

## Mockingbirds and Metamaterials

Listening to a mockingbird is so amazing. There are so many combinations of sounds in their song repertoire! Their scientific name (*Mimus polyglottos*) represents their incredible ability to mimic the songs of many other birds. The act of creating these combinations is very interesting, as this is what mankind has been doing with materials for centuries to try to make something that is pretty or valuable.

In the early days of man, there was no real understanding of the makeup of substances and materials. Clever people decided how to make iron tools and eventually developed the harder alloy steel, but they had no knowledge of the building blocks that comprise matter.

The ancient philosophers postulated that everything was made of earth, wind, fire, and water. Some added the fifth element, the quintessence, that was the aether (a heavenly substance, perhaps akin to spirit). Later, there were those called alchemists that tried to profit from this perceived understanding of the universe by searching for a way to turn lead into gold.

Once it became clear that molecules, atoms, and even more fundamental particles were the true makeup of matter, man was able to mix things together in many different combinations and “create” various molecules for his own use. Every combination of metals was also studied and new alloys formed that had amazing properties. But soon most of the combinations had been tried, and progress slowed drastically.

The next step came with the ability to form very pure crystals that had well ordered lattice organizations. When these substances were “doped” with other materials, those atoms displaced original atoms at regularly spaced locations. In the world of radiation detectors, these complex crystals could respond to different (especially the longer infrared) wavelengths of light in a much more powerful way.

Then came the emergence of metamaterials, the nanotechnology that gives an entirely new dimension to the variety and number of products. These structures have metrics on the order of the wavelength of light, and one particular use is to segregate specific wavelengths of light by creating microchannels using holes or stacks of layered components.

When I think of such a device, I think of the parallel to writing a story that weaves all of the “elements” together like in one of these metamaterials, only it channels a thought instead of a wavelength projecting it coherently to a target audience. All other wavelengths (or, distracting thoughts) are minimized, and the main point is made crystal clear. These structures are what I want to build to make people think about what is Good and True.