

## Similarities and Differences between Metatronics and Electronics

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The fields of electronics, micro- and nanoelectronics have seen unprecedented developments in the past several decades as an excellent paradigm for information processing. The underlying mechanism in electronics is the ability to control the motion of charged particles, e.g., electrons and holes, and as a result manipulating electric currents. But is the motion of charged particles the only current we encounter? The electric displacement current is of course another important current, particularly as one considers higher frequencies such as IR and optical regimes. How can we then manipulate, tailor, and control the displacement currents at the nanoscale? The concepts of metamaterials and plasmonic optics provide us with the tools to tame the displacement currents at optical frequencies. This is at the basis of the field of metatronics – metamaterial-inspired optical nanocircuitry-- which we have been developing in my group (N. Engheta, Science, 317, 1698, September 21, 2007). Metatronics offers a novel paradigm for nanoscale optical information processing. The metatronic circuits exhibit exciting features that are not available in their electronic counterparts. In this talk, I will present some of the major distinctions between the two fields of metatronics and electronics.