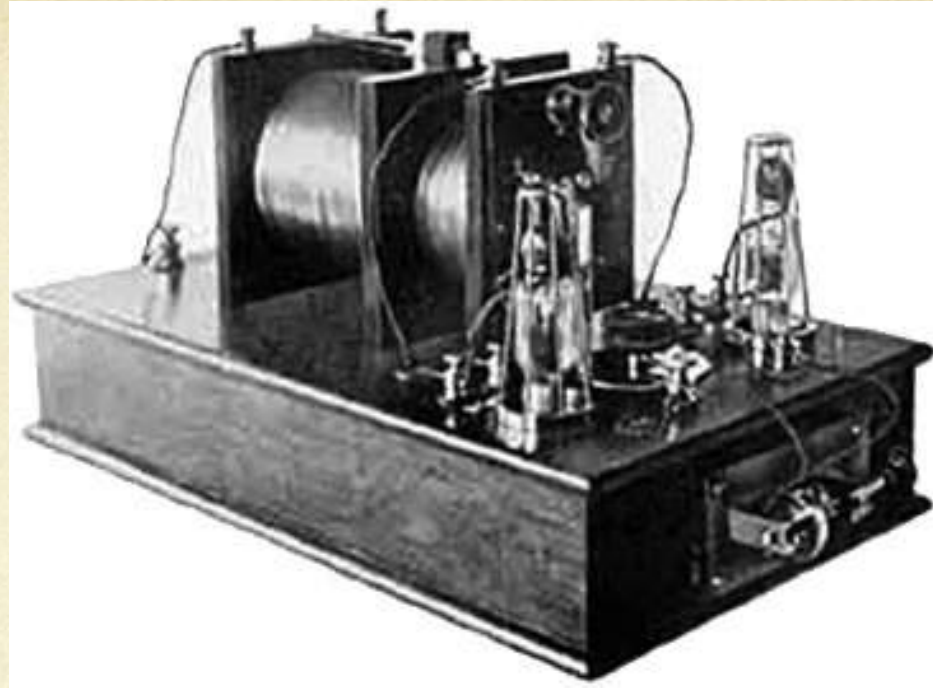
Invented by Emile Berliner in 1887

An improvement over the phonograph, the turntable was the first audio device designed to play flat discs as opposed to cylinders



Vacuum Tube Audio Amplifier, 1906

Invented by Lee De Forest.



The vacuum tube amplifier was designed as an electronic amplifier for use in radio communications and made radio

The time changed from mechanical recording to electronic and then to optical.

The optical film recording was first demonstrated in 1922.

Sound recording on Tape coated with powdered magnetized material was developed in 1930s

In Germany .

It reached the world after WWII. **These were known as Magnetophons**

These were analog recorders . It was referred as analog because of the fact that the waveform encoded

On tape was close analogy to the original sound waveform picked form the microphone.

Digital Audio Recording

The core concept of Digital audio recording is Sampling, means converting continues audio signals to discrete time sampled signals.

Here we get the sampling theorem also known as Nyquist theorem

(Based on the work of Harold Nyquist of Bell Telephone Laboratories

Nyquist Theorem

► $F_s \geq 2f_{\max}$ (Maximum frequency)

The Nyquist Theorem, also known as the sampling theorem, is a principle that engineers follow in the digitization of analog signals.

Suppose the highest frequency component, in hertz, for a given analog signal is f_{\max} . According to the Nyquist Theorem, the sampling rate must be at least $2f_{\max}$, or twice the highest analog frequency component.

The sampling in an analog-to-digital converter. It is actuated by a pulse generator (clock). If the sampling rate is less than $2f_{\max}$, some of the highest frequency components in the analog input signal will not be correctly represented in the digitized output.

This undesirable condition is a form of distortion called aliasing.



The Audio Engineering Society is the only professional society devoted exclusively to audio technology. Founded in the USA in 1948, the AES is now an international organization that unites audio engineers, creative artists, scientists and students worldwide by promoting advances in audio and disseminating new knowledge and research.

The Audio Engineer Society established two standards sampling frequencies

44.1 Khz or 44100 Hz. & 48Khz or 48000Hz

A 32Khz Frequency is also used for broadcasting (Shortwave Radio)

Digital Sound for public

Digital Sound reached public in 1982 by means of Compact Disc (CD).

This was developed by a joint collaboration of Sony Corporation & Phillips







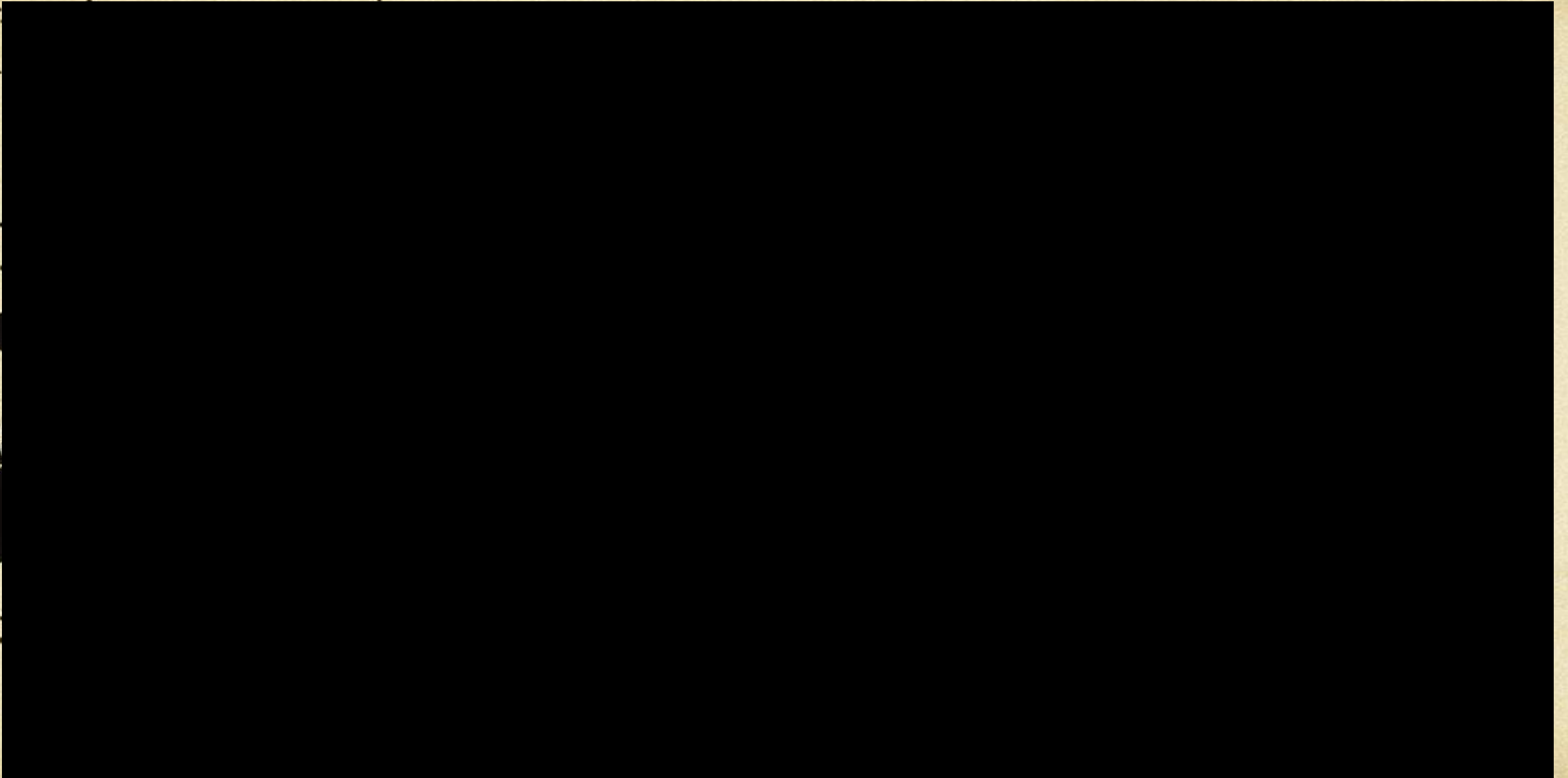
Lets see if you can figure out the difference in sound

Listen and tell the difference

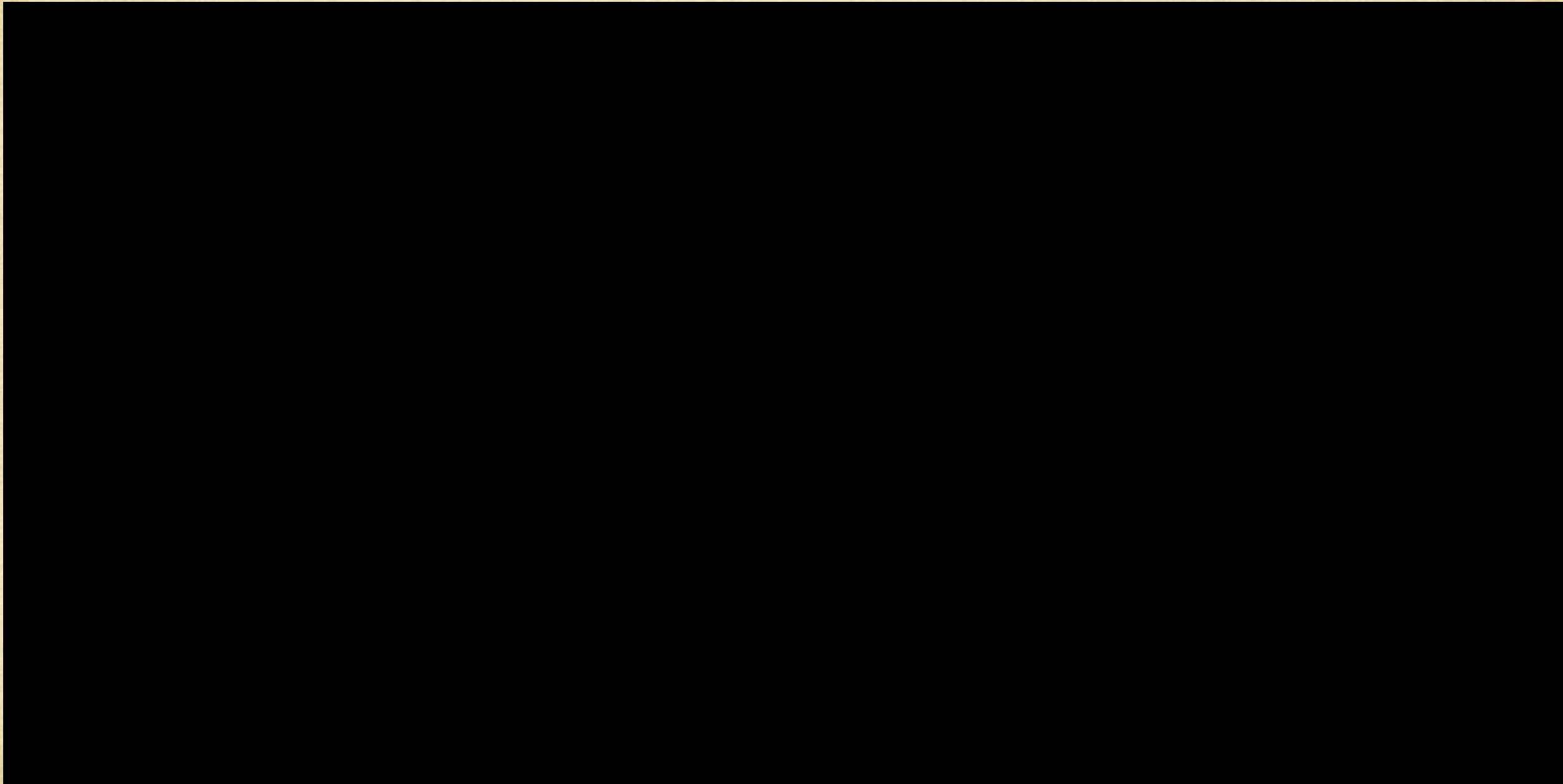
Gramophone



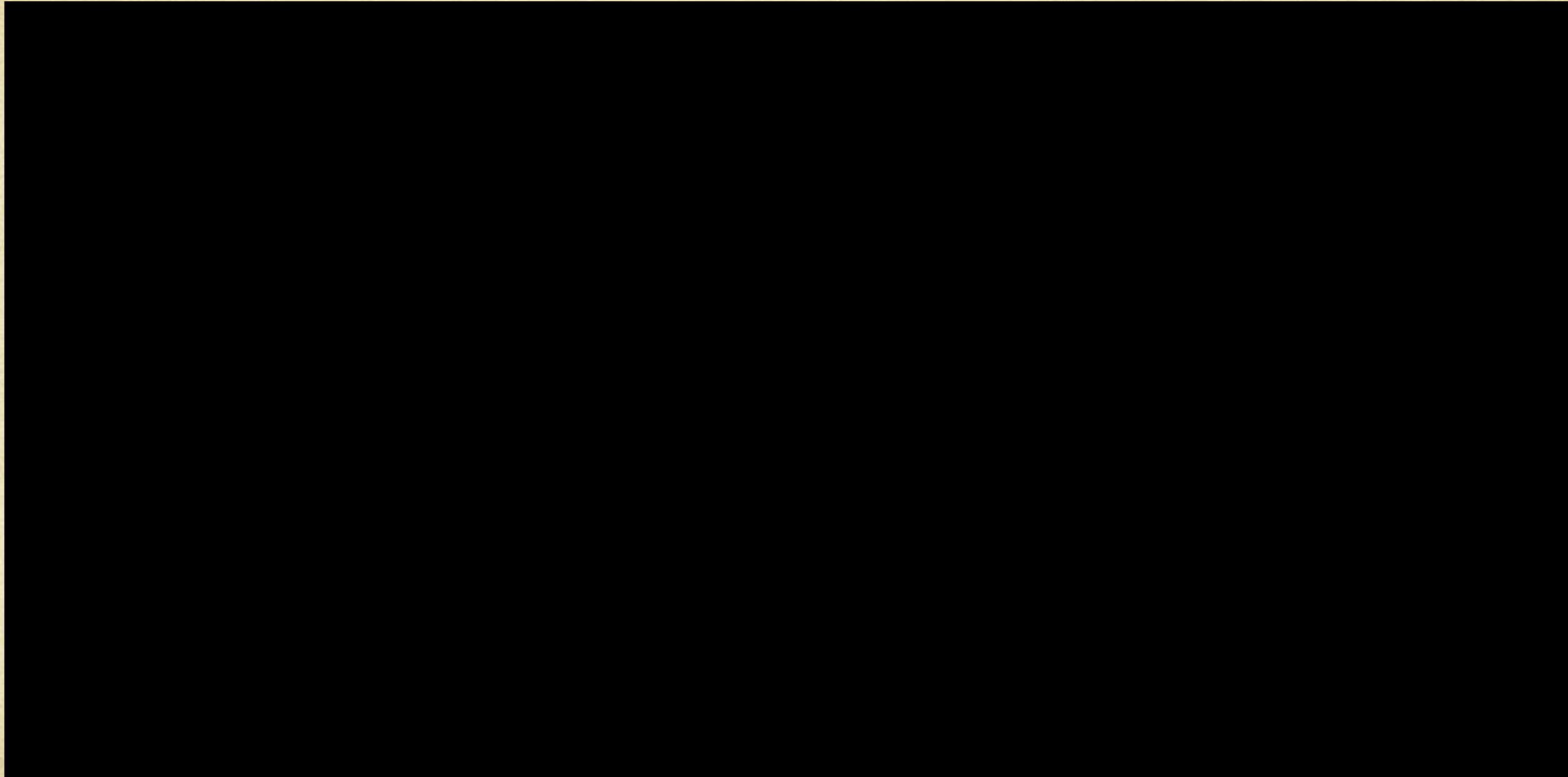
Vacuum Tube Radio



Spool Machine



Cassette Player



Hi Res Audio File



Sampling rate 96Khz 24 bits



What is the difference?

Audio Output

Fidelity of audio or we can say clarity of sound

Amplitude or dynamics of the audio