

Turn the Physics Around – *Generate Music from $1/f^\beta$ Noise!*

It should be clear to the reader that since human music does have temporal $1/f^\beta$ “noise” fluctuations in amplitude/loudness, frequency/pitch and beat/tempo/rhythm, that it is indeed possible to generate a “new” kind of music – fractal music e.g. via computer programs using $1/f^\beta$ random “noise” generator(s) for these parameters!

We stumbled on this ourselves some years back, in the process of developing the Chaotic Water Drop experiment for the UIUC Advanced/Modern Physics Lab:



A “leaky” water faucet most of the time exhibits a periodic rate of water drops falling from/dripping off of the faucet. A 2-D scatterplot of successive time differences between adjacent water drops $t_{n+2} - t_{n+1}$ vs. $t_{n+1} - t_n$ in the periodic regime exhibits a linear y vs. x correlation in the scatterplot as the flow/leak rate in the precision needle valve is slowly changed, or a 2-D Gaussian distribution for *fixed* flow/leak rate. However, for certain very specific flow rates thru the precision needle valve, chaotic/strange attractor behavior in the scatterplot of successive time differences between adjacent water drops $t_{n+2} - t_{n+1}$ vs. $t_{n+1} - t_n$ occurs, as shown below in the two scatterplot figures. The first scatterplot was obtained slowly scanning the flow rate over a large range; the second scatterplot was obtained at a fixed flow rate.