

From our research, my goal is to be a competent computational scientists. For me this means I am capable of contributing tools to computational chemists and biophysicists. I should be able to understand the different components of membrane theory when applied to both biology and soft-matter material science. Most importantly, I should be able to discuss not only my results, but my research plans, and how my work has evolved and changed based on my results.

In order to achieve this:

First, I need to enhance my understanding of membrane physics that was theorized by Helfrich and expanded over the past 45 years. These theories will be the foundation of our proposed work allowing us to better characterize and measure nAChR partitioning, and its boundary lipids.

Secondly, I have a foundation developed for constructing analysis programs, but I do not have the skill to build an integrated package for VMD. I need to learn how to combine the strengths of multiple scripting languages to build intuitive applications for myself and others to use. I also must improve my programming etiquette, allowing other researchers to use and or customize programs with ease to fit their own needs. Time spent learning and trouble shooting the fundamentals above will improve my scientific reasoning. Honing this reasoning is paramount to becoming an independent researcher, and being able to trouble shoot issues that arise.

Finally, whether accepted or rejected, applying to this fellowship begins building, to me, the most important skill, scientific communication. Under this fellowship, it is my goal to not only publish the work I plan to do, but to present it to the scientific community. I must learn to write both theory and evidence succinctly; this will not only allow me to publish and make a name for myself, but obtain funding to expand my research. Presenting data I must learn to be able to clearly explain and sell our tools.

After finishing my graduate education I aim to work in a university setting as a tenured faculty member, where I start a computational laboratory for graduate level biophysics, computational chemist and theoretical material scientists (geared towards biomedical). Ideally I want to provide a setting where incoming scientists can foster an interest in studying computational science applied biomedical topics (such as lipid based disease, neurological signaling). The hope is working with experimentalists working in neurology and pharmaceuticals, to improve our computational models.

I believe, with the help of this fellowship, that the research we have proposed will supply me with the opportunities to accumulate the skills I need to make this lab a reality. The paramount skills I need are a more complete understanding of elastic membrane theory, building both standalone applications and plugins, predicting data trends to independently build hypotheses and experiments, and scientific communication.