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**Convection driven generation of long-range material gradients in microchannels**[1] MATTHEW HANCOCK, YANAN DU, JIANKANG HE, ALI KHADEMHOSSEINI, Harvard Medical School — Natural materials exhibit anisotropy with variations in soluble factors, cell distribution, and matrix properties. The ability to recreate the heterogeneity of the natural materials is a major challenge for investigating cell-material interactions and for developing biomimetic materials. Here we present a generic fluidic approach using convection and alternating flow to rapidly generate multi-centimeter gradients of biomolecules, polymers, beads and cells and cross-gradients of two species in a microchannel. Accompanying theoretical estimates and simulations of gradient growth provide design criteria over a range of material properties. A poly(ethylene-glycol) hydrogel gradient, a porous collagen gradient and a composite material with a hyaluronic acid/gelatin cross-gradient were generated with continuous variations in material properties and in their ability to regulate cellular response. This simple yet generic fluidic platform should prove useful for creating anisotropic biomimetic materials and high-throughput platforms for investigating cell-microenvironment interaction.

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