

## Application for an Undergraduate Research Assistant Position

Brouhard Lab, McGill University

### 1. What do you want to do in the Brouhard lab?

Propose a research project for your time in the lab. The proposal should be brief (1/2-page) and describe the concepts of the project. What draws you to the cytoskeleton? What is the open question you would answer if you could? Be creative! For guidance, here are the major techniques that we use:

- a. Single-molecule biophysics and biochemistry. We purify microtubules, we purify microtubule-associated proteins (MAPs), and we watch how they interact under the microscope.
- b. Imaging of fixed and stained neurons. We can see where a MAP is located in the neuron, and how this localization changes as the neuron develops.
- c. Live imaging of tissue-culture cells. The cells express GFP-tubulin or a GFP-EB1, allowing us to track microtubule dynamics in live cells.
- d. Electron microscopy of microtubules. We take ultra-high resolution images of purified microtubules by EM and we use image processing to extract the 3D structure of microtubules + MAPs
- e. Computational biophysics. We run computer simulations of microtubules growing and shrinking, and we also attempt to simulate MAPs.

At present, we are interested in the following microtubule-associated proteins: Doublecortin, Tau, CRMP-2, TPX2, Stathmin, and Cdk5RAP2. We also have MCAK, XMAP215, EB1, and kinesin-1 in the freezer. If appropriate, your proposal can reference one or more of these proteins as subjects of study.

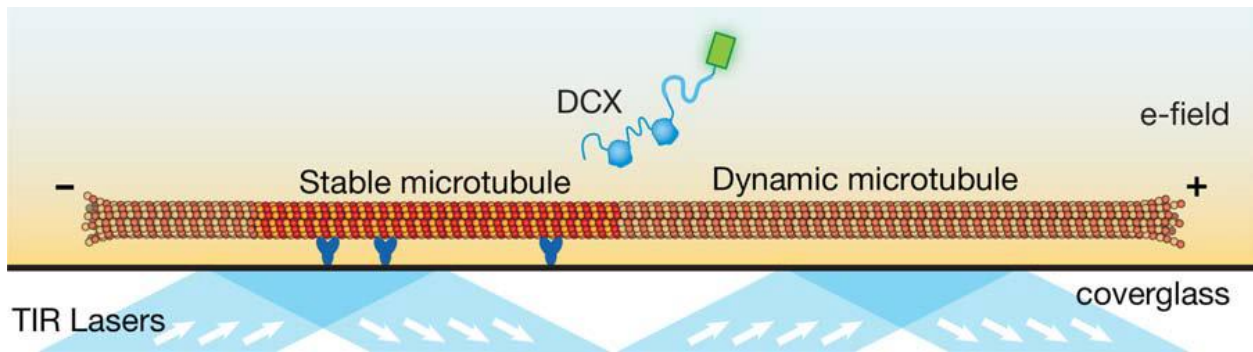
### 2. Why are you interested in research?

In 2-3 sentences, explain your long-term career goals (academic scientist, medical doctor, biotechnology innovator, science teacher, etc.) and how you feel that training in a lab will benefit you. Keep it short! If you are unsure about your career goals (the majority case!), describe your top 2-3 goals.

Your complete application should fit on one page with reasonable font sizes and margins. Please create a single PDF file with your application, your CV, and your transcripts and send this PDF to Prof. Brouhard.

*Deadline:* Review of applications will begin on March 30<sup>th</sup> for summer positions and continue until the positions are filled.

## Inspiration



A schematic of our single-molecule biophysics assay. How could you use this assay to study a novel MAP?

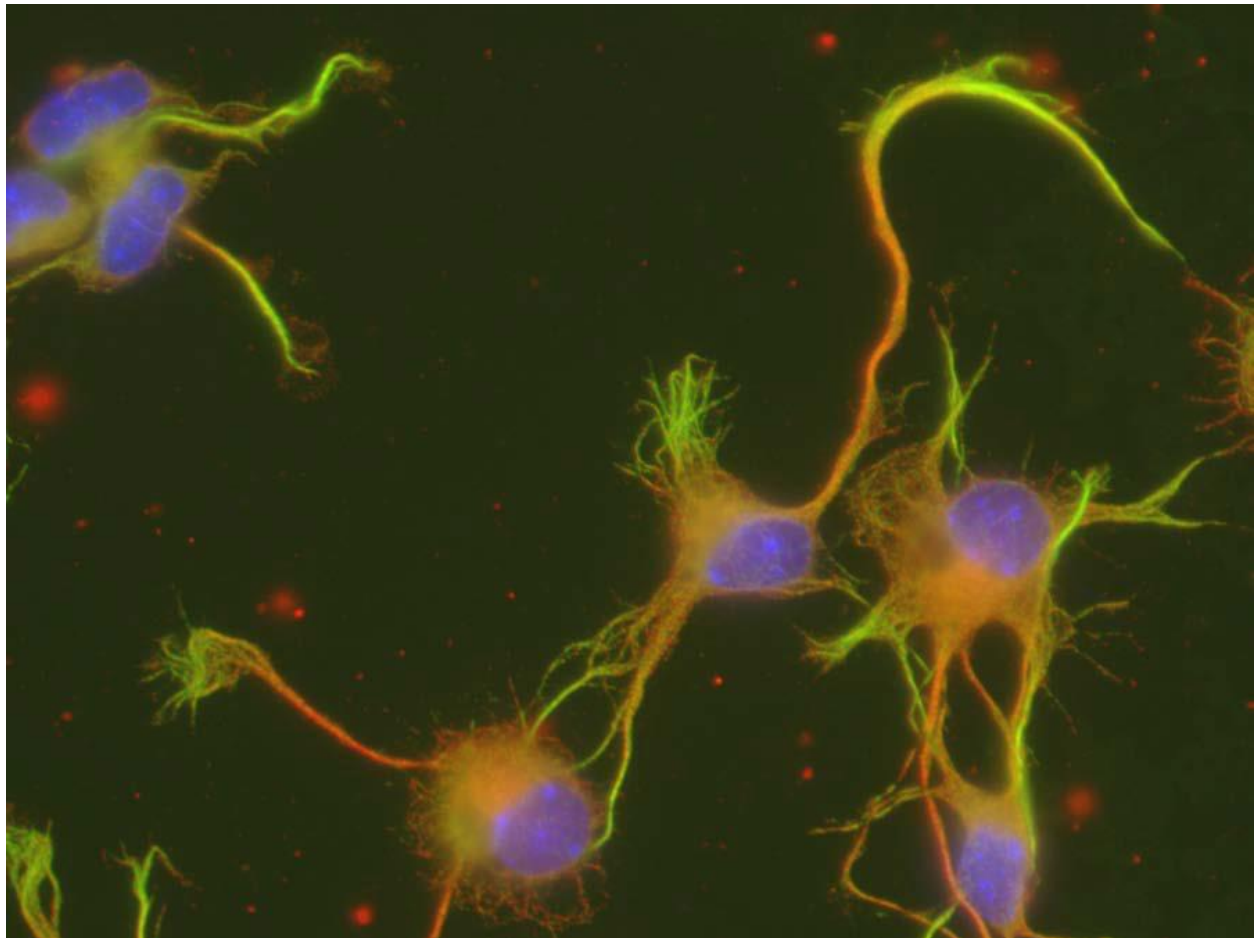


Image of fixed and stained neurons. How could you analyze images of this type to learn something about how microtubules are organized?