Supplementary Fig. S1. Fibroblast morphologies adopted after one day of culture in gelatin scaffolds with 60-μm pores.
**Supplementary Fig. S2.** Fibroblast morphologies adopted after one day of culture in gelatin scaffolds with 120-μm pores.

**Supplementary Movies**

**Supplementary Movie S1.** Monodisperse bubbles are generated in a flow-focusing microfluidic device and self-organize into an ordered array of flowing lattice.

**Supplementary Movie S2.** A z-scan of polarized MDCK cells in a scaffold with pores of 70 μm by confocal microscopy.

**Supplementary Movie S3.** Rendering movie (360°) of a sticker fibroblast spread across the wall of the spherical pore. This cell also appears in Fig. 5A.

**Supplementary Movie S4.** Rendering movie (360°) of a stretcher fibroblast straddling a scaffold pore. This cell also appears in Fig. 5B.
Supplementary Movie S5. Rendering movie (360°) of a squatter fibroblast lifting its body away from the pore wall by short pseudopodia. This cell also appears in Fig. 5C.

Supplementary Movie S6. A z-scan of the aster pattern constructed by C2C12 cells in a scaffold by confocal microscopy.