It is my hope to synthesize a molecular subunit called a "δ-lactone", using chemistry developed in our group, and then to determine its specific, three-dimensional shape. The "statin" family of cholesterol-lowering drugs (simvastatin (Zocor), pravastatin (Pravacor), etc.) all feature δ-lactones, which are known to cause their biological actions. A δ-lactone is a six-membered carbon ring containing an oxygen atom; we believe that our method can quickly and efficiently synthesize δ-lactones from β-lactones (four-membered rings) via a novel two-atom ring expansion. Additionally, the δ-lactones will be formed with the same stereochemistry (shape) inherent in these important drugs; our method, would be much more efficient.

The experiment will consist of four phases, of three to four weeks each. The first phase will be the preparation of the precursor molecules, called β-hydroxy ketones; our group has extensive experience in this area. Next will be preparing the β-lactones themselves, which is a nontrivial task for the type of β-lactone required. The third phase will involve the rearrangement of the β-lactones to the corresponding δ-lactones. After each of these phases, purification and analysis of the product will be carried out. The fourth phase will consist of exhaustive analysis regarding the shape of the molecule, including complex spectroscopic techniques.

I am a junior now at Eastern and I have taken general chemistry as well as the first semester of organic chemistry; I have earned "A"s in all of them. By next spring I will have completed both quantitative analysis and the second semester of organic chemistry. These classes, as well as the labs, have given me valuable techniques necessary to carry out these reactions. For example, I can isolate products and confirm them using various methods of analysis. Also, since the initial reaction of the group directly relates to what I will be performing, I have gained additional skills necessary to carry out this task.

Lactones are crucial structures for many natural products like pheromones, flavors and fragrances, as well as antibiotics. Delta lactones are very important in the flavor industry, and various insect sex pheromones which aid in pesticides. In recent years lactones have been found to be helpful in fighting tumor growth. As with most drugs, the shape of the molecule is extremely important because molecular shape is the major variable determining its fit into a receptor in the body. This research may be helpful in developing new drugs as well as some insight on the shape of delta lactones. [expand this a little - what kinds of tumors, etc. - emphasize that control of the shape is critical]

Initially, products will be purified using techniques ranging from column chromatography to recrystallization. When pure, their identities will be spectroscopically confirmed. The spectra that will be used will be nuclear magnetic resonance (NMR), infrared spectrophotometry (IR), and mass spectroscopy (MS). The NMR data will be the key to determining the shape of the molecule via the nuclear Overhauser effect (nOe). This determines how close hydrogen atoms are to each other and this will help us determine the ultimate shape of the molecule.

The results can be disseminated in several ways. There are a number of meeting held by the American Chemical Society; student research conferences also present the opportunities to present the work to groups of people. There will also be scientific papers submitted to international, peer-reviewed journals such as the Journal of Organic Chemistry, Synthetic Communications, Tetrahedron Letters, as well as others.

NOT BAD AT ALL, ESP. FOR A FIRST TRY! Make these changes, smooth it out, and I think you'll be ready