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Abstract for an Invited Paper
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**Effects of surface asymmetry on neuronal growth**[1]

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Understanding the brain is of tremendous fundamental importance, but it is immensely challenging because of the complexity of both its architecture and function. A growing body of evidence shows that physical stimuli (stiffness of the growth substrate, gradients of various molecular species, geometry of the surrounding environment, traction forces etc.) play a key role in the wiring up of the nervous system. I will present a systematic experimental and theoretical investigation of neuronal growth on substrates with asymmetric geometries and textures. The experimental results show unidirectional axonal growth on these substrates. We demonstrate that the unidirectional bias is imparted by the surface ratchet geometry and quantify the geometrical guidance cues that control neuronal growth. Our results provide new insight into the role played by physical cues in neuronal growth, and could lead to new methods for stimulating neuronal regeneration and the engineering of artificial neuronal tissue.

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