Progress this week began well with much work done in the 1-5 period of senior design lab. During this time period, I observed how the current setup was for analyzing the frog muscle in the PNB labs. It was a terrific opportunity to learn how an existing successful setup works, and through the graces of the advisor of that department, Penny Dobbins, the setup was allowed to be viewed by me as an outsider coming in. What I got out of the participation was knowledge of constants which are best suited for the successful operation of stimulating a calf muscle and recording its results. The most pertinent information which I received is the magnitude of the force developed by stimulating the muscle. The force transducer was outputting results in terms of grams. This alone confused me as grams are a measure of mass, not force. What I surmised was that for the purposes of a strictly biological experiment, calling force mass is tantamount describing the same thing since on earth, mass is directly proportional to weight, or force of gravity. In our case of exploration, describing mass in this manner would be insufficient since we need to have meaningful definitions for purposes of engineering and science. Therefore, I decided I had to convert the output mass to force. The masses the computers in PNB were reading out were in the range of 400 g to about 1500 grams. Multiplying these terms by acceleration due to gravity, and this received a value of about 4 Newtons to 15 Newtons. What this implied for us is that the force transducer must be setup so that it has a range with sensitivity to such small forces.

The second work I accomplished this week was to setup the lever for our box design. The first step to try to accomplish this task was to acquire a proper hollow tube as to be the member which the lever is built out of. Originally, surgical stainless steel was the recommended item to be used for the building of this, and there were requirements that the steel must be hollow. We would like the steel lever to be as mass less as possible as it is assumed to be mass less during the carrying out of calculations while conducting this experiment. Because of this reason, while shopping, I chose to buy a different type of item which is less dense than steel and therefore lighter. Additionally, it was a hollow rod as well, further reducing its mass. There was PVC tubing available at $1.79 per 10 feet, so I chose this to purchase and become the stem device up on which the lever will be built. The next process in setting up the lever was augmenting the PVC tubing so that it can be manipulated into a useful lever system. The method upon which this was accomplished was a team effort by Angela and me. The two of us went to the machine shop to cut the long tubing into a usable piece. We weren’t sure what shape of piece would be most ideal, so we cut two different types upon which we could pick whichever one would respond best during experimentation. One is a complete hollow tube, with a length of 30 cm. The other possible lever also has a length of 30 cm, but has half the mass of the alternate lever. This was accomplished by cutting the tubing in half. This might be a more advantageous setup since this allows for enough width to still adjust the lever and make changes within it, but also be the method to reduce the error in the mass of the lever the most.
Next, I wanted to begin the process of making the lever free rotating. If the lever were to be free rotating, then it would have to have a pivot upon which the resistance between lever and pivot was negligible. The friction between the pin connecting the lever to the box is not accounted for in the carry out of experimental calculations, and therefore for accurate measurements, it better not pose any tangible effects on the experiment. In order to gauge how effective the lever may be, after a hole is drilled into it, it must be observed that the pin is free rotating. In order to place a hole within the member of the lever, the drill in the back of the senior design lab was applied to the PVC tubing. This became trickier and trickier though as the clamp could not hold the oblique object. I was expecting that the vice would at least hold the object in place during compression force applied onto it by the drill. Unfortunately, this was not the case, and the weak plastic began deforming! Therefore, a different test area was used, and I drilled an alternate hole with the machine. This hole was not a perfectly circular one, but it did puncture the tubing on both sides, making for a slide upon which a pin could be placed through. The only pin that would be known to fit this exact hole in this circumstance was the pin used to drill through the tubing initially. Upon reinserting this drill head into the hole, the piece of tubing began swaying in the air on its own! This was of great relief, since it implied that the tubing was of a shape where it can rotate freely. Also, if the circumference of the pin could be acquired, then it could be known what size screw or alternate pin to use in order to apply during the building of our project. One thing that was confirmed is that the lever had a feasible chance of being used during conduction of our project since it was now seen to definitely provide no resistance to free rotation. In the design above, the lever is viewed at its side where it would look rectangular rather than half-cylindrical.