



### The Colors of Noise

We've all heard of "White Noise"...probably even saw the flick (I gave it a two thumbs down...or as they used to say "Hated it...").

Remember; Sound and Light obey the same laws of reflection. And with that being said - because the Spectrum of Sound Wave Frequencies are similar to the Spectrum of Light Wave Frequencies the different colors apply to different types of noise based on their distinct frequencies and characteristics. Thus, if the sound wave pattern of Pink Noise were rendered into light waves, the result would be Pink Light, etc.

We all know that "White Light" is a combination of all colors in the visible light spectrum. When "White Light" shines through a prism (or water vapor, like when you see a rainbow); the "White Light" is broken apart into the colors of the visible light spectrum.

#### Definitions of the Colors of Noise

Black Noise; is noise that has a frequency spectrum of predominantly zero power level over all frequencies except for a few narrow bands or spikes. Basically, Black Noise is silence, no noise at all.

Blue Noise; aka Azure Noise, is similar to Pink Noise except the power density increases 3 dB per octave as the frequency increases. In technical terms the density is proportional to the frequency. This can be good noise for dithering (digital audio processing technique used to prevent sound distortion).

Brown Noise; has more energy at lower frequencies (decreasing by around 6dB per octave). To the human ear, Brown Noise is similar to White Noise but at a lower frequency. Examples in nature include waves on the beach and some wind noise.

Green Noise; said to be the background noise of the world. It is the mid-frequency component of White Noise. Ambient noise averaged from several different outdoors locations, similar in sound to Pink Noise with an emphasis on the range around 500Hz.

Grey Noise; is a random noise which sounds the same at all frequencies to the human ear. This is not the same as White Noise, which has the same energy at all frequencies. Grey Noise is subjected to a psycho-acoustic equal loudness curve which compensates for the bias of the

human ear so that it sounds the same at all frequencies. (Psycho-acoustic is the study of sounds or acoustics perceived by the human ear).

Orange Noise; relates to musical scales, the bands of zero energy coincide with the notes in the scale. This means that the "in-tune" notes of a scale are removed, leaving only the "out-of-tune" frequencies. It creates a clashing, displeasing noise, since all "in-tune" musical notes are eliminated, the remaining spectrum consists of "sour" or "Orange Notes".

Pink Noise; is similar to White Noise except that it contains an equal amount of energy in each octave band. Sound Engineers use Pink Noise to test whether a system has a flat frequency response. Pink Noise can be generated by putting White Noise through a Pinking Filter which removes more energy as the frequency increases (approximately 3 dB per octave). Each octave contains the same amount of power. As White Noise is similar to White Light (representing all frequencies equally); Pink Noise is similar to light which leans towards the lower end of the visible light spectrum - Red Light. Cool Edit Pro's Definition: Pink Noise has a spectral frequency of  $1/f$  and is found mostly in nature. It is the most natural sounding of the noises. By equalizing the sounds, you can generate rainfall, waterfalls, wind, rushing river, and other natural sounds. Pink Noise is exactly between Brown and White Noise (which is why some people used to call it Tan Noise, but Pink was more appealing). It is neither random nor predictable. It has a fractal-like nature when viewed. When zoomed in, the pattern looks identical to when zoomed out, except at lower amplitude.

Purple Noise; is similar to Brown Noise except that the power density increases 6 dB per octave as the frequency increases.

Red Noise; is another name for Brown Noise, and an oceanographic term which describes the ambient noise of distant underwater objects due to the selective absorption of higher frequencies. The color "Red" refers to the loss of higher frequencies with an emphasis on lower frequencies (this is from the White Noise/White Light analogy and applies to either of the above definitions).

White Noise; a random noise that contains an equal amount of energy in all frequency bands. White Noise is the equivalent of White Light and is how it gets its name. White Light is made-up of all light frequencies (colors), while White Noise is made-up of all audio frequencies. White Noise is used in electronic music, either directly as a sound effect or as the basis to create other noises. For example, many percussion instruments have a high component of White Noise. White Noise is also used to mask other sounds. This process takes advantage of the way the human brain works; the brain is able to single-out simple frequency ranges but has trouble when too many frequencies are heard at once. When White Noise is present, other noises appear diminished.