

Journal Two *

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- What has been the most significant challenge you have faced in the research environment? This could either be in your research activities or in terms of personal and professional relationships.

Managing Autonomy: I enjoy a lot of control over my workflow. Having built a good relationship with my faculty mentor over the course of spring semester and now this summer, I am supposed to design experiments, select research papers for “deep-reading”, and choose which concepts I should make a comprehensive report on. While my faculty mentor still guides me through the rough spots, the wheel is in my hands most of the time. Such autonomy, however, translates to an increased sense of pressure to produce “progress”. And this can get overwhelming. However, having my Gandalf poster (Figure 1) on the opposite wall and “the Avengers” soundtrack buzzing in my room, I tell myself, “Whatever it takes!” And I get moving!

Dealing with Distractions: I miss Library of Science and Medicine, mostly because I can’t get myself to watch a 1.5 hour movie in the middle of a study session in the quiet floor. Yet, that’s not true in my current workplace. While I do try to learn more about myself and schedule my day accordingly, I can get it wrong, especially on Fridays. For the past 2 weekends, I have had to work extra hours on Sunday because Friday didn’t go so well! However, with every passing day, I get more comfortable with working 6-7 hours a day as long as I spread my hours sufficiently.

- How has research differed from your expectations?

Art of Explaining: I did not expect that a large part of my research will be constantly explaining to myself and others. Properly reasoning my research is invaluable. I have experienced several instances of embarrassment in my meetings with my faculty mentor and

⁰I have used casual language throughout this document because it makes it easier for me to answer such deep questions. If such language is inappropriate on this occasion, please let me know and I will send you a revised draft.



Figure 1: My inspirational “Gandalf” poster!

other professors whom I explain my research to. The reason? I didn't think enough about my methods, forgot to review small yet significant details like units on a graph, assumed something was true despite lack of evidence, etc. I fool myself into assuming that I understand something when I really don't.

For example, during a presentation to a research group from the chemistry department, I was asked whether the subject of my talk - Variational Quantum Eigensolver- could solve the electronic structure problem within chemical accuracy. In the context of my work, this question was a simple yet important one, one that I forgot to ask myself. So naturally, I fumbled for a few minutes. Fortunately, the leader of that research group saved me from further embarrassment. Whew!

- **What has been your greatest success or accomplishment thus far?**

Exciting Experiments: Since quantum computers can be efficiently accessed through IBM Cloud, I can run experiments efficiently and retrieve results in a matter of seconds. This means that I can go beyond the assertions made by research papers and actually test out

the proposed techniques in real time. Yet, to do so, one needs to understand the IBM code works. This can be stressful. However, sometimes things click and they have done so several times this week! Shown below are results from an experiment testing whether I can use “noisy” or error sensitive results to produce a better result i.e. a curve that is closer to the ideal curve. The graph below shows how it is possible to extrapolate from the “noisy” orange and green curves to produce a better result (red curve) which is closer to the ideal result (blue curve). The implications of such cheeky trick are huge: we can get somewhat accurate answers despite the “noisiness” of our current quantum devices.

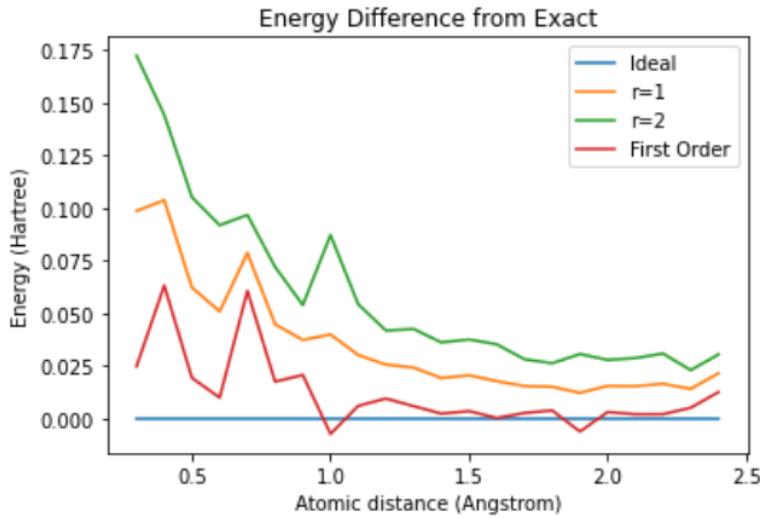


Figure 2: Results from an extrapolation experiment on the energy dissociation curves of hydrogen H_2 molecule.