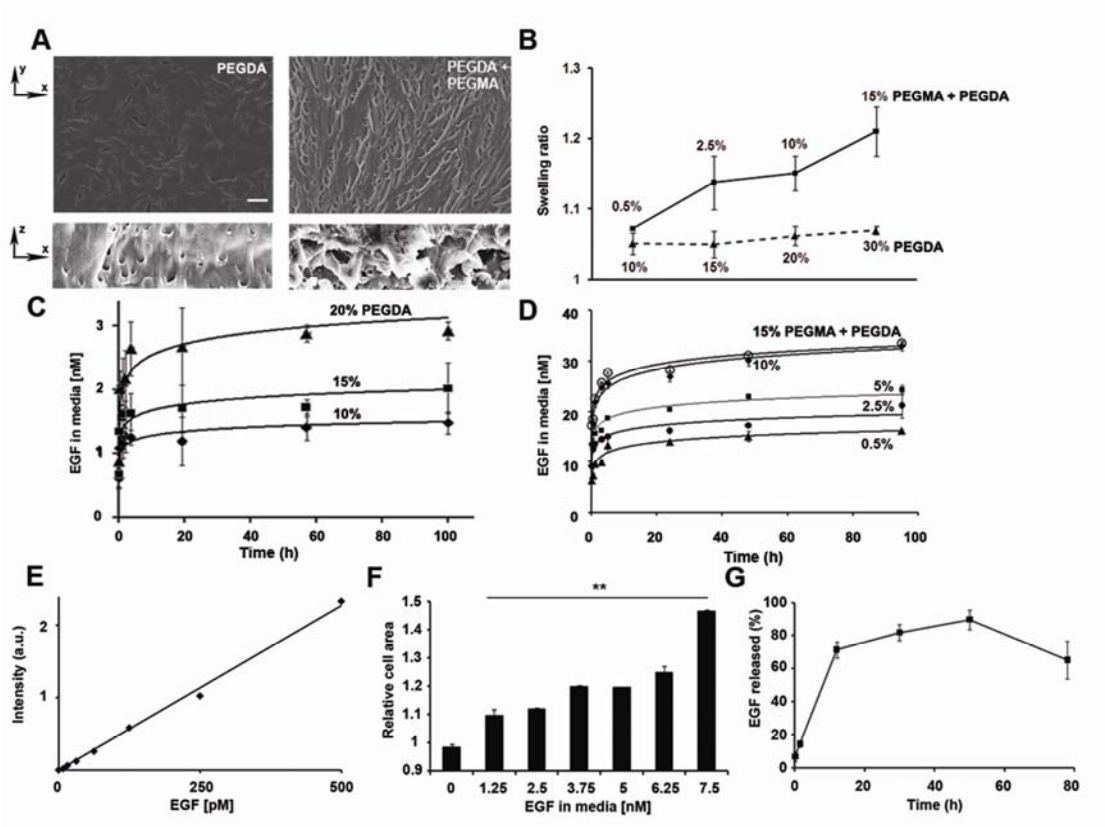
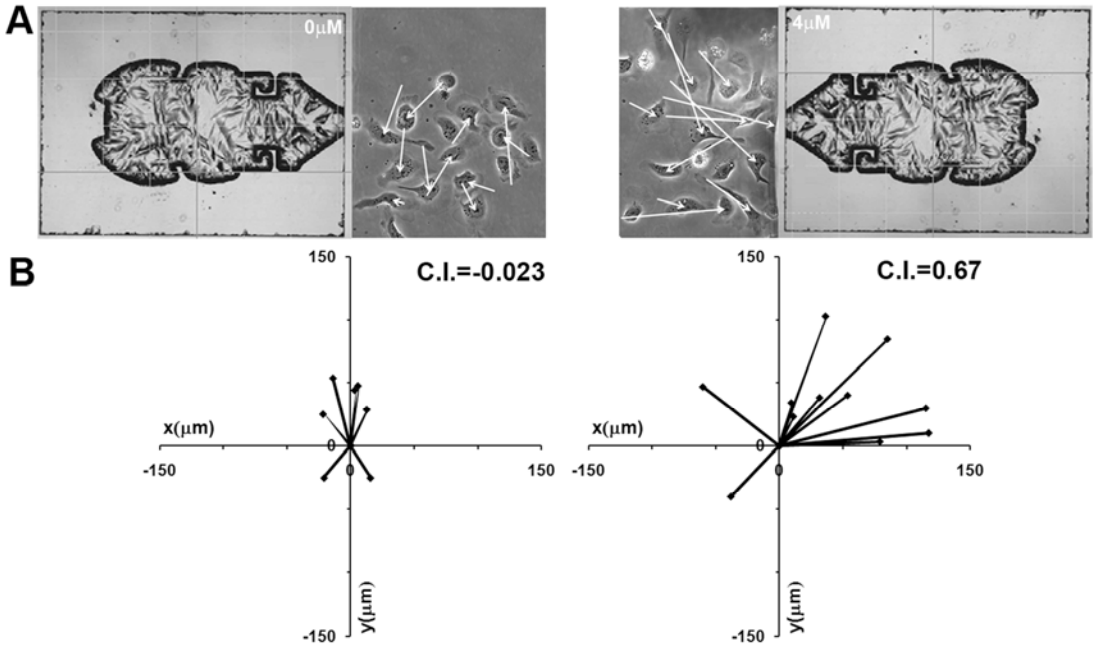
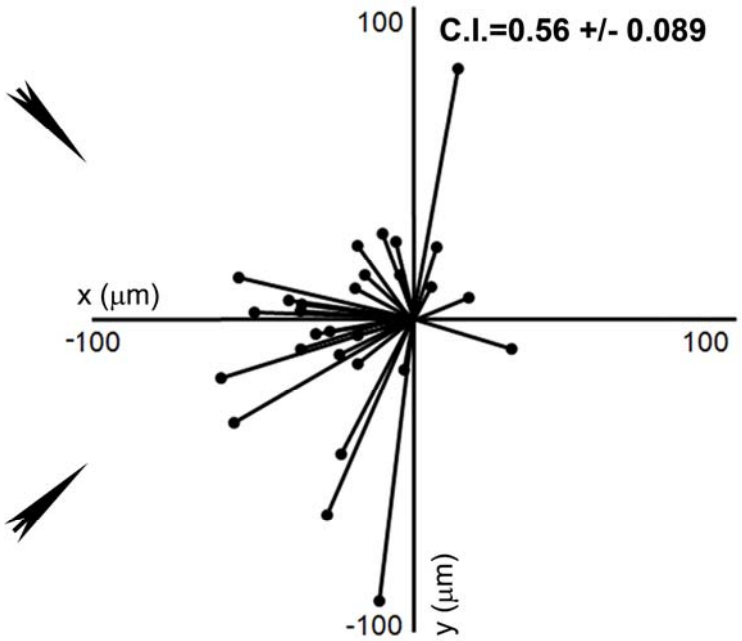
Supplementary data



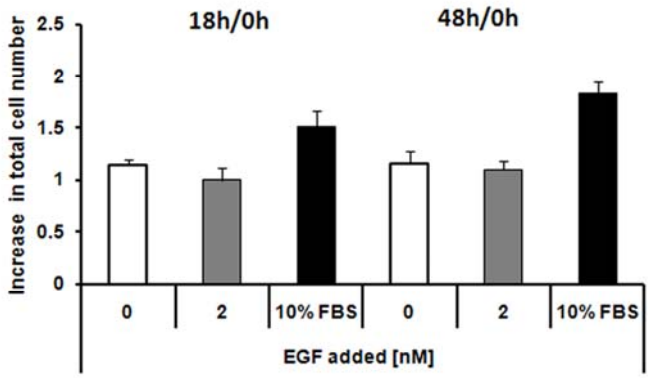
Supplementary Figure 1. Optimization of hydrogel formula. A) SEM micrographs of top views (xy) and cross-sections (xz) of PEGDA and PEGDA/PEGMA blend. Scale 5μm. B). Swelling ratios of hydrogel containing PEGDA alone at increasing concentrations (dashed line) and PEGDA/PEGMA blend (full line) with a constant concentration of 20% PEGDA and increasing PEGMA.C) Release of EGF measured by ELISA from hydrogel with 10% (diamonds) , 15% (squares) or 20% PEGDA (triangles). D) Release of EGF from hydrogel mixtures with constant 20% PEGDA and 0.5% (triangles), 2.5% (black circles), 5% (squares), 10% (diamonds) or 15% (white circles) PEGMA. Data points represent mean of three separate experiments +/- stdev. E) Standard curve used for ELISA measurements assays in panel C) and D). F) An EGF stimulation assay in MTLn3 Mena^{inv} cells was used to evaluate EGF functionality inside the hydrogel after curing with UV light. Media from the experiment shown in D) was transferred into a dish containing cells and a change in cell area (due to lamellipod protrusion) was measured. G) EGF release from the hydrogel cured inside the finished chemotaxis device. Data points represent mean values from three separate experiments (9 devices in each) +/- stdev.



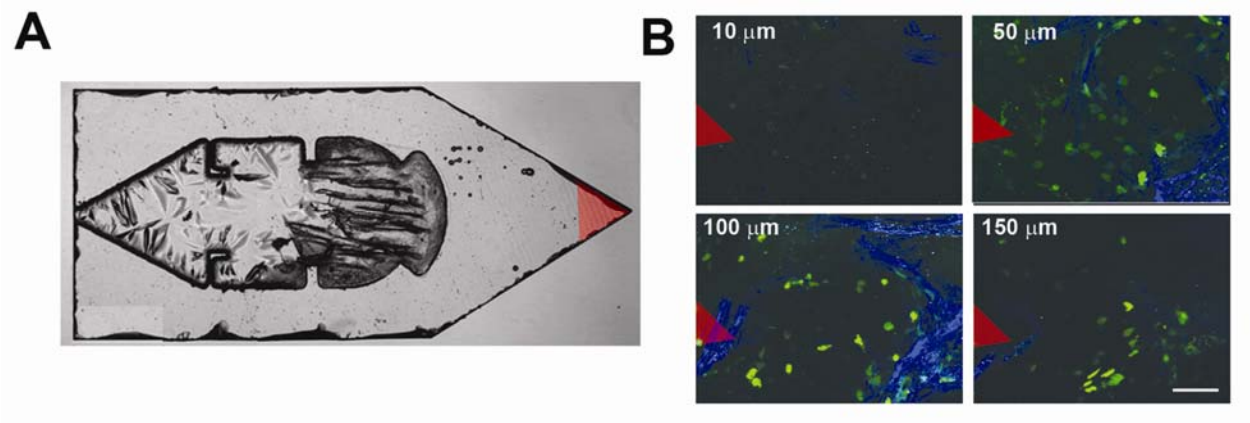
Supplementary Figure 2. Dual device experiment: A) Experimental setup and representative results. Two devices were positioned next to the neighboring colonies of cells. Device containing no EGF was positioned on the left and 4 μM on the right. White arrows indicate total path lengths and directions (for paths, see Supplementary Movie 2). B) Vector plots corresponding to experiment in panel A).



Supplementary Figure 3. Device induces a chemotactic response in MDA-MB-231 cells in 2D conditions: A device was inserted in adjacent to cells grown on matrigel coating, at t=0. Images were acquired for 3 hours, 30 images/h, at 20X magnification.



Supplementary Figure 4. Cell division of MDA-MB-231 cells over 18 h or 48 h under conditions of the cell migration in 3D collagen. Starvation media used on top of collagen was supplemented with either 0 nM EGF (as in experiments in Figure 4), with 2 nM EGF (mimicking EGF from the device) or 10% FBS (contains the same amount of EGF as the standard tissue culture media)



Supplementary Figure 5. Preliminary images of NANIVID in vivo: A) Device edges were modified to form a pointed tip, labeled with fluorescent beads, for easier insertion and visualization. B) Representative images from a 3D stack (at 10, 50, 100 and 150 μm depth from the tumor surface) collected in a transgenic animal (MMTV-PyMT/cfms-GFP). Myeloid cells are shown in green, collagen was shown in blue, and tip of the device is highlighted in red. Scale 100 μm.

Supplementary Movie 1. Time lapse of cell behavior in front of the device containing 3.5 μM EGF (Figure 3A). Tracks for were constructed by marking cell centroids in each of the images, which were acquired for 4 hours at a rate of 15 images/hour.

Supplementary Movie 2. Time lapse of cells positioned in between two devices in the dual device experiment (Supplementary Figure 2) showing behavior of two neighboring colonies of cells in front of devices loaded with hydrogel containing no EGF (left edge) or 4 μM EGF (right edge). Tracks for were constructed by marking cell centroids in each of the images, acquired for 3 hours, 15 images/h.