Our 490B Honours Presentations are adapting like other parts of department life. So, next week we will have two honours presentations delivered virtually using the Online Rooms feature of Brightspace using the link below. Please join in next Wednesday afternoon to support John and Colby.

PHYS 490B Honours Presentations
Wed March 25 3PM
Brightspace Online Room:
https://ysu-na.youseeu.com/sync-activity/invite/483191/0ba936e8f04f068edb5ae176be32e8f6?lti-scope=d2l-resource-syncmeeting-list

Conductive Polymer Films as Electrodes in Organic Solar Cells

by John Healey

Organic solar cells are a class of photovoltaic technologies that provide an environmentally sustainable and cost-effective alternative to traditional Silicon solar cells. By replacing inorganic materials such as Silicon with organic mate-rials that can be synthesized in a laboratory, the need for costly and environmentally harmful mining operations is
eliminated, and simple methods such as spin-coating can be used for device fabrication. However, most organic solar cell architectures still rely on inorganic Indium Tin Oxide as the anode material,thereby limiting the advantages these devices have over traditional architectures.In this thesis, the viability of a conductive polymer film to replace ITO as the anode in organic solar cells is investigated. Using Transfer Matrix Formalism for multi-layer structures, the optical properties of potential anode materials were compared computationally. This was followed by a series of experiments to con-firm the optical performance ofeach material, and to gain insight into electrical performance as well. If an organic material is to replace ITO, it must combine high transmittance with high conductivity, making this a difficult problem to solve.

A Model for Simulating the Flow of Fluid Through a Microcantilever Sensor Cell

by Colby Morgan

Microcantilever sensors are highly sensitive detectors capable of detecting target chemicals in solutions with concentrations in the parts per billion. Commercial and custom built sensor-based instruments make use of one or more probes consisting of eight cantilevers each. Until now the cantilevers have been treated equally, however, since they are in different locations with respect to the flow of input target chemicals this might not be the case. It is important to understand the concentration of targets in the vicinity of each cantilever to see what concentration each cantilever actually experiences. In this work we developed a model to simulate fluid motion throughout the cantilever sensor cell. It was found that there is a lot of variability in the flow across the cantilevers,which is suspected to impact the absorption rate.

In accordance with the flow, there are regions of high and low pressure on the surface of the cantilevers, which could result in misleading deflection readings. Understanding the fluid motion is the first step towards properly understanding the deflection signal of each cantilever.