My focus of the project is to make an actuating micro-fluidic valve. After finding a commercially available valve was deemed unacceptable by the client I had to find other alternatives. The client recently expressed interest in using hydro-gels that can expand upon applied voltage to block a fluid flow.

Over the break I performed extensive research on such gels. I learned the theory, preparation methods, and experimental procedures associated with the gels. Based on this research, I selected a PAA-HEMA gel to make and have placed the order for the necessary regents.

Another alternative method to be researched was the use of magnetic nano-particles embedded in a gel. A magnetic field would be induced to move the particles and thus the gel. For this, a NIPA gel was selected due to is viscous nature. This would allow for maximum movement. The nano-particles are being made by a graduate student of the client. The procedure for making the NIPA gel is complex. After having two attempts at making the gel fail, a third attempt with modifications to the procedure yielded a gel that could hold a shape after being make on a micro-channel mold. This was a big step since no further surface modification to the mold was necessary. The next step is to attempt to make a gel with the nano-particles embedded.

Another alternative design to be researched was the use of nano-porous silica (zeolite) to absorb ions from the gel and then create and increased shrinkage in the gel to block a micro-channel. This would be used as particulate composed with the PAA gel. However, since zeolite is generally produced in mass quantities, finding a cost effective sample for research has proved troublesome. Recently a company was found that was willing to provide some free samples to use. These will be ordered and shipped immediately.