Chapter for the public: <http://scifun.org/Thesis_Awards/chapter_guidelines.html>

My thesis starts in a place where many should, but likely isn’t mentioned often enough: failure.

Picture this: It’s your second year in a completely new place, having moved far away from family and friends, and you’re in a room with 5 of your friends, and you’re excitedly telling them about this cool thing you learned recently: …3 random facts here.

Except instead of just 5 friends, these are your mentors with PhDs and many, many scientific publications to each of their names, listening to you blab on about the beginnings of a project that you’re supposed to be the expert of AND complete within the next 4-6 years (I feel like there’s a joke here about how I don’t even know what socks I’m putting on the next morning). They ask you questions about tiny details you hadn’t yet thought about, and they expect you to tell them the right answer: how are you going to address if it doesn’t work? What about …, etc. (maybe actual questions that I then come back to the next year?) . After an hour and a half, you leave the room, deflated, exasperated, mind afloat. You remember to breathe. Other students pass you by in the hallway and congratulate you, telling you the worst is over. You’re ready to move on and get back to doing the science that you love. You walk back into the room to hear how they felt about YOUR project, YOUR presentation, YOUR ability as a scientist…and they say that you failed.

…

It's not an easy process, overcoming failure. Not much came easy to me: high school math and English…, college chemistry and biology, … I’ve been able to constantly push through those tough moments in learning, but despite that like many graduate students, I suffer greatly from …, a feeling known as imposter syndrome. Couple that with the fact that I am a minority among minorities, it’s a bit difficult to relate to others and feel like the struggle is mutual. Thoughts like: My application wasn’t that great, I only got into graduate school because they wanted to increase diversity. Or … . And then when you get here and you meet all the smart people who raise their hands to answer and ask questions in classes, who pick up concepts much faster than you, and who seem like they’ve really figured out why they came to graduate school and what they want to get out of it. I always thought that overcoming failure was taking into account all of these thoughts, machinations, ideas, etc., slamming them to the back of your mind to put yourself and the work first and to do your best to succeed.

…

**“He’ll be fine, no one fails out of our program”**

How do I write a paragraph stating how much this idea that someone attributed my experience to that of a default hurt me, while also saying how it moved me as a person and allowed me to succeed?

Should I mention covid here? In some relatable way? Maybe with the silence and how it pushed me to succeed?

Silence. At first, I thought the silence was painful. But after realizing that some people were just talking at me rather than actually listening to what I felt about this painful experience, I grew fond of it. I thrived in my own mind, thinking of new ways to make my project work, explaining concepts to myself, making metaphors, crying on the floor of my room when I couldn’t get things to work and jumping with joy when I did. I

…

After a couple of years I finally realized that overcoming failure isn’t just ignoring all of those facets of life that … instead, it’s accepting that you’re not perfect. It’s realizing that even through a lot of hard work, you may still fail. Overcoming failure is the ability to accept your shortcomings and look deeper at yourself to determine how to address them…example of an introspective situation…

…

Some ways to approach telling my project to the ley

My project is …:

* Understanding membrane protein folding
* Determining the strength of forces in the membrane
* Finding out how strong a force is…

Support from lab mates…advisors…mentors…true friends…

I thank my lab mates for helping me through what could have been the worst time of my life…

I began to realize that the thing I was missing wasn’t as much hard work as it was …love…

…

You go back into that room: the same one where you were told you failed the first time. With the same people, but each of them smiling, listening, hearing you out. You answer questions flawlessly, or are able to build a discussion around them… The chat feels fluid. After 20 minutes they tell you to leave the room again. But this time around, you’ve passed.

…

Love of science and my project and learning

…

How has this shaped me as a person: complaining without a purpose means nothing

I’ve been pushed to my limit as a student and I’ve come out alive.

I went into graduate school thinking it would be a challenge, but never expecting it to 1. Be this fucking hard. 2. To change my life in such a profound way.

A PhD is a realization that I have the tools to learn about anything that I’m interested in. It’s about objectively asking questions, knowing that they won’t all be the right questions, and quickly moving on to the next one once you realize they’re not. It’s about not getting frustrated that you haven’t figured something out, but rather being fascinated by why you haven’t and thinking of new ways to discover the extent of your own learning. It’s pushed me into new avenues: the beginnings of a podcast, music production, using machine learning to project basketball players…, things I would have never even thought of trying …

How long should this be? Check how long other people wrote their own.

The actual project:

**What is protein?**

Proteins are very small complexes that are used by our body to facilitate and manage many of the ways that we function. You often hear that people are able to get the correct amount of protein by eating protein rich foods like meat and dairy products. This idea actually sparked one of my first interests in proteins: when I became a vegetarian, I began to think of ways to properly maintain the amount of protein in my diet. Would I have to drink more milk or eat more yogurt? How much protein do vegetables contain? How do vegans get enough protein in their diet?

Long story short, proteins are found everywhere in daily life. As a vegetarian, I’ve found many protein rich substitutes including tofu, tempeh, and mushrooms. \*Do these contain different types of protein than meat? How do I get to the idea that there are many different types of proteins? Is this too in the details? Can I show some way to compare what we think of proteins and what they actually are: the structure of whey versus proteins that are actually in our bodies?

… to the point that we eat a lot of protein, but don’t

So why is consuming these smaller proteins so important for our body?

… is that too in the weeds too: I’d be breaking down the kind of processing that is necessary for proteins to be made: which is important, but kind of long: can I do it in a nice small figure

Image: protein eaten through mouth, digested by stomach into building blocks (how does this actually happen?), passes into … (does anything else have to happen to proteins before getting to be… processed into different cells, attached to new proteins being made in our body as old proteins are … (broken down?)

I specifically work with a subset of proteins called membrane proteins. Membrane proteins are fascinating molecules: they are found within the protective membrane structures that separate our cells from the outer environment. Figure: cell membrane with proteins in it, proteins floating inside cell (soluble) and outside environment. These are the proteins that help to facilitate interactions between our cells and the outside environment, for processes including cellular uptake (image) and responses (same image). Because membrane proteins act as the main players (?) in contacting cells from the outside, they are essential in regulating cellular responses to anything happening in our body, from … to …. And if something goes wrong with these regulatory proteins, it typically leads to diseases including …, and cancer.

So yes, technically my work is related to somehow studying how proteins are involved in these disease states and my work could be somewhat applicable to understanding preventing them. But I’d be remiss to say this is the main point of my research and the quest for understanding how these proteins work. The main point of my research has been to get better at understanding and asking the questions that could be important in a variety of areas…Being able to focus intently on what I find interesting and discovering the extent that I can pursue and achieve something I’m focused on (this sentence doesn’t really make sense right now)

So again, yes I’m trying to determine how these miniscule forces known as van der Waals impact membrane protein folding and association. But I’m also exploring the impact that I myself can have in a certain area of learning and knowledge, pushing the boundaries of my own personal learning to do so. It’s a journey I never expected to take, and one with many drawbacks including lost friendships, long work days, and stresses that take you … (analogy, ends of the earth? Maybe a dodie quote?).

…

Every journey has a beginning. I wouldn’t be the same person, the same scientist, without having failed my exam. I would have never reached these heights of my learning ability without it…and I would never have known that there is so much more for me to still do.

I’m planning on pursuing my own independence in the future. I want to do something that I love without feeling like the consequences of them are going to misshape the way I think of myself. I plan to put forward myself in a way that allows me to continue my love of learning.

**Can van der Waals packing act as a driving force in membrane protein association and folding?**