Transcranial direct current stimulation (tDCS) is an emerging therapeutic technique under investigation for a variety of neurological and psychiatric disorders including stroke rehabilitation, addiction recovery, major depressive disorder, neuropathic pain, as well as other indications. There are encouraging results for some conditions, yet the efficacy of tDCS is mixed for others and even for successful trials there is a need to further improve effectiveness. Moreover, it is unusual that a single approach would be effective and specific in such a diversity of applications. This talk introduces the source of specificity and efficacy with tDCS, and outlines approaches to customize and optimize tDCS treatment for specific indications and individuals. Based on computational modeling of current flow using MRI-derived models and on brain slice neurophysiology, work from the Bikson lab aims to enhance the efficacy and specificity of tDCS by using physics (anatomical targeting) and electrophysiology (functional targeting).