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Rotational Dynamics of Asymmetric Molecules MADELINE KILLIAN, VARUN MAKHIJA, University of Mary Washington — In nature, light is constantly interacting with molecules (natural processes like vision or photosynthesis). Understanding these interactions gives us more insight into what our world is made up of. When light hits a molecule, it is absorbed by the electrons in the molecule. The overarching research goal of our research is to make a "movie" of the electrons after light hits the molecule by using a femtosecond (a millionth of a billionth of a second) laser pulse. A molecule's natural rotation creates a blur in this movie. The goal of this research is to understand the rotation of the asymmetric chloroethylene (C_2H_3Cl) molecule in order to get rid of the blur it creates in the electron movie. Similar research has been previously conducted for the symmetric molecule ethylene (C_2H_4). The asymmetry of C_2H_3Cl results in complicated probability distributions for rotational orientation after a laser pulse hits the molecule. We solve the Time Dependent Schrodinger Equation to determine these probability distributions computationally for C_2H_4 and C_2H_3Cl. The results show that for C_2H_3Cl there is a highly asymmetric distribution of probabilities and a unidirectional rotation; this is not observed in C_2H_4. This is the first step towards being able to image electronic motion in C_2H_3Cl.

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