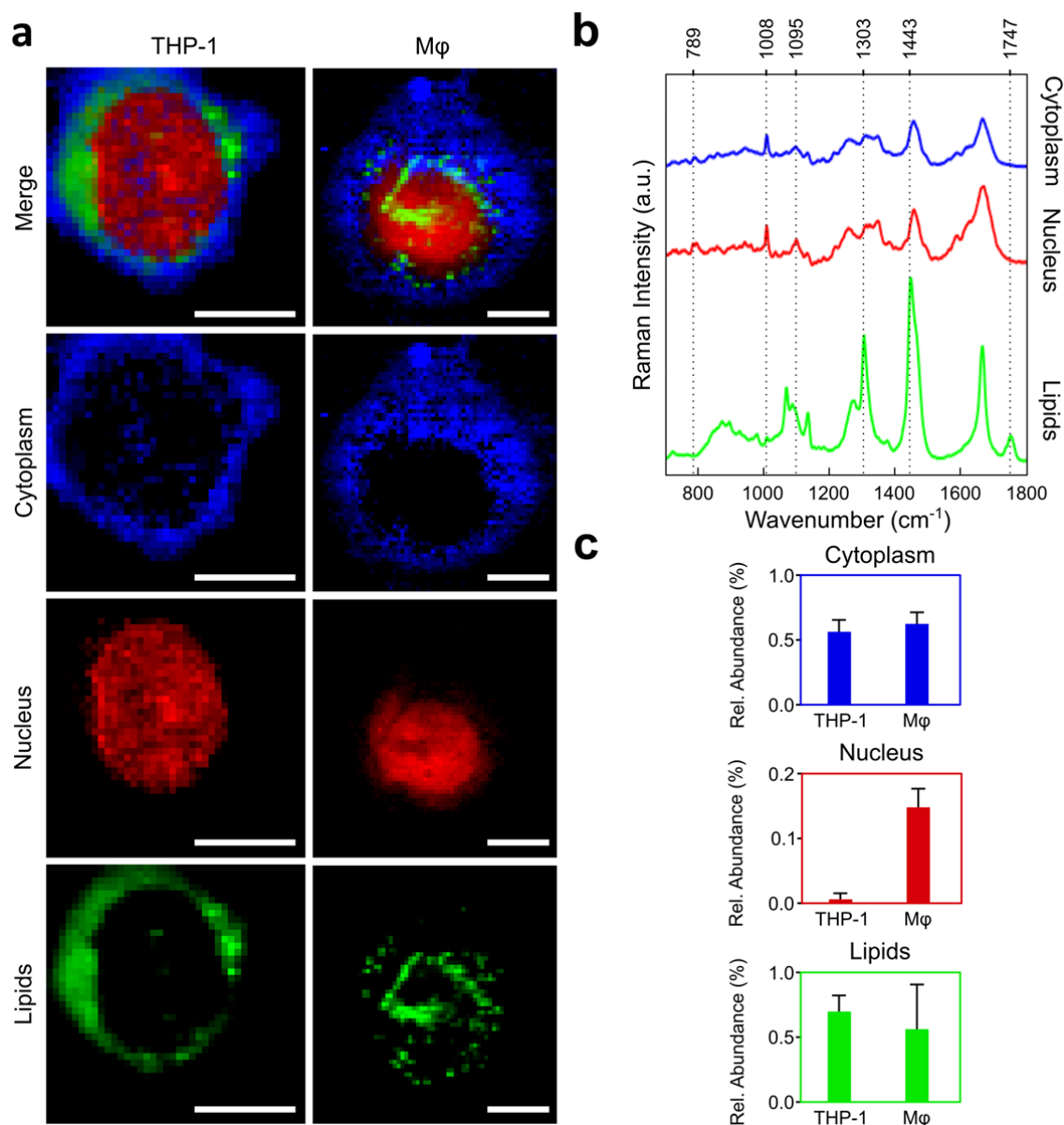
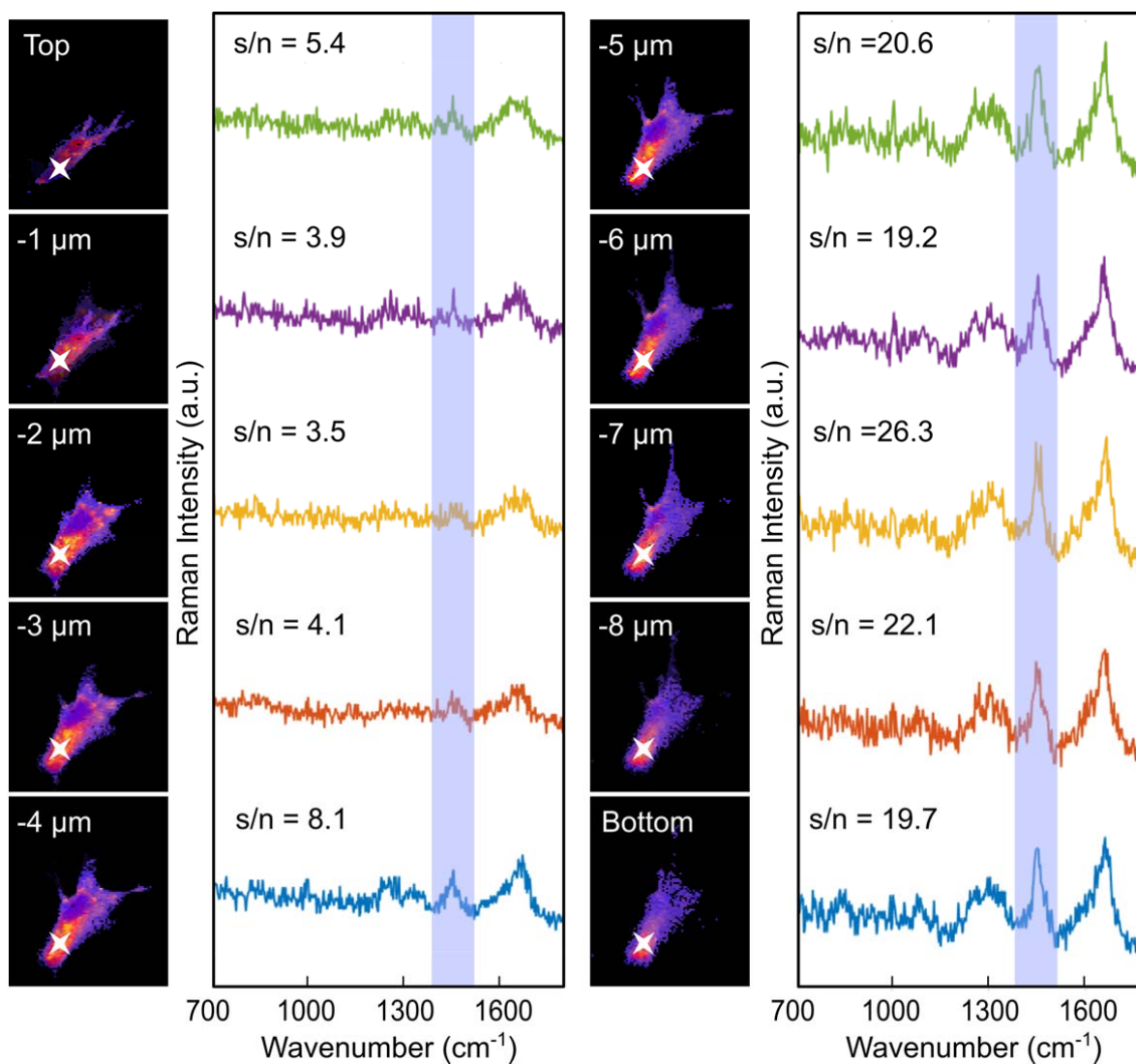


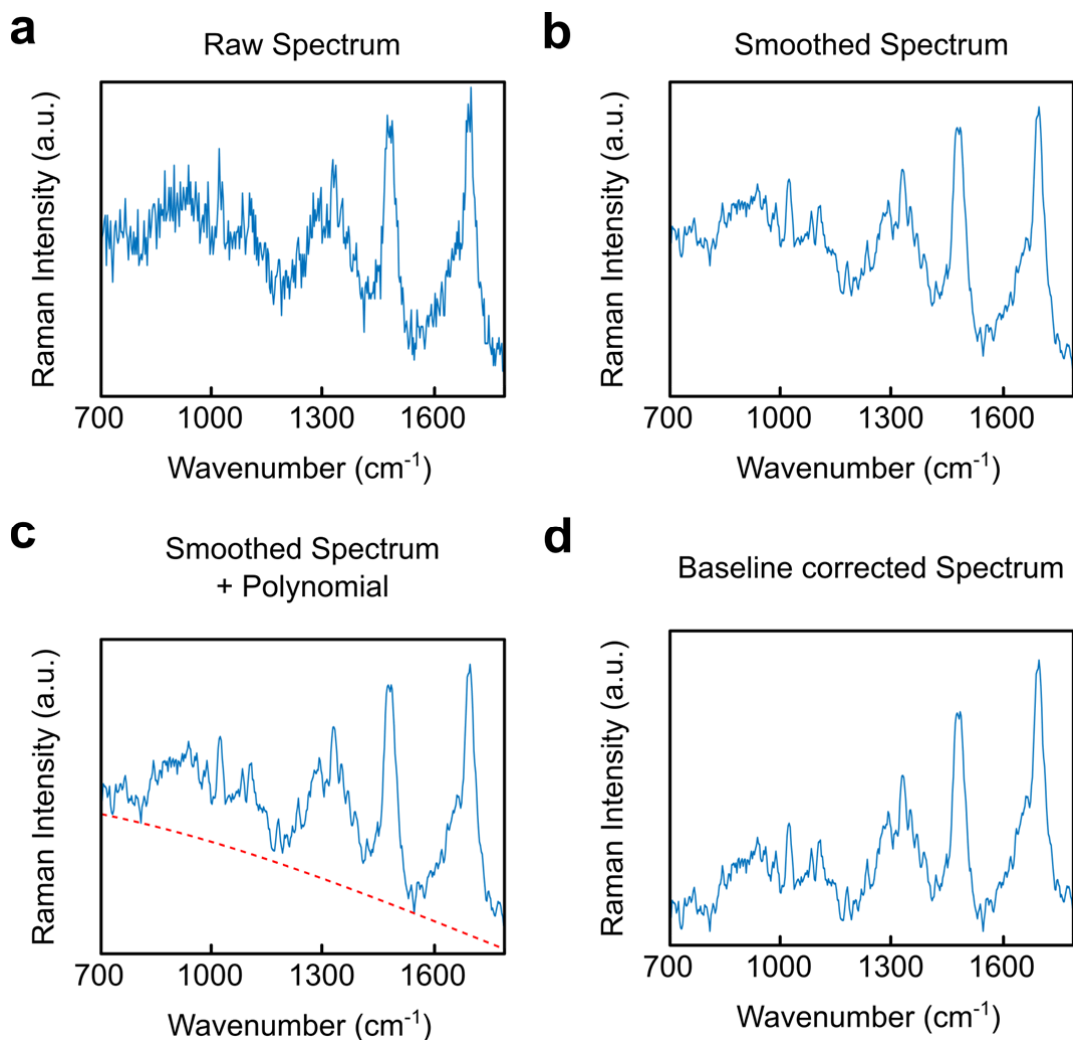


Supplementary Figure 1 | Raman spectral imaging of representative THP-1 and Mφ cells. (a) Identifying the main subcellular components of THP-1 cells and THP-1 differentiated macrophages (Mφ), and their corresponding **(b)** endmember Raman spectra from VCA (showing 3 components) using a z

stack projection by summing hyperspectral datasets from all imaging layers; from top to bottom cytoplasm (blue), nucleus (red), general lipids (green). **(c)** Bar chart of mean abundance values for each subcellular component. Error bars represent one standard deviation around the mean. Scale bar 10 μm .



Supplementary Figure 2 | Signal-to-noise (s/n) dependence on z distance. All imaging layers from qVRI for the reconstruction of a representative MSC in a bioactive hydrogel with a 1 μm step between layers in z , along with representative raw Raman spectra of the same $x \times y$ position for all layers indicated by the white cross. S/N ratio was calculated using the 1449cm^{-1} CH_2 band (blue shaded area).



Supplementary Figure 3 | Pre-processing of representative Raman spectra. (a) Raw Raman spectrum (b) Smoothed Raman spectrum using the 2 order Savitzky–Golay algorithm with a 3 point window (c) Smoothed Raman spectrum with polynomial curve (dashed red) before baseline correction (d) Baseline corrected spectrum using a 3rd order polynomial fit.