

I am studying the development of auditory sensory epithelium in the inner ear. This epithelium consists of two cell types; hair cells (HC) which transduce auditory information into electrical impulses, and supporting cells which function in ionic homeostasis of the HC. These cell types have a common origin, a progenitor pool that undergoes specification, differentiation, and maturation as a result of multiple signalling cues. My project aims to understand the role of the transcription factor, Sox2 in the cell fate transitions that occur during cochlear development. My focus is the role Sox2 may play in the ability to translate extrinsic developmental information into cell-state specific gene expression by changing the 3D genome. During my journey, I have come to appreciate the intricacies of transcription factor function, particularly in the context of gene expression changes over the course of development. The use of single-cell genomics to understand the transcription state of the different cell fates in cochlea has illustrated the differences that can exist on top of a common regulator such as Sox2. One way that these differences could be studied is by delving into locusdependent single-cell microscopy to evaluate transcription factor interaction with both chromatin and other effector molecules. An added dimension to this investigation would be observe these changes in transcription factor interaction over time and in response to signalling cues. This would shed light on how transcription factors help in interpreting morphogen signals and implementing these through changes in chromatin arrangements such as enhancer-promoter interaction. I believe this course would further my understanding of single-cell genomics and microscopy techniques and open newer avenues of exploration in my current project. I hope to implement my learnings from this course to explore how pioneer factor like SOX2 drives chromatin architecture during cell differentiation but also provide with an opportunity to understand the broader implication of such understanding during development or regeneration.