

Beyond charge currents: spin and ion currents for future computing Technologies tutorial

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Abstract

The era of computing technologies based on charge currents is coming to an end after more than 40 years of exponential increases in computing power that have been largely based on shrinking devices in two dimensions. A new era of "Beyond charge!" will evolve over the next decade that will likely be based on several new concepts.

Firstly, devices whose innate properties are derived not from the electron's charge but from spin currents and from ion currents. In some cases new functionality will arise that can extend charge based devices but in other case fundamentally new computing paradigms will evolve.

Secondly, devices will inevitably become three-dimensional: novel means of constructing devices, both from bottom-up and top-down, will become increasingly important.

Thirdly, bio-inspired devices that may mimic the extremely energy efficient computation systems in the biological world are compelling. In this talk I will discuss possible spintronic and ionitronic devices and how they may lead to novel computing technologies.

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