

## Week 5 Progress Report

Multiple printed circuit companies were contacted in order to determine an ideal manufacturer for our future custom flexible circuit needs. There were logistical complications with the majority of companies contacted, specifically many were international, making our lead time undesirably high. Additionally, most companies requested a minimum order of 3000 units for a custom order. After extensive research of manufacturers, we have decided that Coast to Coast circuits will be an ideal flexible circuit manufacturer for our needs. Their minimum order is not limited by unit rather price. The minimum order at Coast to Coast circuits is \$1100. We believe that this is an acceptable expense, as the improved connection between omnetics and molex (which this circuit would provide) would vastly increase current neural recording limits, making it one of the most integral portions of our project. The Director of Technology at Coast to Coast Circuits, Dan Tozer, has given us contact information for a third party circuit designer. We intend to discuss our project idea with this circuit designer to check its validity and for methods to design it on our own. We have also begun researching open source circuit designing software in preparation for our conversation with the third party circuit designer.

Research for the preliminary report has commenced. We have found two papers highlighting the importance of material choice in neural electrodes and studied the current carbon fiber electrode paper extensively for inspiration on our project. A paper by *EIC Laboratories* parallels our project involves the study of how the use of “intrinsically conducting polymers and carbon nano-tubules” could yield promising results as a material for chronic microelectrode recordings<sup>[1]</sup>. This hypothesis is based on the biocompatibility of the electrodes with neurons, eliminating the noise that can be attributed to glial cells adhering to foreign materials. This is an aspect of the carbon nano-tubules that we discussed with Keith earlier in the semester, and a key focus in the choice to use this material as a recording electrode. Another paper by the *Duke University* also studied how a carbon exterior has its use as an insulating layer, as it is “chemically inert” and behaves as a “good substrate for biological molecule attachments”<sup>[2]</sup>. This paper also explained how brain tissue responded to foreign neural electrodes, and highlighted several key points about the bio-compatibility of different materials that we must consider.

Our jig design process has begun. We have drawn and 3D modelled two different redesigns of the carbon fiber jig. We are still waiting for actual dimensions for Hengen Lab. We got a large print of one of the models made at STS.

### References

- [1] Stuart F Cogan. [*Neural Stimulation and Recording Electrodes*]. Annual Review of Biomedical Engineering 2008 10:1, 275-309
- [2] Vadim S. Polikov et al. [*Response of brain tissue to chronically implanted neural electrodes*]. Journal of Neuroscience Methods - 2005