3-Dimensional Visualization of Cell Behavior and Movement in Tissue

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The ability to visualize cell behavior within the 3-dimensional space of a tissue is invaluable for understanding cell function. Although open-source and professional software exist to analyze cell movement in 3D, in some cases available software is unable to track cells over time due to densely packed cells or low resolution imaging of the tissue. Using confocal microscopes, biologists can collect a series of 2-dimensional images scanned at different heights through the thickness of a tissue. The purpose of this project is to visualize the movement of cells in dense tissue in 3 dimensions, from images that were acquired at low resolution in order to avoid bleaching of fluorescent signals and tissue damage by confocal microscope lasers. I am currently working with images of Drosophila ovarian tissue to visualize follicle stem cell movement around germline cysts in the germarium. Using stacks of manually segmented images of stem cells and germline cysts, and using coordinates from the segmentations, a Python program was written to create a 3D wireframe animation. The wireframe allows visual transparency through each element, so that the stem cells can be seen through the germline cysts. In addition, any element can be hidden in order to better visualize the remaining elements, a feature that is especially helpful for a dense tissue. The animation can be rotated to view from any angle, and zoomed in and out. This program allows visualization of follicle stem cell movement around germline cysts in 3D for the first time.

Awards Won:
Fourth Award of $500