



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Rory C. Simpson	Project Number S2316
Project Title Planarian Vision: Investigating Negative Phototaxis in Planaria Undergoing Regeneration to Analyze Sensory Functionality	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The visual system of a planarian is relatively rudimentary, allowing for them to perceive incoming light and move away accordingly in a response known as negative phototaxis. The project was intending to describe the nature of planarian sensory regeneration through the redevelopment of the negative phototaxis in the flatworms.</p> <p>Methods/Materials Groups of 3 planaria of the species <i>Dugesia dorotocephala</i> were dissected transversely at either the medial, anterior, or posterior regions. Placed tail regions in a rectangular container divided lengthwise into 4 equal quadrants with a constant light source and the time they spent in each quadrant was measured during a period of 3 minutes. Assay repeated regularly until the planaria had redeveloped their sense of photoreception at about nine days. Examined planaria under a microscope for evidence of visual morphology and stages of redevelopment.</p> <p>Results After the first few days of blastema formation and limited movement, the earliest evidence of pigment cells of the planarian eyespots and negative phototaxis were found in the planaria severed at the midsection by the fourth day. The seventh day saw a considerable increase in the sensitivity of the response as the planaria rapidly moved towards darker regions of the container. The planaria cut at the posterior took longer for phototaxis to become apparent despite similar rates of physical anatomical development with the other sections. A majority had redeveloped full sensory perception and phototaxis by the ninth day and had distinctive eyespots indicative of fully regenerated planaria.</p> <p>Conclusions/Discussion The study reveals how the presence of visual structures such as pigment cups and photoreceptors in the planaria does not result in the return of phototaxis, but rather indicates the early stages in its redevelopment. There was a distinctive decrease in phototaxis amongst the flatworms which were initially cut at the posterior even though the locations of cuts on separate planaria did not impact the rates of regeneration. The delay of the response may be due to the continued development of axonal connections to the cerebral ganglia, though the optic chiasma had already formed. The response appears to not be entirely mediated by the visual system, but by higher integrative functions which return during brain redevelopment.</p>	
Summary Statement Through the investigation of planaria during regeneration, the project demonstrates that the functional recovery of behavioral responses to light does not directly coincide with the initial physical development of visual morphology.	
Help Received Dr. Shauna Bennett assisted in the general care of the planaria and gave guidance in developing a viable experiment. All of the research done for the study was conducted at TheLab, a public biology facility. My mom helped in driving and gathering necessary materials.	