My work utilizes multiplexed ion beam imaging (MIBI) to understand how tumor cells, immune cells, and stromal cells interact in pre-invasive breast, lung, and prostate tumors, and specifically, which 'bad actors' may drive progression to invasive carcinoma. MIBI has the unparalleled ability to simultaneously measure 50+ markers in a single tumor region, allowing us to measure the many cell types that exist within tumors, how these cell types are spatially related, and how they change in frequency, identity, and signalling as tumors progress to invasive carcinoma. A better understanding of the cellular changes that support transition to invasive cancer will allow us to design clinical tests to identify which patients are at risk of progression, and which are not, allowing oncologists to spare tens of thousands patients per year with low-risk tumors the unnecessary surgery, chemotherapy, and radiation that may be of no benefit. Further, through these investigations I seek to identify new molecular targets that can prevent or halt tumor progression, allowing us to design therapeutics that can combat cancer at this early, sensitive state.