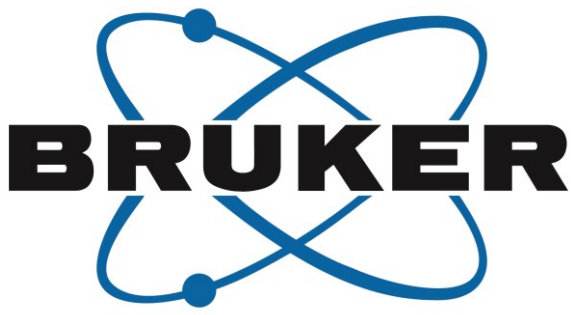


# Whole Transcriptome Single-Cell Spatial Imaging of Tumor vs Normal Tissue Microarray using CosMx Spatial Molecular Imaging



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## Introduction

CosMx<sup>®</sup> 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 here, the most complete, unbiased spatial view of cancer tissue that has ever been measured.



Khafizov R et al. (2024)

## 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*.

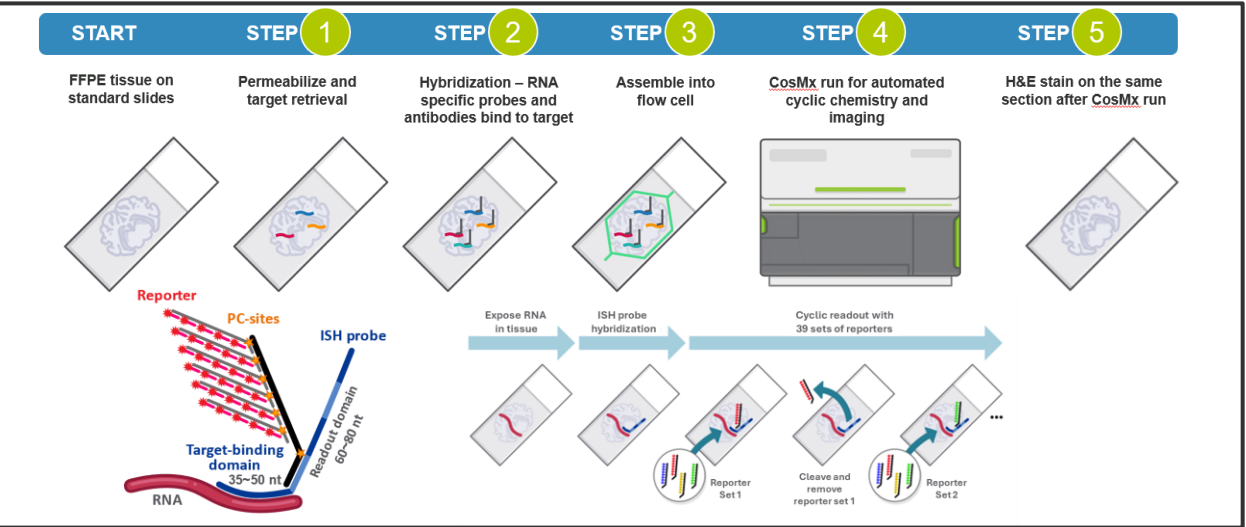
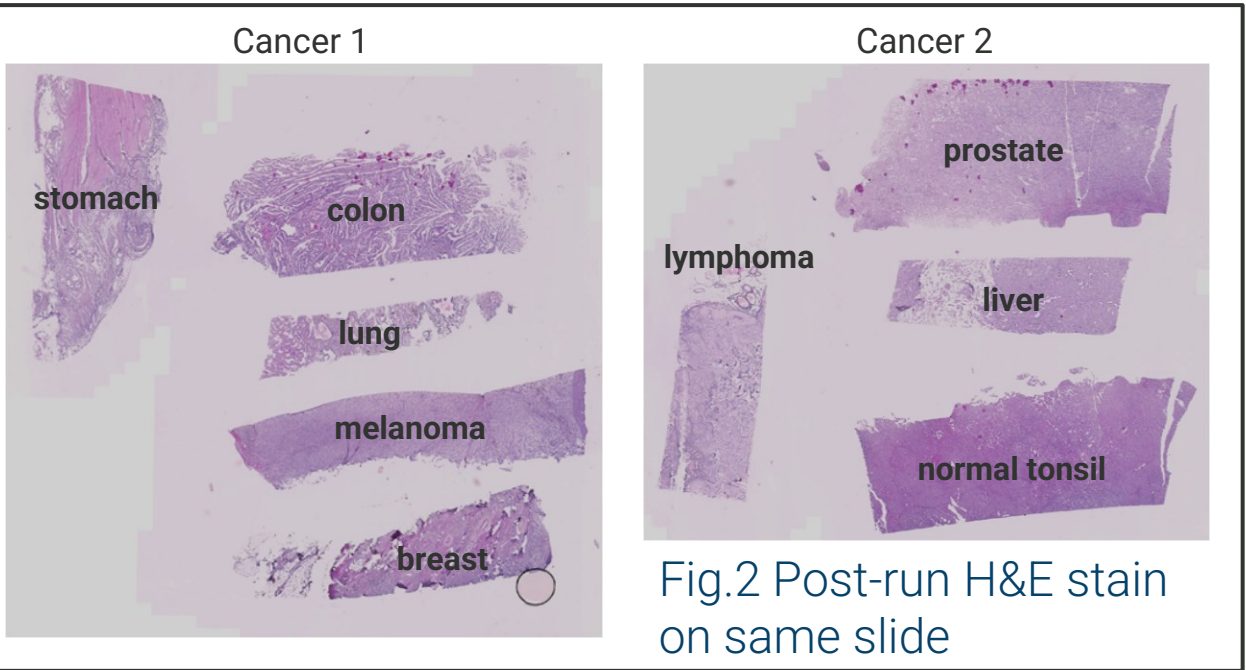


Fig.1 CosMx WTX Assay workflow with same-slide H&E stain



## 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.

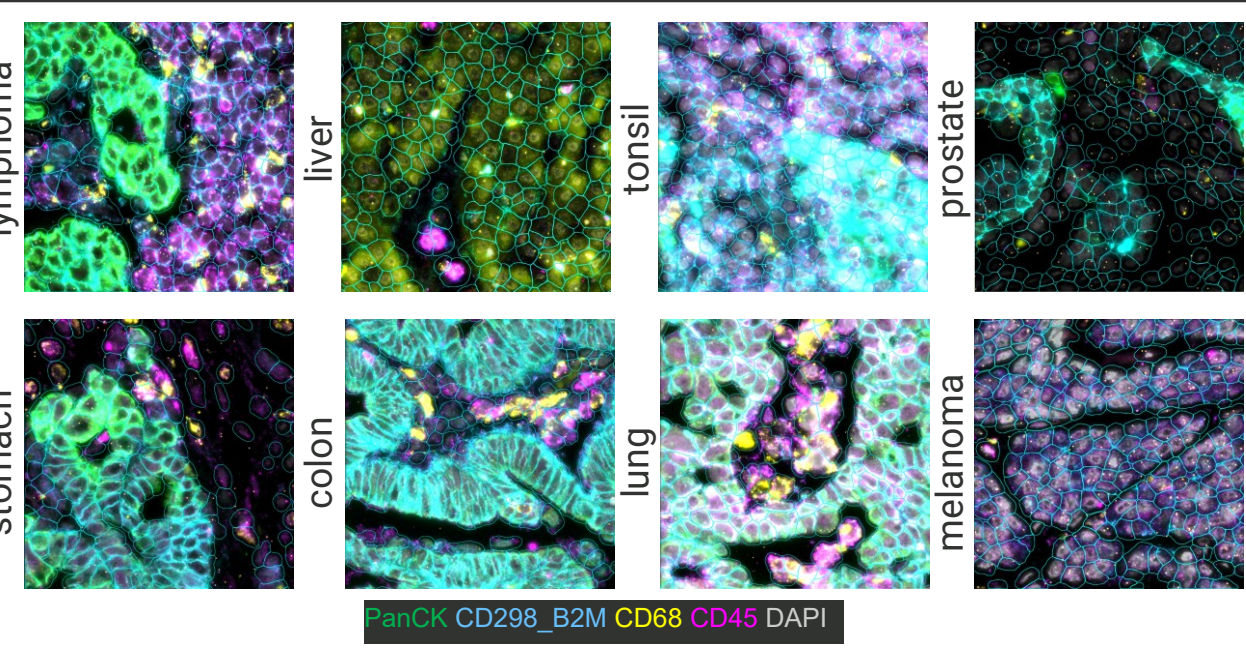
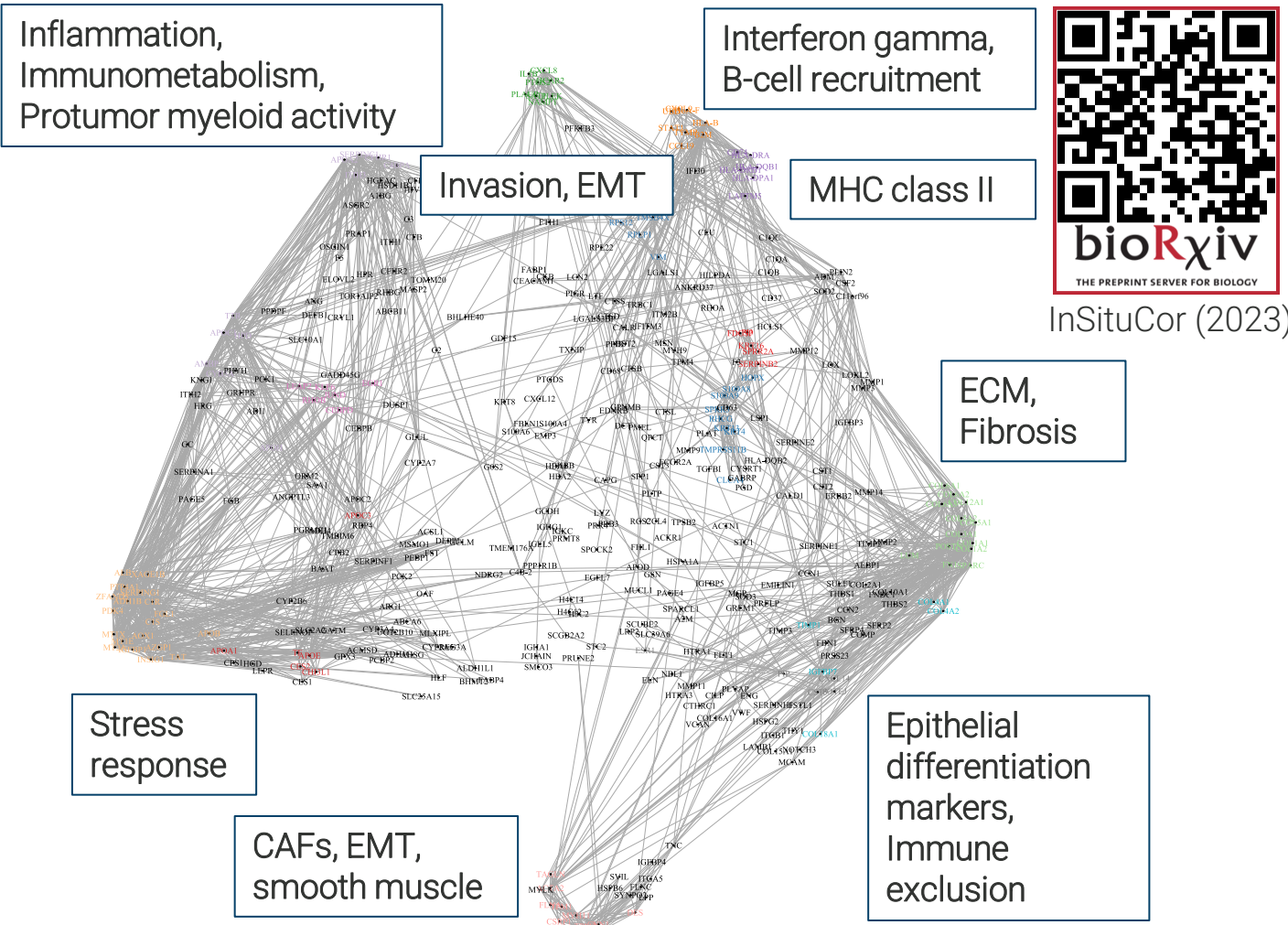


Fig. 3 Outstanding cell segmentation across various tissue types

## InSituCor Discovers Pan-Cancer Spatially Correlated Gene Modules



## Reactome Pathways at Single Cell Scale: Direct Imaging of EMT

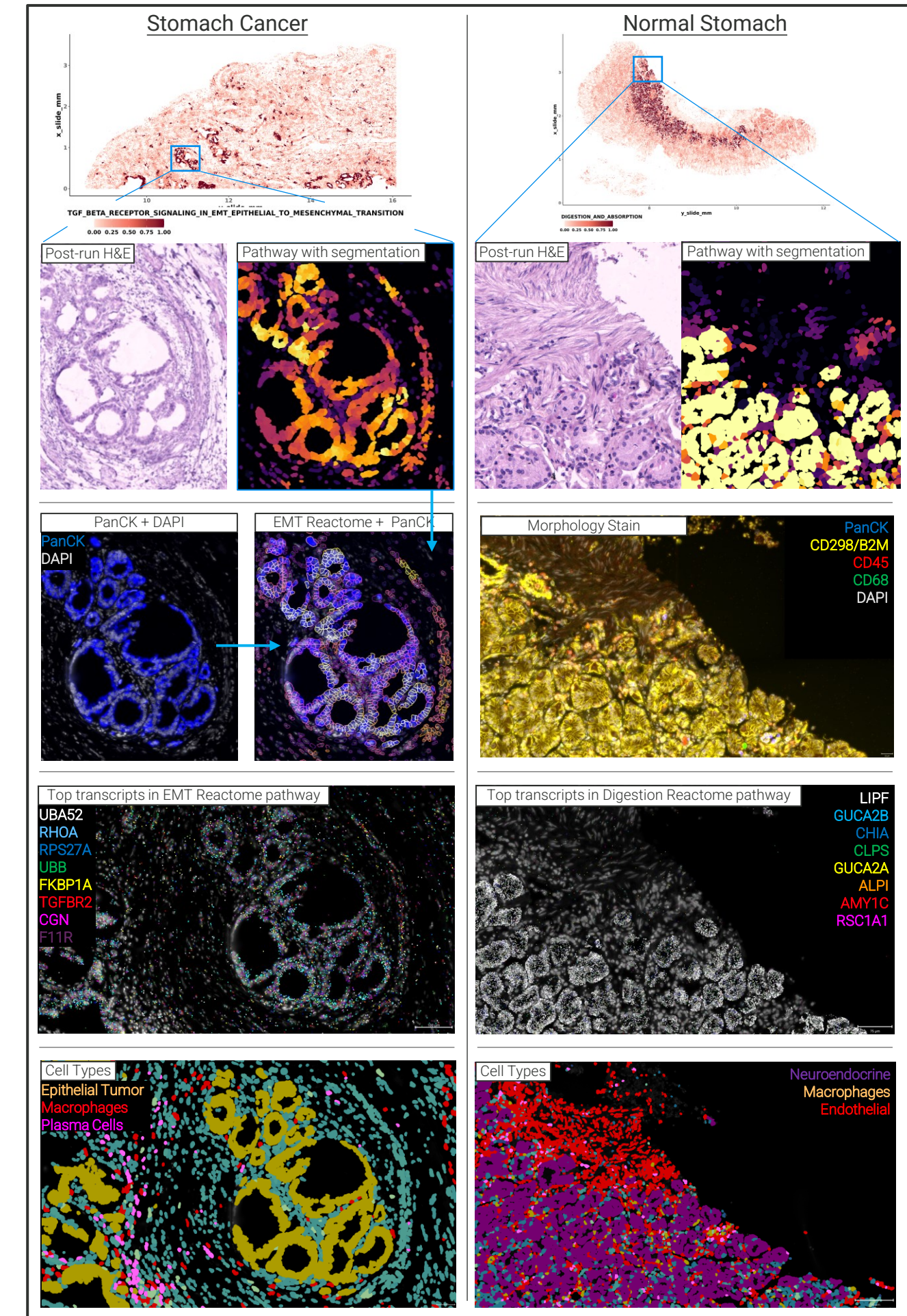


Fig. 4 Reactome and transcriptome analysis at subcellular resolution: direct visualization of EMT

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

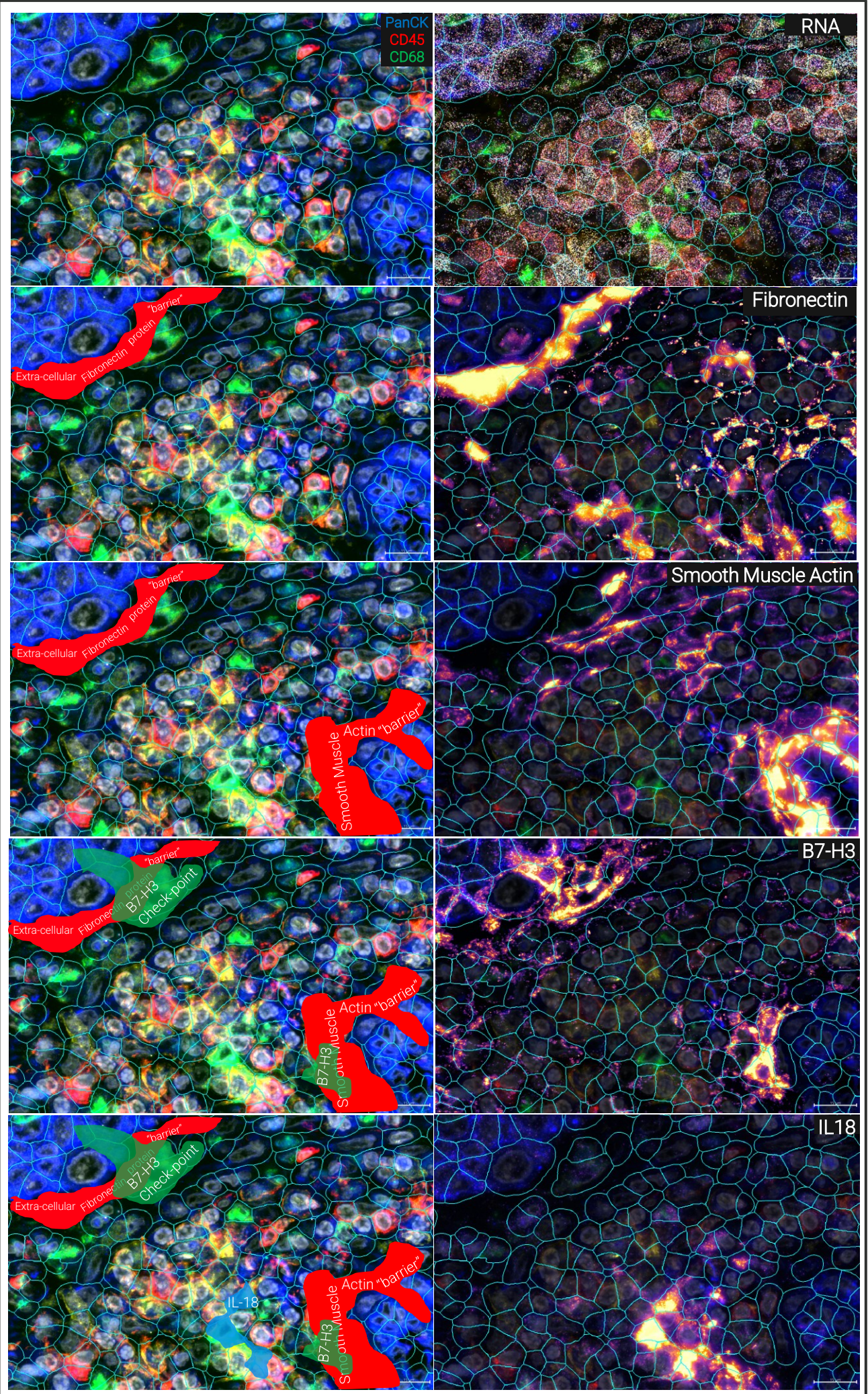


Fig. 6 Same slide RNA + Protein assay allows researchers to uncover hidden biology in the "blank" space between cells

## Stomach Tissue

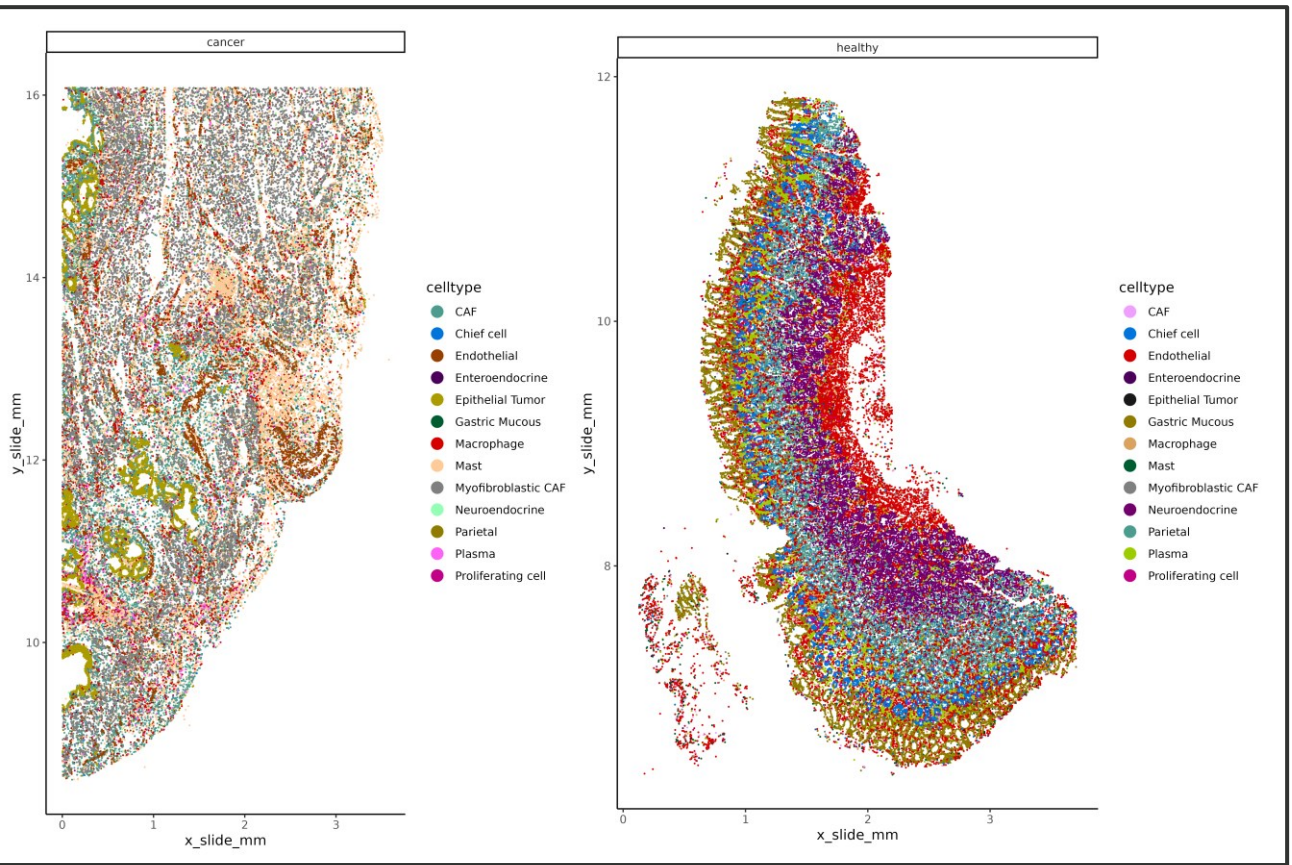


Fig. 5 Cell type identification based on marker gene expression

## Spatially Differential Pathway Activity Among Macrophage Lymphoma Tissue

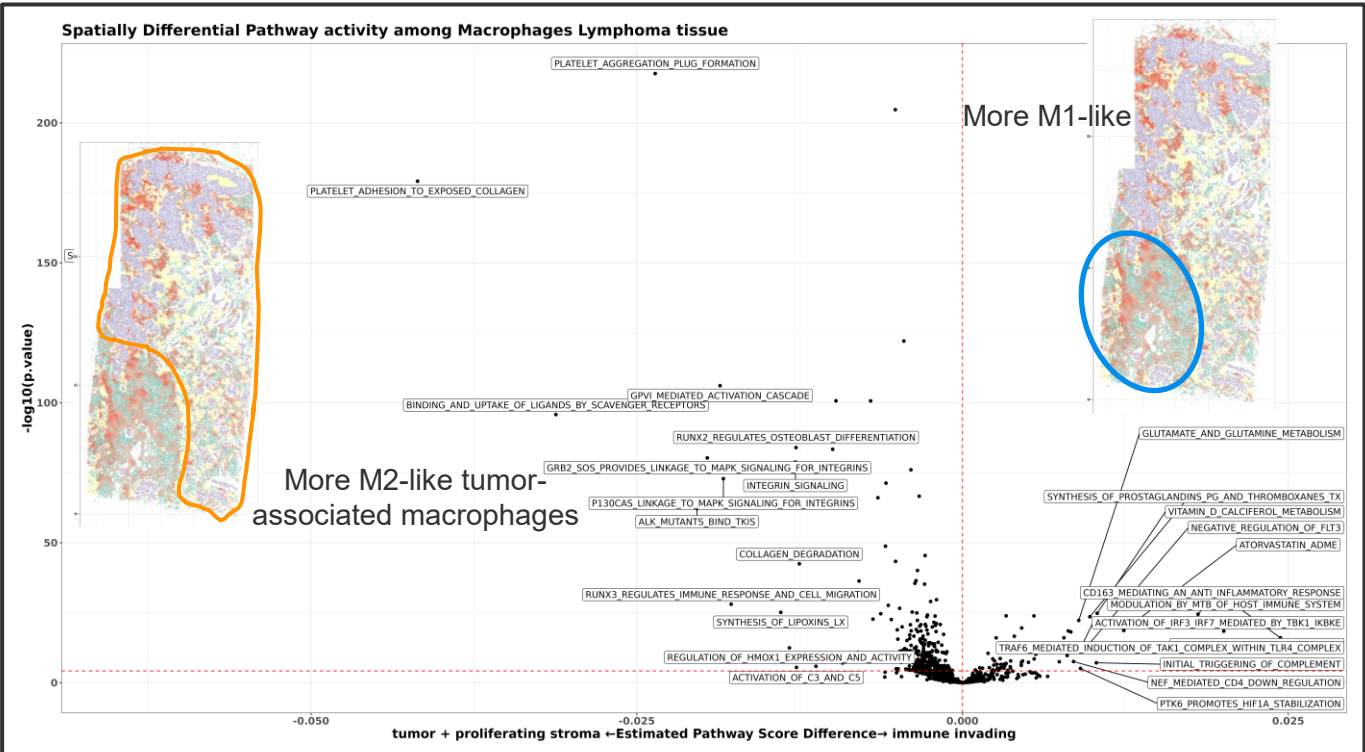


Fig. 8 Spatially differential pathway activity among macrophages

## Pathway Projection on Tissue Reveals Differentially Activated Pathways

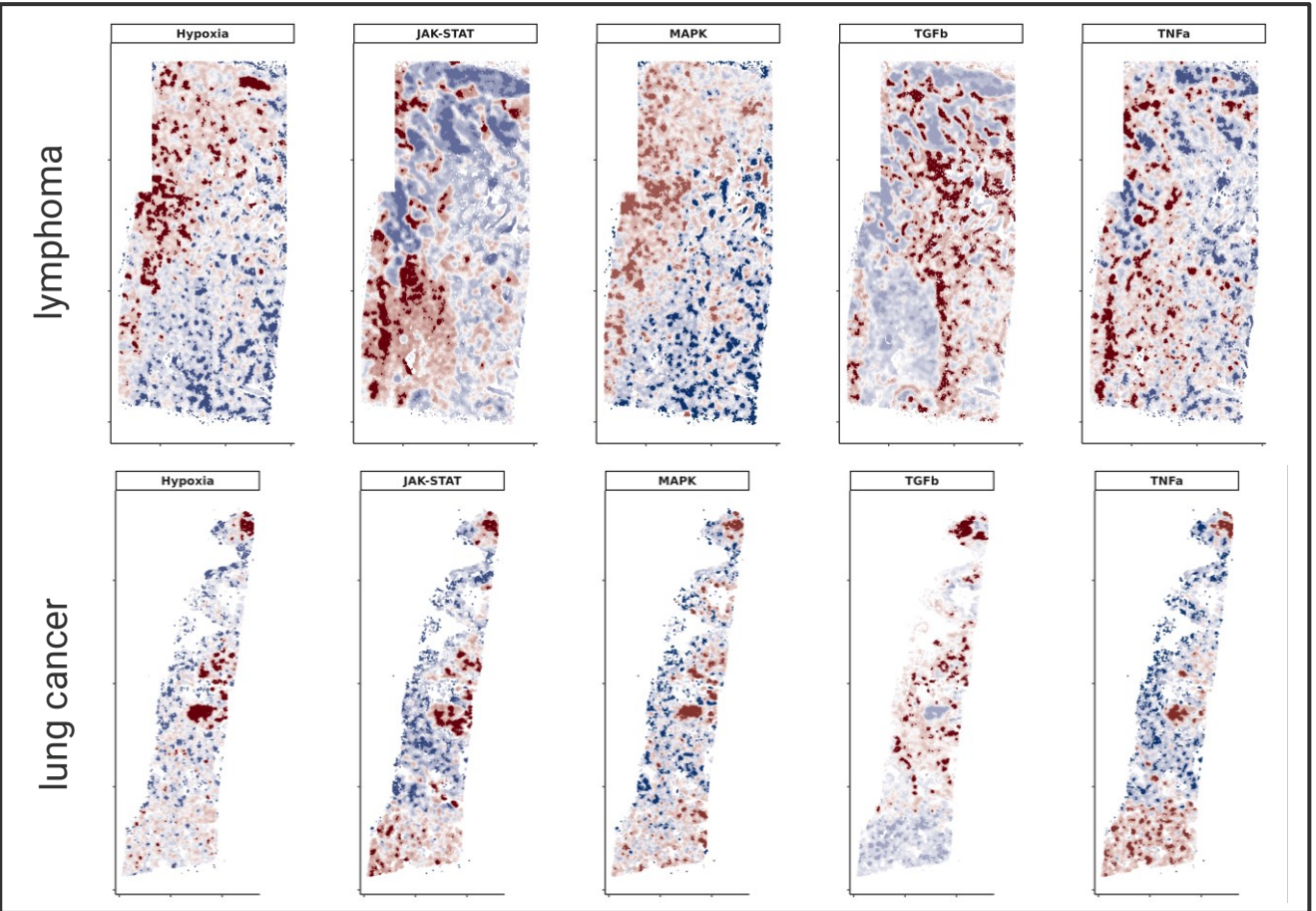


Fig. 9 Pathway score of typical pathways for different tissue types

## 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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