Chapter P: Moog Synthesizer I.

PHYS 102: The Physics of Sound and Music (Prof. Ruiz)

Claude Debussy
"La Mer"
The Sea

What is the Theremin?
Instrument making eerie pitches without touch
Higher pitch when hand hears the vertical metal rod

Impressionism
Maurice Ravel
Concerto for Left Hand, Boléro
Includes impression of conflict
Orchestra (life) vs Piano (individual)
Piano at end plays "life theme"—at one with nature

VCO. Voltage-Controlled Oscillator
Send in a voltage and out comes an audio wave.
Send the audio signal to the house system or output mixer for now
Sample and Hold
The voltage keeps going out after you release the key.

Trigger Voltage
When key is pressed you get a signal (let's represent this with a "1"). When the key is released, you get a "0."

KBD. Keyboard
When you press a key you get a voltage to send to the VCO, which in turn responds by generating the proper frequency for the key you press.

Control Voltage to VCO
Trigger Voltage
Sample and Hold
either on or off all keys behave the same

VCA. Voltage-Controlled Amplifier
The control voltage is a volume control. This either amplifies the incoming signal (turns the volume up) or kills it (turns the volume down).

Controlling the amplifier electronically enables you to make plucking sounds. There is no way you can turn a volume control up in 1 ms (i.e., 1 thousandth of a second).

Turning volume up to begin a sound is the Attack.
Turning volume down to end a sound is called Release.

Give the 4 basic sounds based on the above controls.

Attack
Abrupt Abrupt
Abrupt Gradual
Gradual Abrupt
Gradual Gradual

Release
Staccato (like a slap)
Explosive (like an explosion)
Sucking (like on a straw—last drop)
Swishing (like ocean, "La Mer")
Four-Part Model of Sound: Attack (begin sound), Decay (back off quickly to sustain level), Sustain (as key is down), then Release (key is released). ADSR is also called the envelope.

Amplitude Shaping

Square wave is shaped like "fucking it in an envelope."

The **ADSR** (also called Envelope Generator). Attack, Decay, Sustain, Release. When you press a key, the attack begins and then the decay, all based on settings you made earlier for the ADSR. Then, if you keep pressing the key, the sustain phase continues. When you release the key, the ADSR turns the VCA off for you, based on your prior setting for the ADSR.

**LFO. Low-Frequency Oscillator**. Low-frequency (0 to 25 Hz) control voltage so you can do modulation. Attach it to the VCO for frequency modulation (vibrato); attach it to the VCA for amplitude modulation (tremolo).

The VCO, KBD, VCA, and ADSR Together. Playing a Tune with **Vibrato**.

Later sketch the arrangement for playing a tune with tremolo. Where do you attach the LFO?

Give our two movie examples of impressionism: **Annie** and **Superman**.

What are the objects related to these impressions? **House** and **Crystal**

 Moves the LFO from the VCO to the VCA (Amplitude Modulation) Tremolo

John Williams' Music

Fantastic, Large, Magnificent

Mystery Key to Superman's Identity