Abstract: Insight into subatomic particles can be attained through understanding electric and magnetic distributions inside the nucleus. By increasing the energy used in a particle accelerator, higher precision measurements can be attained. Towards this goal an upgrade was required to the BigBite spectrometer in Hall A at Jefferson Lab. This upgrade consisted of assembling and installing 90 hodoscope bars into BigBite. Hodoscopes consist of a plastic scintillator in between two light guides attached to photo multiplier tubes (PMTs). The bars were marked, and carefully centered within the detector to ensure that they are were aligned. At the end of the project, all of the bars were inserted into BigBite and affixed. These new hodoscopes can handle high rates and information of timing at high precision.

Introduction
Scientists use the Hall A spectrometer to study the basic building blocks of matter. Protons, neutrons, and electrons are larger systems that are made up of quarks. At a scale smaller than a proton, you cannot consider quarks as points so you need to consider their distributions. At larger values of momentum transfer (Q²) the theoretical predictions vary from experimental data. When incoming particles pass through the scintillators, it triggers two photons that travel to each end of the bar. Through studying the arrival time of the photons at each end of the bar, the position of the incoming particle can be reconstructed through analyzing the time of flight.

Methods
1.) PMT and scintillator bars were assembled prior to arrival at Jefferson Lab.
2.) Hodoscopes were marked before installation
3.) Hodoscopes were tested for functionality
4.) One straight hodoscope was placed in the center of the large plate as a reference
5.) A plumb bob was centered to assure alignment and an alignment tool was made
6.) Pairs of straight and curved hodoscope bars were taped together
7.) Pairs were inserted into the area of the spectrometer that hosts the pre-shower calorimeters, honeycomb, and hodoscopes, and were centered with the alignment tool and plumb bob
8.) The ends of each pair were cable tied to plastic adhesive pads attached to the outside of the chamber.
9.) This process was repeated until all bars were mounted
10.) Hodoscopes were affixed with a machined part

Conclusion
During my time at Jefferson Lab, we were able to stock the hodoscopes into BigBite, but not properly mount them due to time in getting the machined part to secure them. Through this upgrade, the electric and magnetic distributions of the neutron will be determined at larger values of Q². This new data will allow a better understanding of the electromagnetic composition of the nucleus.

Acknowledgements
• Rachel Montemery for guidance on hodoscopes and for photographs used in the poster.
• Nick Wade and Jon Fritz for assisting with hodoscope construction, marking, and stacking.
• Doug Higinbotham for help understanding the use of BigBite.
• Dr. Benmokhtar for sending me to Jefferson Lab.