The application of physical sciences and engineering approaches to address medical questions have yielded significant advances in our understanding of disease. In light of this, my research focuses on applying physical sciences and engineering approaches to elucidate the role of cellular phenotypes in health and disease. My talk will focus on two related areas, mainly: 1) the determination of cellular age based on biophysical properties of cells, and 2) the role of the stromal microenvironment in orchestrating a pro-lymphoma niche. As we age, cells within organs and tissues undergo profound biophysical and biomolecular changes, which significantly influence the rate of progressive functional decline in humans. This accumulation of age-associated dysfunctions can be thought of as the decreased capacity of cellular systems to absorb and rebound after perturbations involving either intrinsic or extrinsic stimuli, such as DNA damage after chemotherapy or the physical impacts from a fall. Working under the premise that age-related dysfunctions at the clinical scale is related to propagated cellular defects, I will present data showing that aging information is encoded within biophysical properties of cells, and can therefore be used as robust biomarkers of aging. These findings provide a proof-of-concept, and a hypothetical framework that can be used to stratify individuals based on aging trajectories in health and disease. In the context of disease, diffuse large b-cell lymphoma is an aggressive and the most common type of lymphoma, having a peak incidence between 65 and 74 year of age. Currently, my work focuses on a critical and understudied aspect of lymphoma biology, geared towards understanding the role of the stromal microenvironment in creating a pro-lymphoma niche. By asking questions regarding the biomolecular and biophysical properties of lymphomas, i.e. tumor mechanics, cellular an extracellular matrix (ECM) composition and architecture, as well as genetic and proteomic information, I am elucidating how stromal re-programming and matrix remodeling shape the lymphoma microenvironment. My long vision for this line of research is to identify exploitable targets within the microenvironment for eventual implementation into the clinic.