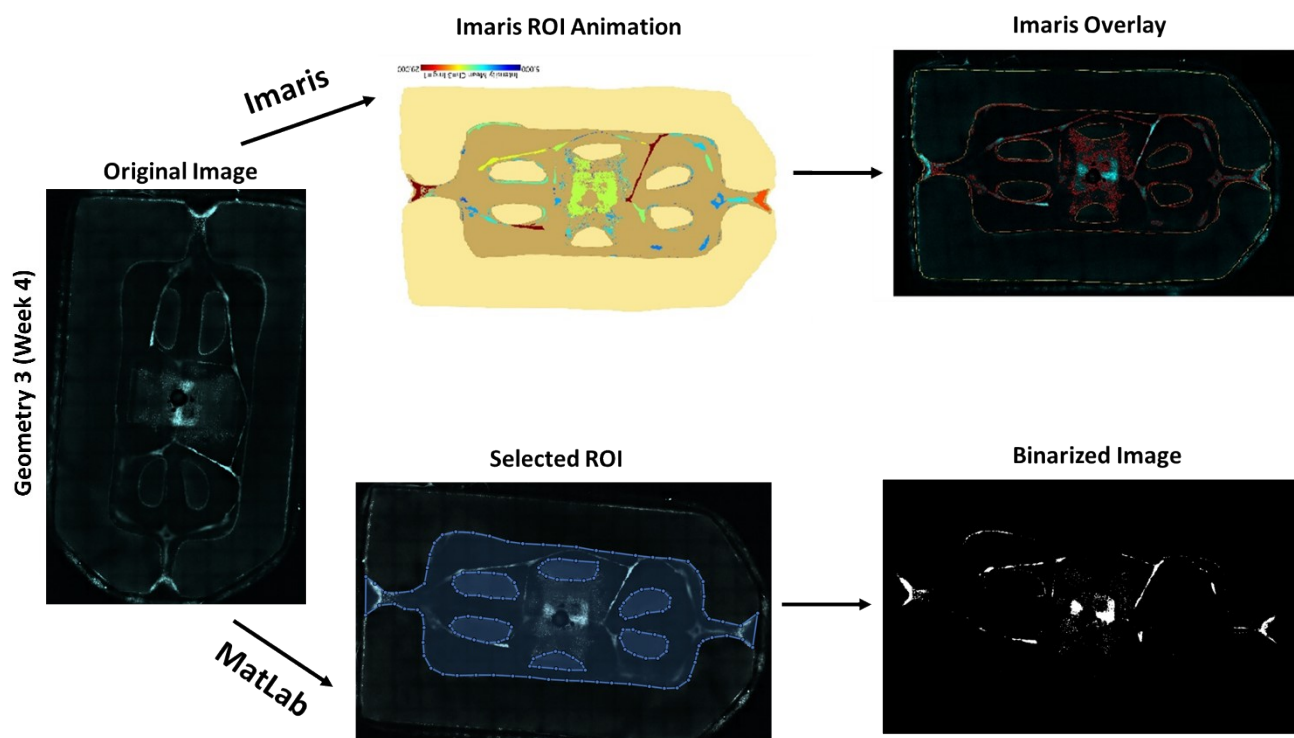
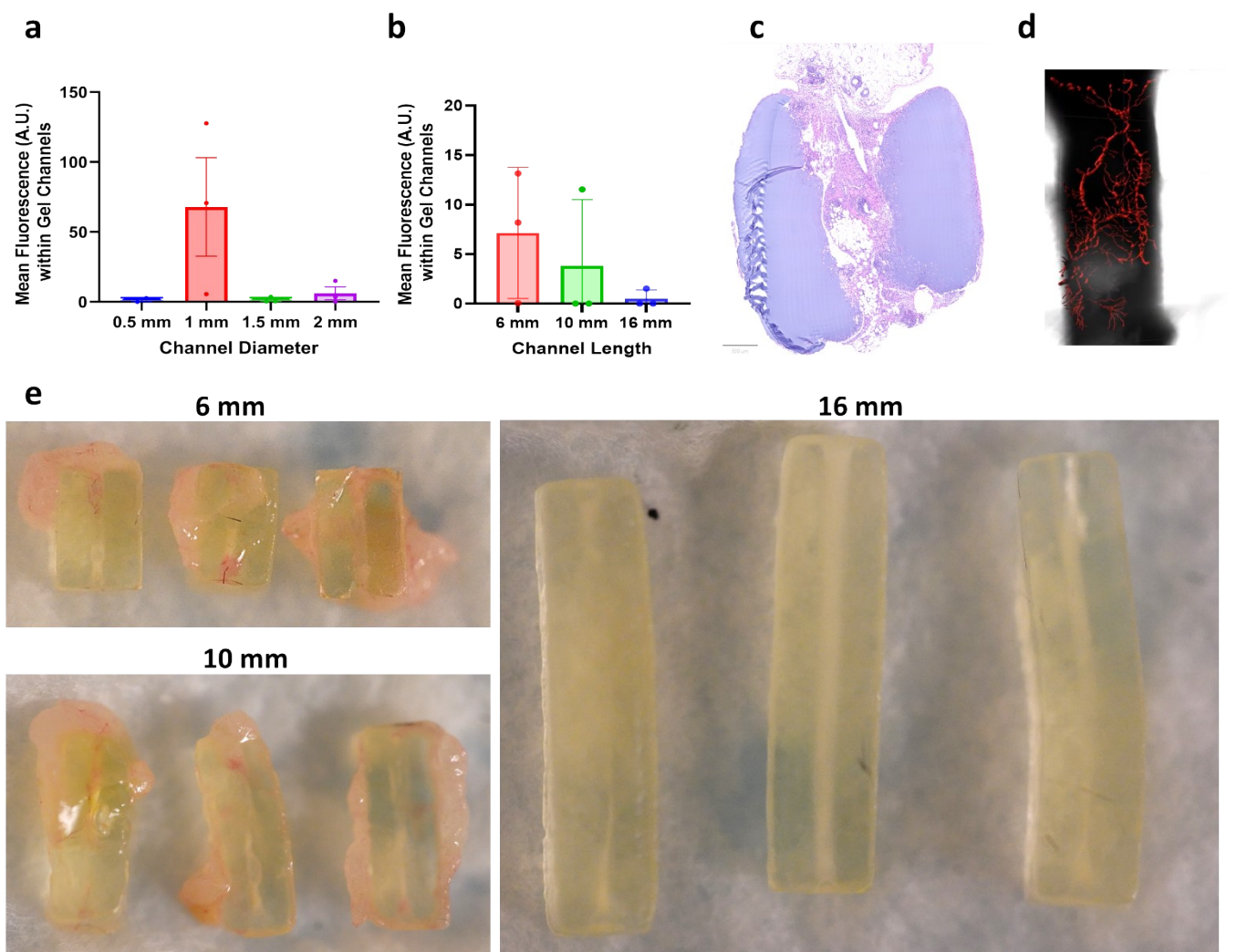


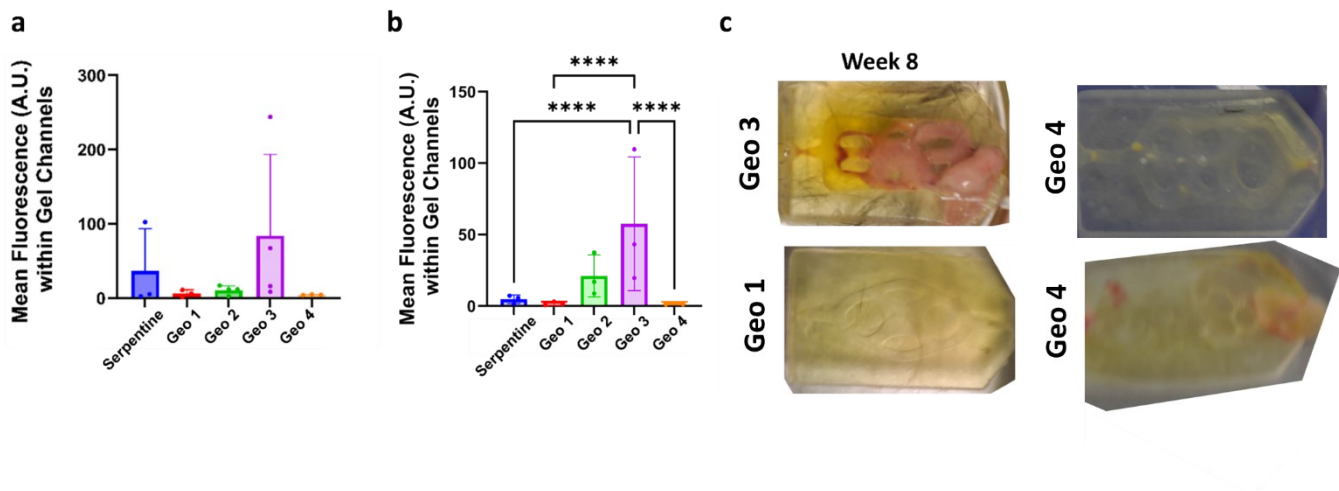
## Supplementary Figures



**Figure 1. Overview of vascularization quantification methods. Confocal images of retrieved hydrogels quantified via Imaris software (top row) and MATLAB software (bottom row) by selection the region of interest (channels) and removal of background noise by either binarizing on MATLAB software or adjusting real intensity compared to background intensity on Imaris software**



**Figure 2. GelMA/PEGDA channel diameter and channel length screening. a)** Mean fluorescence intensity within gel channels in channel diameter screening measured using MATLAB software. **b)** Mean fluorescence intensity within gel channels in channel length screening measured using MATLAB software. **c)** H&E-stained representative image of 6 mm channel implanted in C57BL6 mice for 2 weeks; scale bar = 500  $\mu$ m. **d)** 3D rendering of 6 mm channel with blood vessel infiltration created with Imaris software. **e)** Gross images of channel length screening hydrogels 2-week post implantation in C57BL6 mice.



**Figure 3. 3D bio-printed architecture design screening.** a) Mean fluorescence intensity within channels of architecture pattern screening hydrogels implanted for 4 weeks and b) 8 weeks in C57BL6 mice. c) Representative gross images of geo 1, geo 2, geo 3 and geo 4 architectures 8 weeks post implantation.