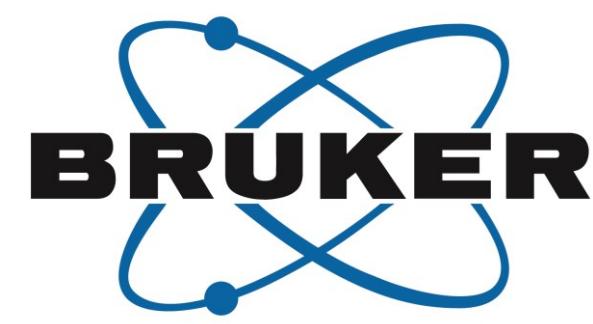


Whole Transcriptome Single-Cell Spatial Imaging of Tumor vs Normal Tissue Microarray using CosMx Spatial Molecular Imaging



Wei Yang, Daniel McGuire, Isabel Lee, Michael Patrick, Shanshan He, Haiyan Zhai, and Joseph Beechem

Bruker Spatial Biology, 500 Fairview Ave N, Seattle, WA 98109, USA

Introduction

CosMx® Spatial Molecular Imaging can now image the entire protein coding transcriptome (18933-plex RNA), in a single 5 µm FFPE section, using ~38000, 156-bit imaging barcodes. For background, see Khafizov (2024). Averaged over 6 tissue types, over 1500 transcripts per cell and over 900 unique genes are obtained, often exceeding the capabilities of dissociative sc-RNA-seq. Same-slide high plex protein (76-plex) capability is also possible. We show herein, the most complete, unbiased spatial view of cancer tissue that has ever been measured.

Method

The CosMx SMI whole transcriptome assay was used to analyze RNA in human FFPE tissue microarrays from normal and cancerous tissues of various organs. RNA, Protein, and H&E were same-slide detected *in situ*.

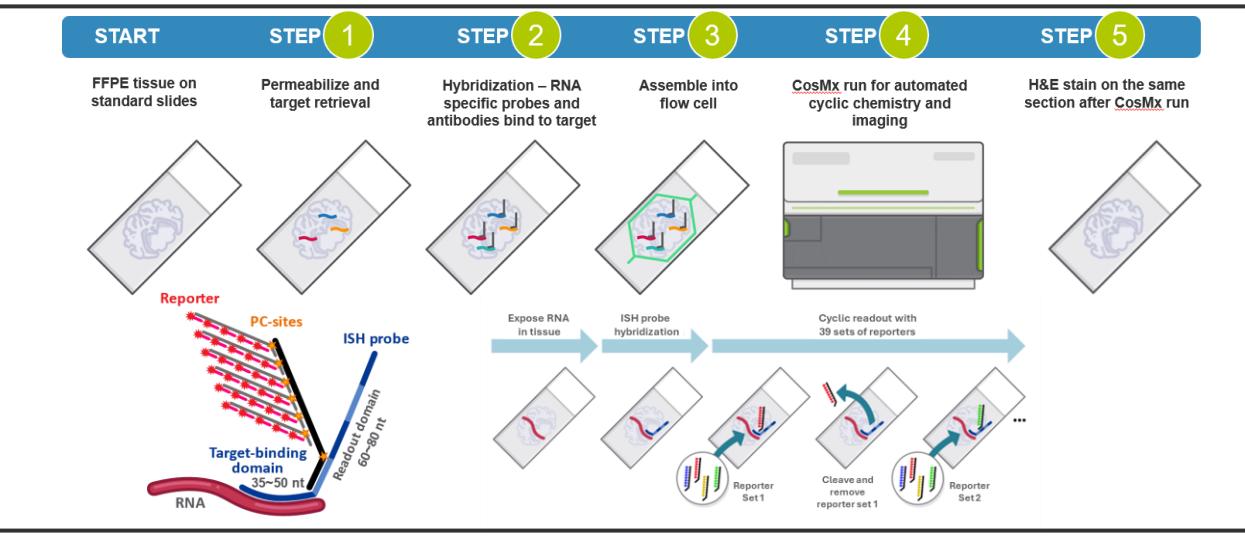


Fig. 1 CosMx WTX Assay workflow with same-slide H&E stain

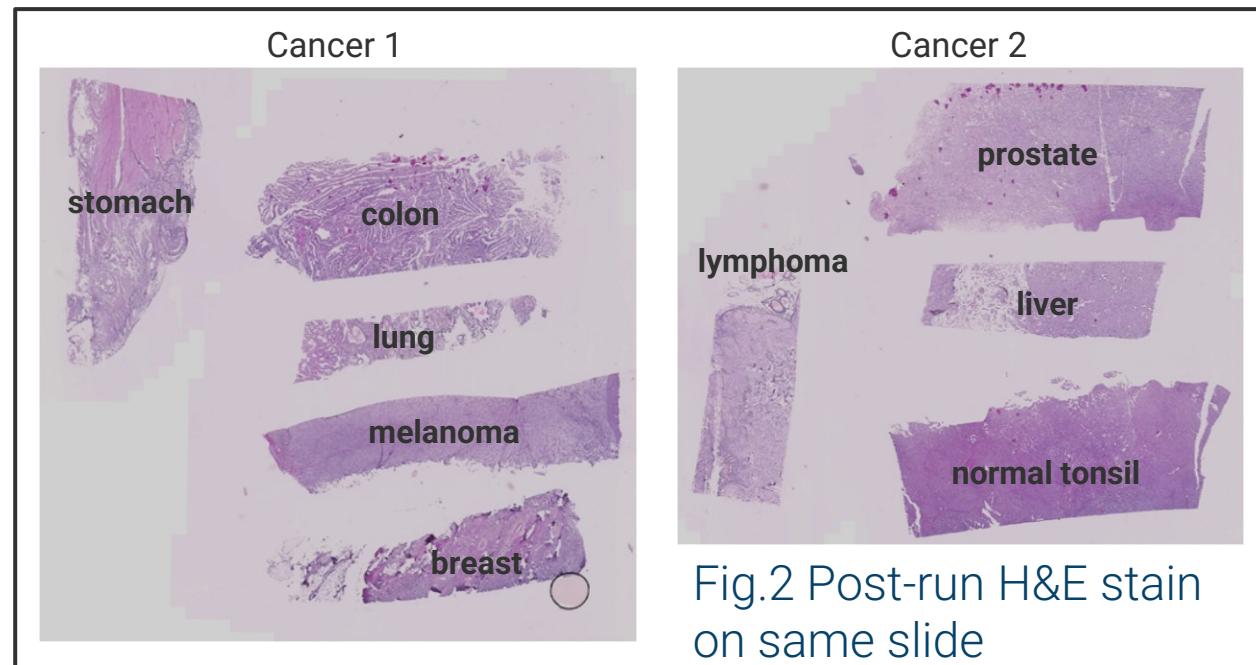


Fig. 2 Post-run H&E stain on same slide

Results

The CosMx SMI provided high cell counts and accurate segmentation for reliable analysis of different tissue types. H&E staining on the same slide helped train the AI algorithm, improving tissue identification and segmentation. We identified distinct cell types and tissue-specific biomarkers.

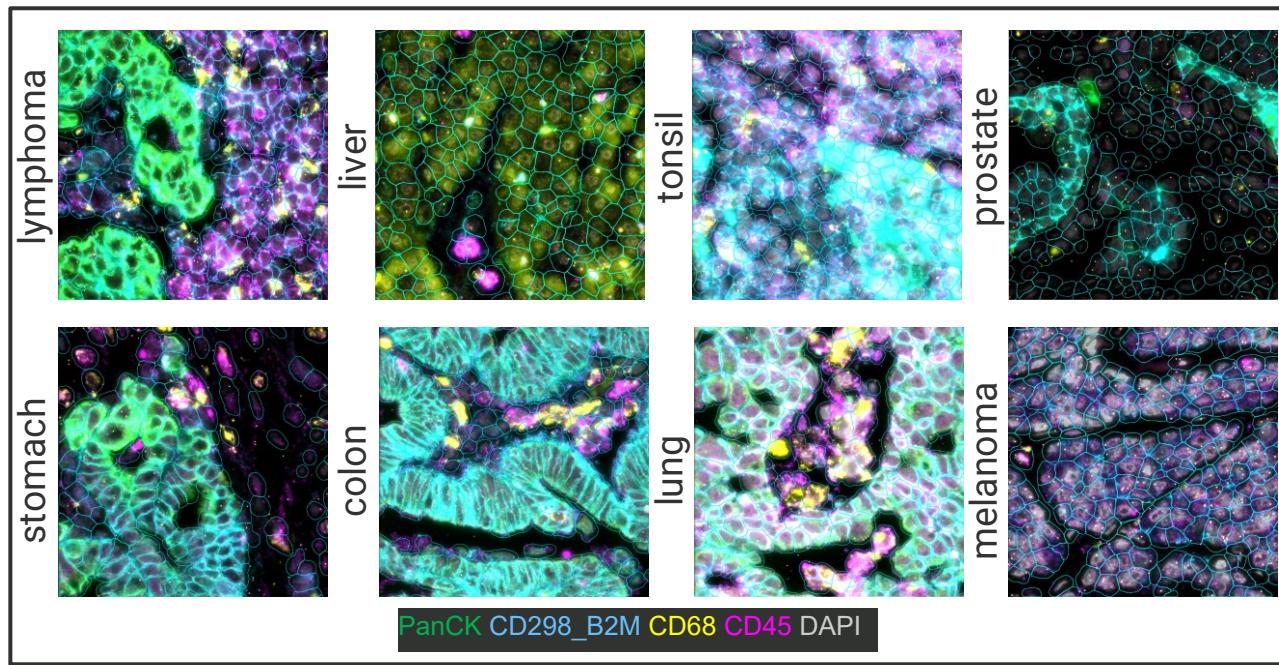
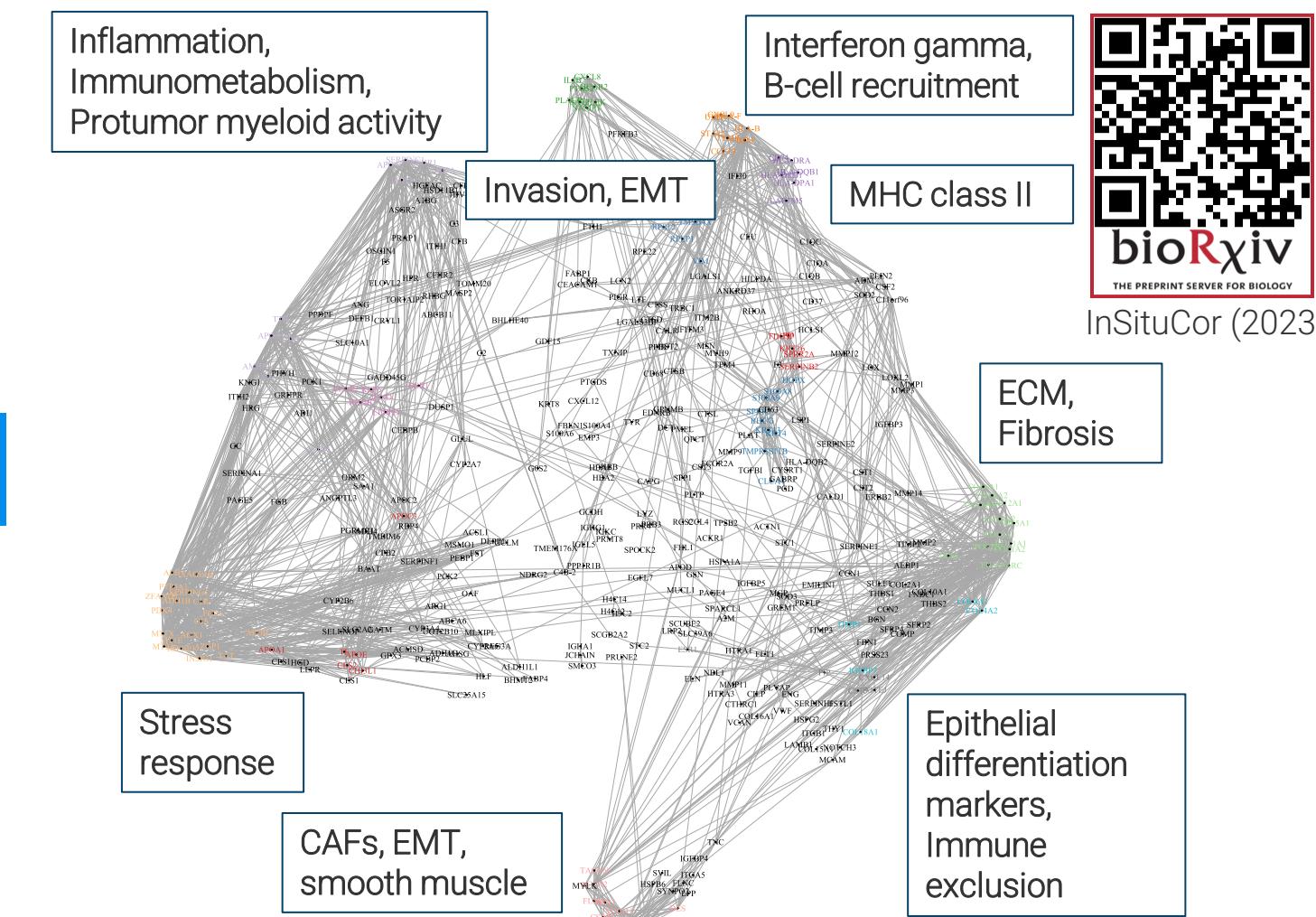
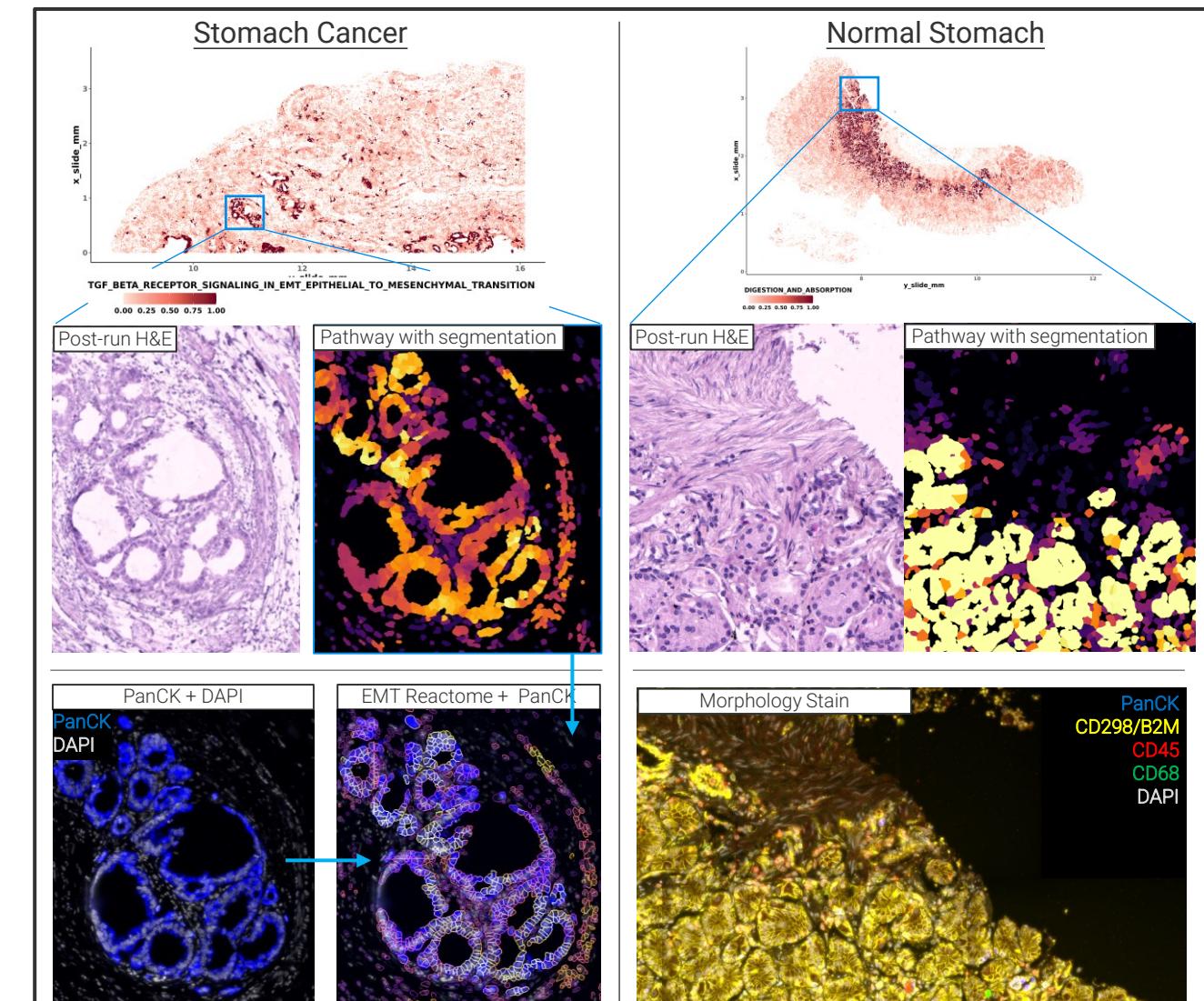


Fig. 3 Outstanding cell segmentation across various tissue types

InSituCor Discovers Pan-Cancer Spatially Correlated Gene Modules



Reactome Pathways at Single Cell Scale: Direct Imaging of EMT



Multi-omics reveals 'hidden' biology in lung cancer: Protein barriers encircling the TME

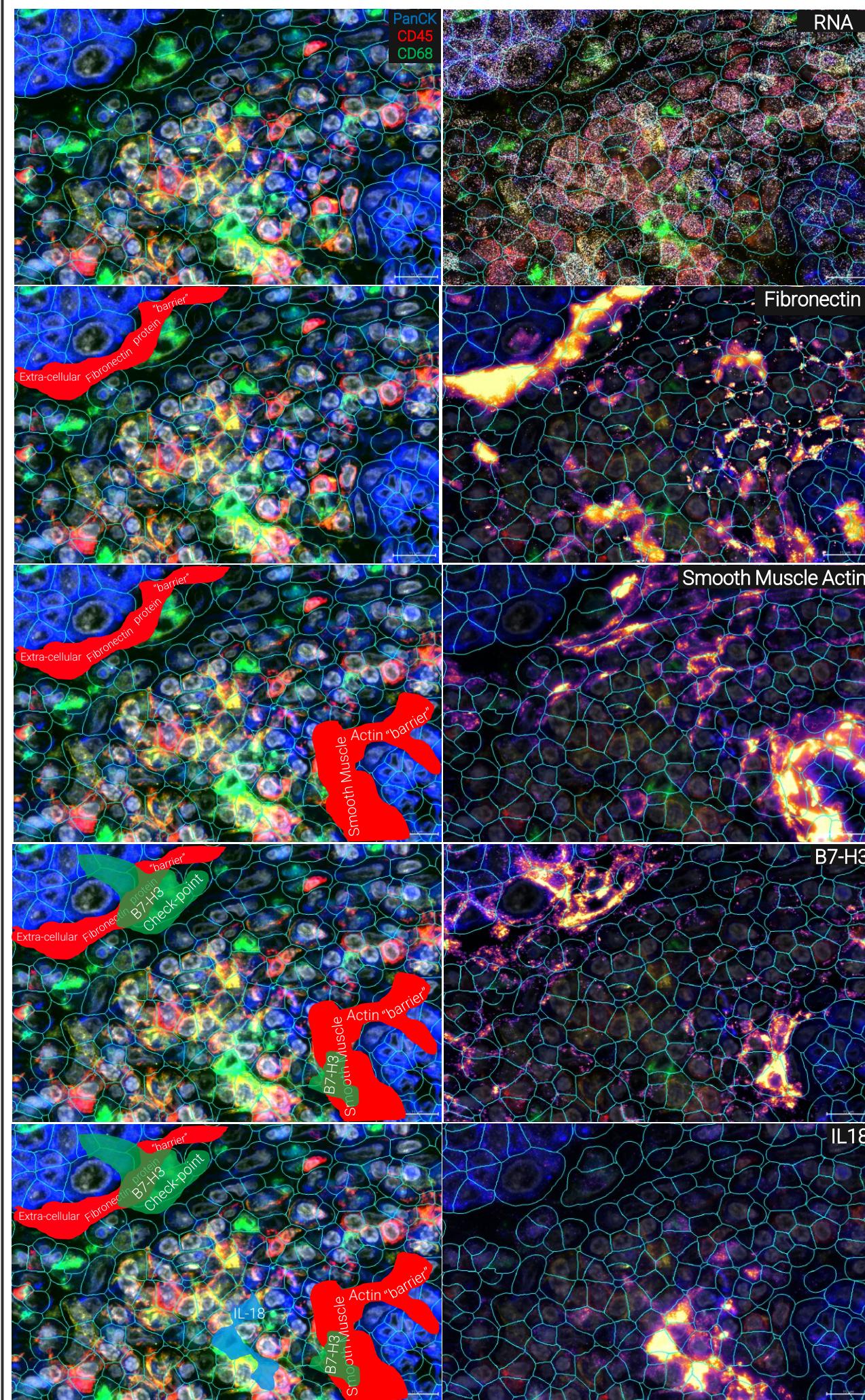
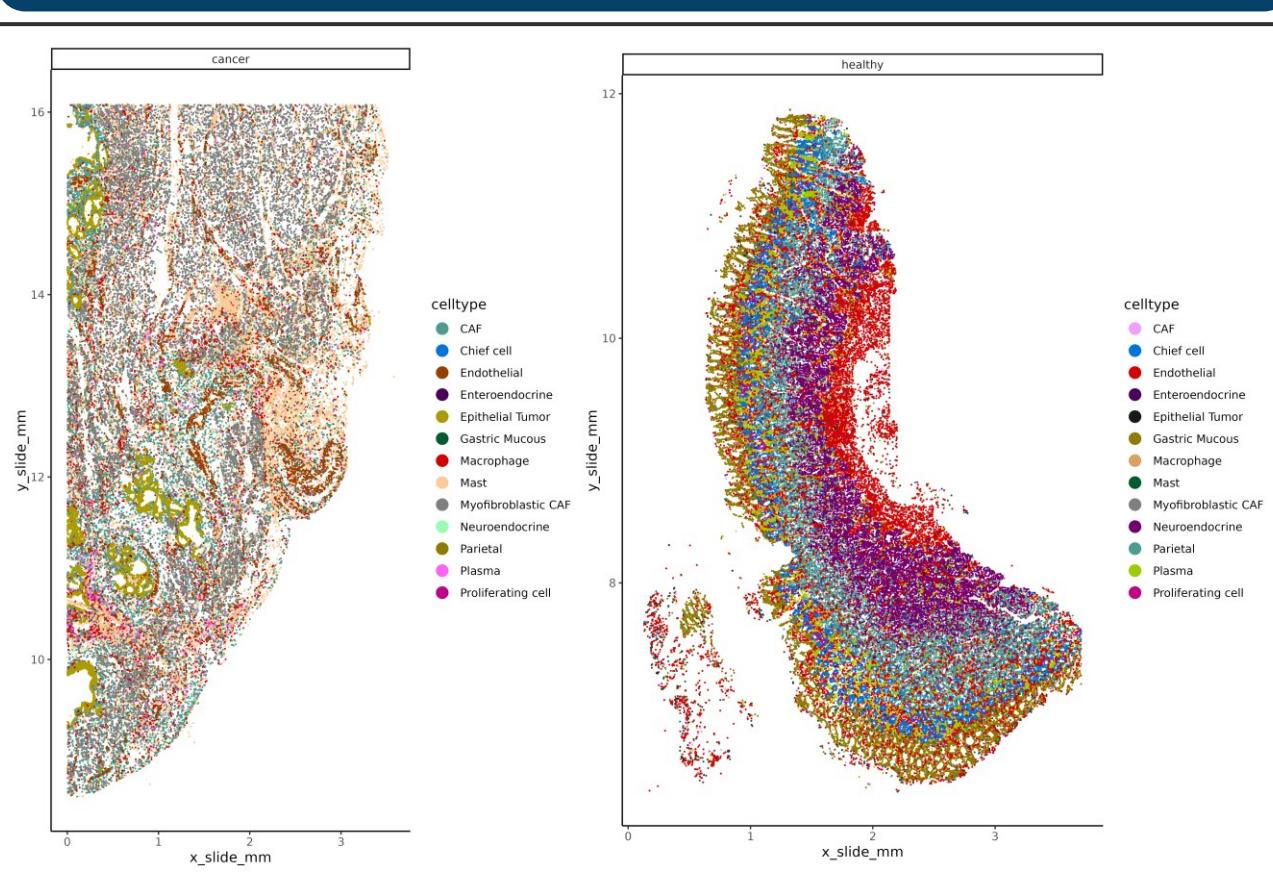


Fig. 6 Same slide RNA + Protein assay allows researchers to uncover hidden biology in the "blank" space between cells

Stomach Tissue



Spatially Differential Pathway Activity Among Macrophage Lymphoma Tissue

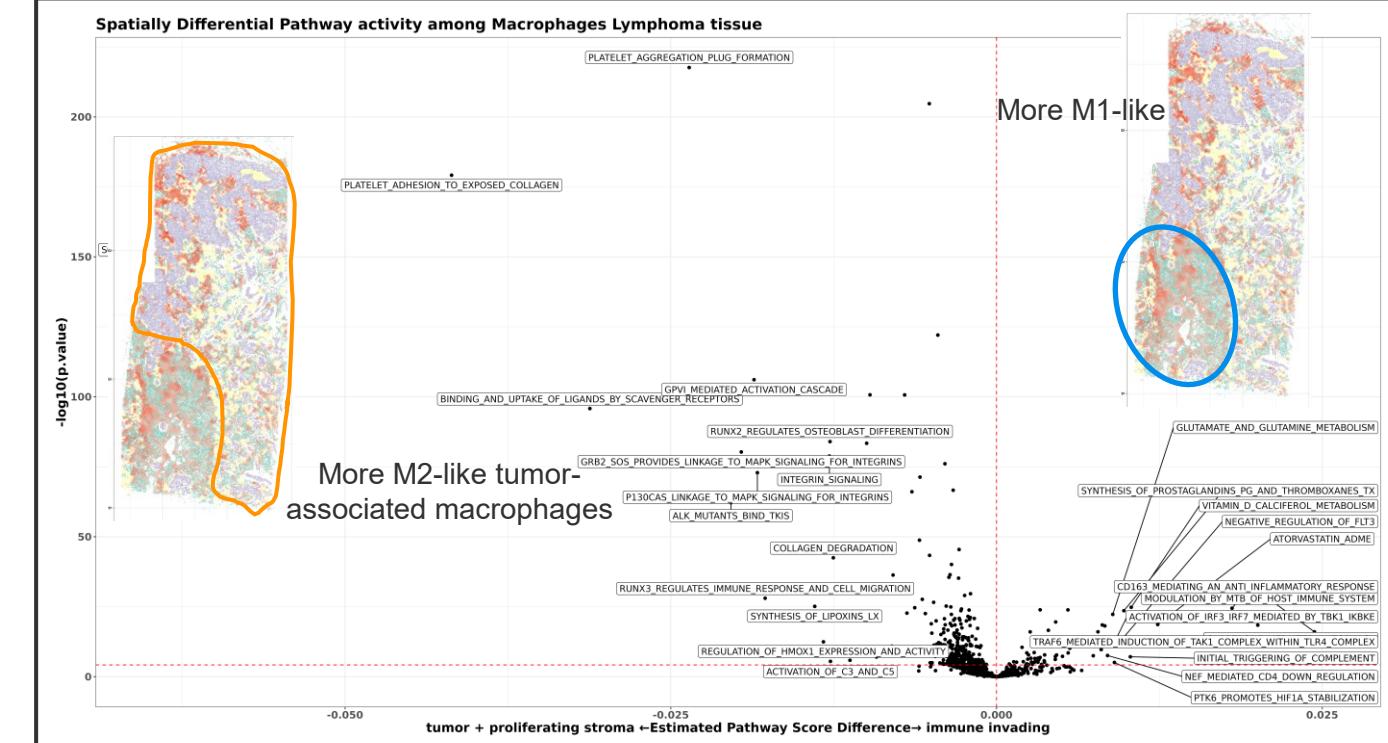


Fig. 8 Spatially differential pathway activity among macrophages

Pathway Projection on Tissue Reveals Differentially Activated Pathways

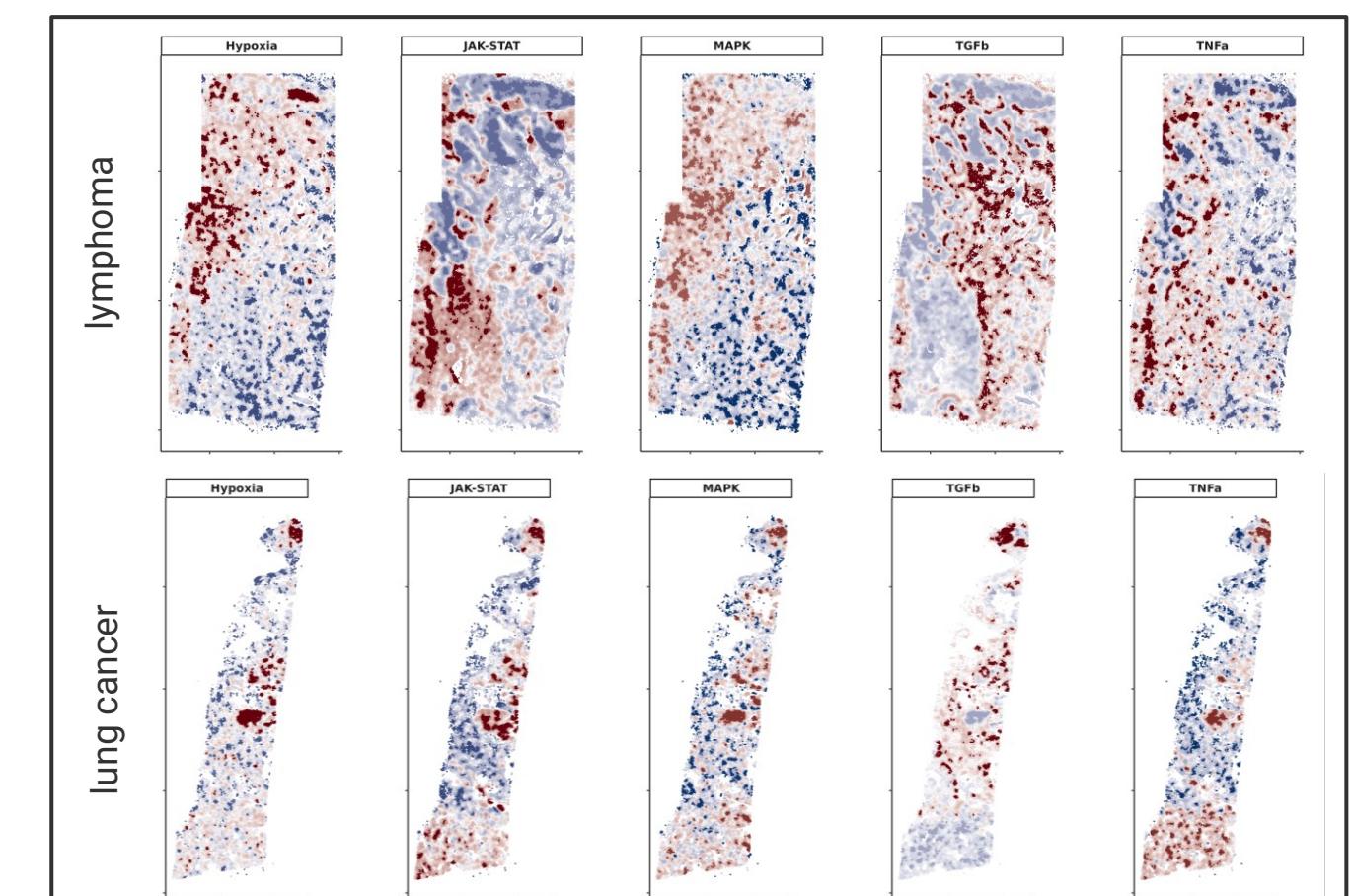


Fig. 9 Pathway score of typical pathways for different tissue types

Conclusion

CosMx SMI whole transcriptome subcellular multi-omic imaging completely changes how tissues can be analyzed. Simply "project" ~2000 measured (not inferred) biological pathways directly onto the tissue with single cell resolution (Fig 8&9). Directly visualize EMT (Fig 4). Discover tumor "protective barriers" and associated check-point structures (Fig 6).

For the first time, an unbiased comprehensive spatial view of tissue biology from a single FFPE slide.

CosMx Whole Transcriptome Assay

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