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Using a Spatial Filter to Reduce Noise in Optical Diffraction KATIE CANAVAN[1], RAFFAELLA ZANETTI, ASIA BAKER, SULEKH FERNANDO-PEIRIS, Vassar College — We analyze the locomotion of the nematode C. elegans, a microscopic worm the diameter of a human hair, using optical diffraction. These nematodes are commonly used as a simplified model for more complex organisms and aid in studying bodily systems such as neuronal pathways. For locomotion analysis, a laser is directed at the live worm, producing a dynamic diffraction pattern; this is useful because variations in light intensity at just one point in the diffraction pattern can reveal information about the entire time series, and the C. elegans overall movement. We modified and updated our optical setup by using a spatial filter and an assortment of lenses to prepare the beam so that a highly resolved diffraction pattern can be produced, using a human hair as a simulation of the worm. The spatial filter cleans the beam by shaping it into a consistent plane wave. It contains an objective lens, which diffracts the beam into a concentric pattern of rings around a central circle of light. Next, a pinhole allows only the desired central circle to pass through, improving the quality of the beam as it exits the spatial filter. As a result, the intensity distribution is uniform before it interacts with the diffracting object, allowing for the comparison to models of diffraction patterns.

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