Supplementary Methods:

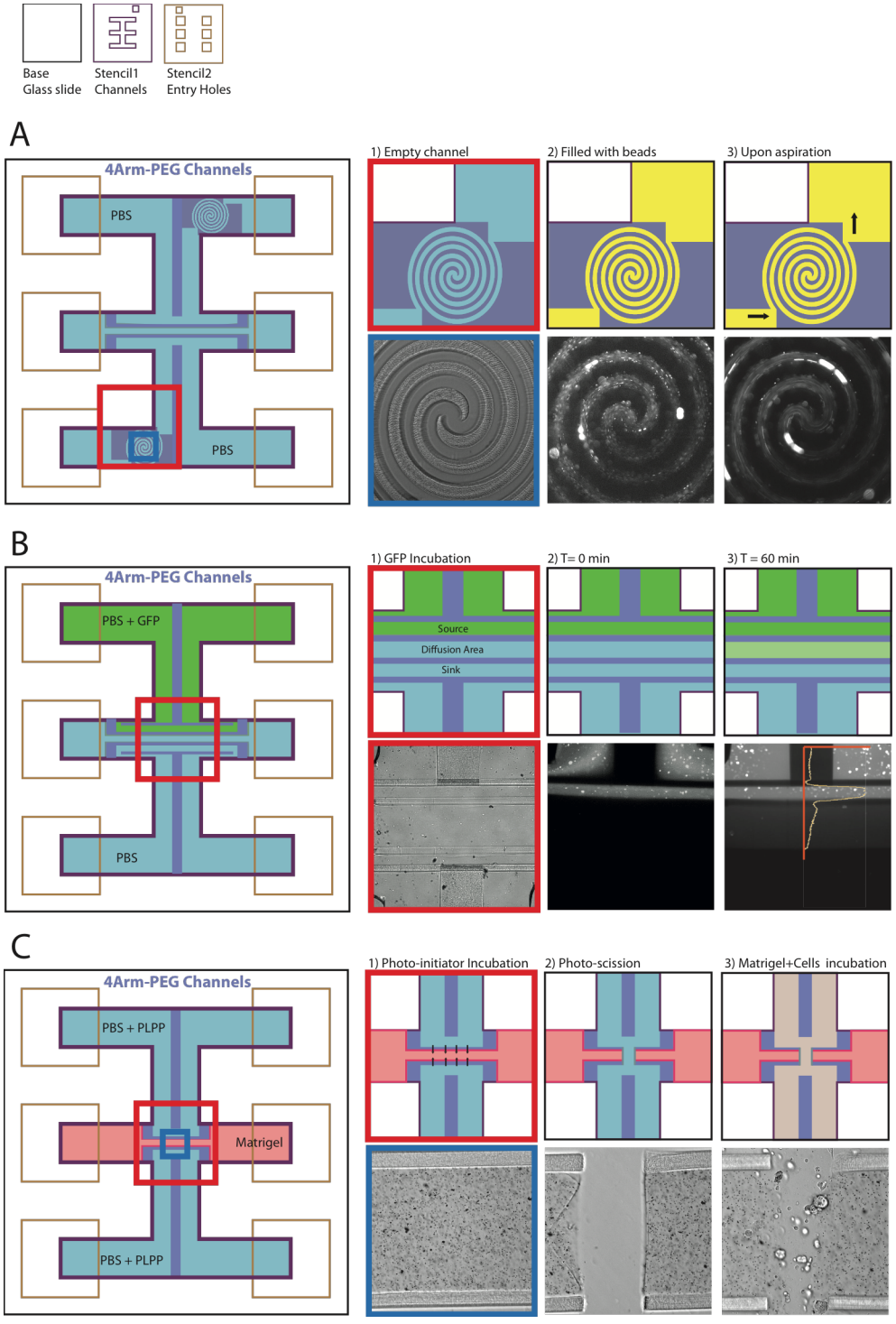
To fabricate the hydrogel micro-channels shown in **Supp.1**, a solution consisting of 5% 4-Arm-PEG-Acrylate diluted in PLPP 1X was injected inside the 6 entries of the PDMS microfluidic devices. During argon perfusion, channels were photo-polymerized using successive and stitched insolations at 128 mw/cm² for 30 sec each. The non-polymerized prepolymer was rinsed with PBS. All insolation steps were performed using a 4X objective.

Panel A: Inside the spiral-shaped microchannels, a solution of 0.3 um carboxy-fluorescent beads was incubated. A flow was induced by pipetting.

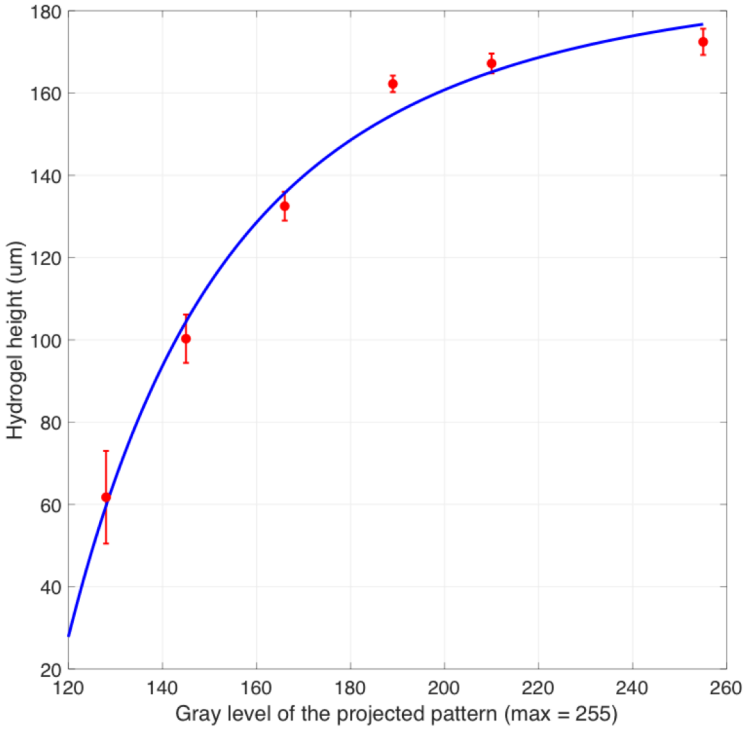
Panel B: After the hydrogels microchannels were photopolymerized, a solution of 1mg/mL purified GFP was flushed through the upper channel. Fluorescent images of the GFP profiles were taken before and after 1 hour of rocking agitation.

Panel C: After the hydrogels microchannels were photopolymerized, high content Matrigel (21 mg/mL) was incubated in the center channel at 4C° for 30 minutes. The chip was then put at 37C° for Matrigel solidification. PLPP 1X was incubated in the upper and lower channels and let to perfuse for 5 minutes. Photo-scission was performed by insolating a grayscale pattern consisting of a bar with white borders **(pattern17 Supp.3)** at 45,7 mw/cm² using a 10X magnification objective during 3 hours. Then, a new solution of cell-laden Matrigel was let to flow from the top channel down to the bottom chamber through the scissionned area. The cell culture was then carried over for one week in cell culture medium.

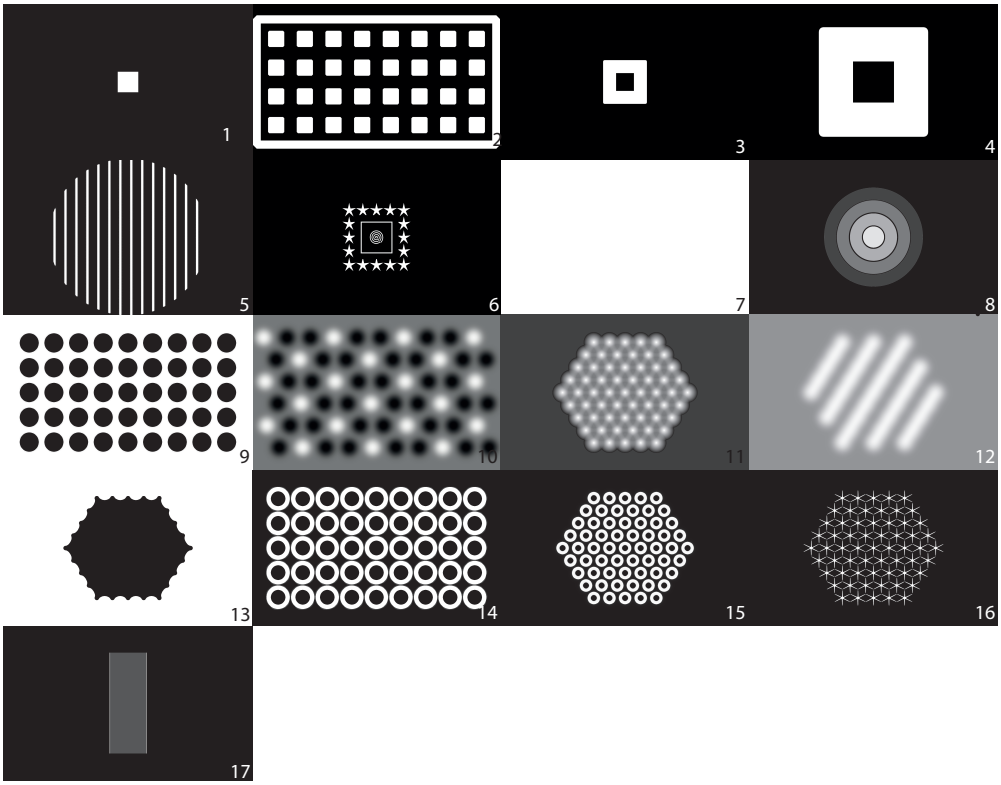
Supplementary Figuress:



Supplementary Figure 1: In-situ photo-polymerization and photo-scission of hydrogels inside standard PDMS microfluidic devices. Top: schematic of the alternative stencils stacked to create standard microfluidic chips. **a,** Left: schematics of the whole chip with channel stencil (violet), entry stencil (orange) and hydrogel channels (blue). Schematics and corresponding fluorescence microscopy images of the device under operation showing flow of fluorescent beads (yellow) inside the channels. **b,** Left: schematics of the whole chip with channel stencil (violet), entry stencil (orange) and hydrogel channels (blue). Right: Schematics and corresponding fluorescence microscopy images of the device under operation showing diffusion of GFP (green) and the establishment of a gradient through the hydrogel channels. **c,** Left: schematics of the whole chip with channel stencil (violet), entry stencil (orange), hydrogel channels (blue) and injected Matrigel (Pink). Right: Schematics and corresponding fluorescence microscopy images of the device under sequential



Supplementary Figure 2: Plot of the gel height as a function of the projected DMD gray level in air atmosphere. Error bars represent the standard deviation of 32 experiments.



Supplementary Figure 3: 8 bit images projected as UV patterns for all the experiments described in this report. Patterns 1-5 were used in **Fig.1**. Patterns 1,3, 4 and 6 were used in **Fig.2B** and 7,8 in **Fig.2C.** Patterns 7 and 9 to 16 were used in **Fig.3**. Pattern 17 was used in **Supp. Fig.1**.