

**Table S1.** Target linking hierarchy and measures. This hierarchy results in the effective organization of all targets fully within ComboCellBody and with every measure referred up the hierarchy to report within ComboCellBody. This organization is critical for making multiparametric comparisons on a cell by cell basis.

**Supplementary Methods.** Segmentation and quantitation workflow for PTH<sub>1</sub>R dataset corresponding to Carl V44.xeap.

**Supplementary Files.** XML format analysis pipelines available online (Carl V44.xeap and Carl V45.xeap). Carl V45.xeap was used for  $\beta_2$ -AR due to need for improvement of ComboCellBody detection in lower quality (where signal to noise ratio was low)  $\beta_2$ -AR images.

**Supplementary Movies.** Example movie of cellular responses to ligand stimulation for Class A (b2AR\_iso3.avi) and Class B GPCRs (PTH1r\_PTH4.avi).