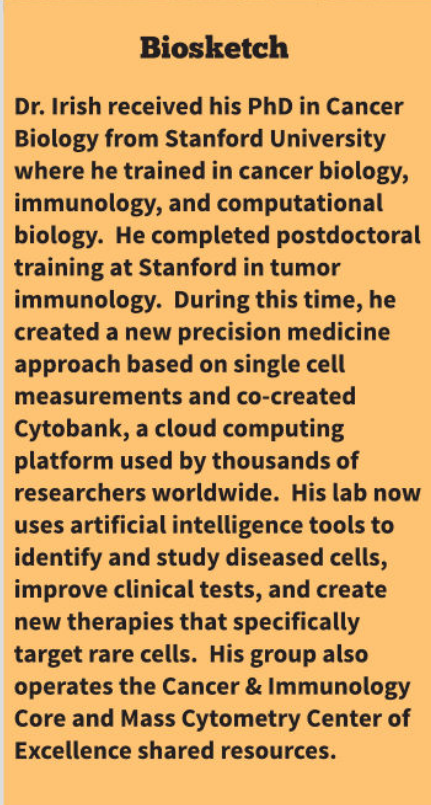




Dr. Irish received his PhD in Cancer Biology from Stanford University where he trained in cancer biology, immunology, and computational biology. He completed postdoctoral training at Stanford in tumor immunology. During this time, he created a new precision medicine approach based on single cell measurements and co-created CytoBank, a cloud computing platform used by thousands of researchers worldwide. His lab now uses artificial intelligence tools to identify and study diseased cells, improve clinical tests, and create new therapies that specifically target rare cells. His group also operates the Cancer & Immunology Core and Mass Cytometry Center of Excellence shared resources.

"Computational immune monitoring reveals abnormal double negative T cells present across human tumor types," *Cancer Immunology Research*, in press, 2018

"Discovery of human cell selective effector molecules using single cell multiplexed activity metabolomics," *Nature Communications*, 2;9(1):39, 2018

"Characterizing cell subsets in heterogeneous tissues using marker enrichment modeling," *Nature Methods*, 14(3):275-278, 2017



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Single cell biology and data science are revolutionizing our understanding of complex, multicellular diseases and therapies. This is especially the case with cancer targeted therapies and immunotherapy, where **an understanding of signaling interactions among cancer cells, microenvironment cells, and immune cells** is critical.

A central goal of our research is to understand **how cell signaling mechanisms govern healthy development and control the outcomes of human diseases and treatments.** Our lab creates cutting-edge single cell mass cytometry and phospho-specific flow cytometry tools to search through billions of cells from human tumors, lymph nodes, bone marrow, and blood samples in order to precisely target rare, abnormal cells.

We are **especially focused on targeting signaling networks and immune interactions in rare cell populations from patient clinical samples** obtained over time during therapy. Our lab members have diverse scientific backgrounds and work at the interface between multiple fields, including computational biology, chemical biology, neuroimmunology, and precision medicine.

We believe great potential exists to **detect diseases earlier and to tailor a patient's therapy to the biological alterations detected in the cells of their disease.** By better understanding biological systems which control development and cell-cell interactions in healthy and diseased contexts, **we can learn to program cells to become therapeutic agents or target malignant signaling events to specifically kill cancer cells.**

The diagram illustrates the multi-scale integration of data in precision oncology. It shows a human figure with callouts to a brain MRI, a cellular diagram of a tumor microenvironment, a neuron, cancer cells, and stromal/immune cells. Below these are images of lab equipment (test tubes, petri dish), a Kaplan-Meier survival plot, and a diagram of patient stratification into two groups.

Single cell biology



Precision medicine