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**Flow-Based Organization of Soft Matter in Three Dimensions**

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— Flows of miscible and immiscible liquids through microchannel networks have been previously used to achieve spatial organization within one plane. However, extending this approach to three dimensions, an essential requirement to create synthetic bulk materials with a regular microstructure, is not straightforward. To our knowledge for the first time, we demonstrate microfluidic strategy for the three-dimensional organization of soft bulk materials. The approach is enabled by a massively scaled microfluidic architecture that distributes two miscible or immiscible fluid streams through an array of parallel channels. The soft-lithographic fabrication process was adapted to consistently define microfluidic channel networks in elastomer substrates that are only 500 microns thin; followed by subsequent bonding of up to ten such layers in the vertical direction. The chip was connected with fluidic inlets, completely immersed in water and continuously extruded the organized material at its exit. Upon leaving the chip, neighbouring fluid streams formed a hydrogel retaining the desired regular microstructure. The material microstructure was controlled by adjusting the flow rates of the interdiffusing fluid streams (e.g. aqueous alginate and calcium chloride solutions).

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