GEOFF SCHIEBINGER, University of British Columbia
Towards a Mathematical Theory of Development

New measurement technologies like single-cell RNA sequencing are bringing 'big data' to biology. In this talk we show how optimal transport can be applied to analyze time-courses of high-dimensional gene expression data. Our ultimate goal is to develop these tools into a mathematical theory of developmental biology. We aim to answer questions like *How does a stem cell transform into a muscle cell, a skin cell, or a neuron? How can we reprogram a skin cell into a neuron?* We model a developing population of cells with a curve in the space of probability distributions on a high-dimensional gene expression space. We design algorithms to recover these curves from samples at various time-points and we collaborate closely with experimentalists to test these ideas on real data.