Defining and Modeling Nuclear Migration in the Early Drosophila Embryo

Kiros, Leah (School: Maclay School)

The early division of nuclei in a Drosophila embryo is composed of eight nuclear divisions, or cycles, producing a total of 256 nuclei by the eighth cycle. The nuclei start in the center of the embryo and then migrate to the periphery the later the cycles occur. During divisions 1–3, nuclei divide in a sphere at the anterior end of the embryo. During divisions 4–6, nuclei divide and spread out along the anterior–posterior axis in a process called axial expansion. During divisions 8-10, nuclei migrate to the cortex of the embryo in a process called cortical migration. Before starting my research, I found that no quantitative analysis of axial nuclear migration had been described or reported. Based on this information and the lack thereof, I hypothesized that the nuclei will move farther away from the center of the embryo throughout the later cycles (6-8) and since the division is exponential, the migration can be modeled. My procedure involved embryo collection and fixation, embryo staining, imaging, and the collection of information from those images on the lengths and count of nuclei at each cycle. From my data, I concluded that the movement of nuclei in the later cycles is quicker than the earlier cycles from the steeper slope shown in the graphs. Additionally, I found that there is a retreat of nuclei back towards the anterior end during the movement from the anterior end to the center during cycle 2. The data from my project answers and supports my hypothesis on the movement of nuclei throughout the cycles.

Awards Won: