

The Lu Lab Research Philosophy

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Welcome

Welcome to the Lu lab! My goal as a Principal Investigator (PI) and mentor is to create and foster an environment in the lab where everyone can reach their full potential, achieve their career goal, and become a better person/scientist than they were before. This document describes my philosophy and how our lab should function to ensure we together achieve this goal. You should read it carefully before deciding to join the lab. If you have questions about any part of this document before and even after joining the lab, please feel free to come see me. I will be happy to discuss it with you in more detail.

Research Philosophy

“Many flee from science because they think it barren and dry; they believe in the ‘myth of heroism’ of those who practise it as a ritual, and the ‘myth of altruism’ of those who renounce more lucrative undertakings in order to satisfy their scientific interest in the service of their native country and of humanity, and in the ‘myth of genius’ which pretends that, in order to achieve scientific discoveries, it is necessary to have a high level of intellect and marvellous cerebral organization. All these myths merit correction: Science is not arid and disagreeable, and the scientists need not be heroes, altruists, or geniuses. Sometimes it is sufficient that they be artists.”

- Pio del Rio-Hortega (1882 – 1945)

My responsibility as a PI and a mentor

My responsibility as a PI is to ensure our lab is an environment where EVERYONE can thrive. To achieve this goal, I need to secure our funding source (meaning writing grant proposals), manage the laboratory space to make it easy for everyone to perform their work, design research projects that are slightly above your skill level so you can grow and succeed, provide guidance when you struggle, be honest with your mistakes, and celebrate your achievements harder than you do. I also have other responsibilities as a UVA faculty member, such as recruiting, teaching, and serving on other students’ thesis committees, but I will try my absolute best to set my priorities straight and be the best PI and the best mentor to you as I can. As a human being, I am certain that I will occasionally get lost and make mistakes along the way. Please feel free to remind me (please do so nicely) if I ever fail to do my job just as I will do the same for you.

Your responsibility as a lab member

You probably have noticed that I emphasized “EVERYONE” in my previous paragraph, and I hope you are not feeling surprised nor disgusted by the idea that making sure our lab is a

happy, comfortable, and safe place for every lab member to work productively is also your responsibility as a lab citizen. That means your responsibility as a lab member includes, but is not limited to, always being polite and respectful to your lab mates, completing your lab duties in a timely fashion, actively listening when your lab members present in the lab meeting, effectively communicating your needs, offering honest apologies when you make a mistake, and always cleaning up the shared lab space after you finish your experiments. The last point is often ignored but you should not. “I am busy with X numbers of important experiments currently running at the same time” is not an excuse for not cleaning it up afterwards. Cleaning is as important as setting up your experiments and should be integrated into your schedule. You can perform your experiments in a shared lab space on time because people cleaned it up before you, and you should return the same favor that you receive. Being a decent human being should be before being a decent scientist.

Your responsibility as a trainee in learning to perform rigorous scientific studies.

You might feel confused why I put the quote from Rio-Hortega upfront and why he concluded that artists are sufficient to be scientists – Think about it and let me know your reasons to the latter question by the time you are leaving this lab. I do sometimes see conducting good scientific studies is a kind of art that you can only learn through practice but not from textbooks – we are at the place that is beyond textbook knowledge and some of your research accomplishments may even one day re-write the textbooks that we know today anyways. Therefore, if you consider mastering the craft of conducting rigorous scientific studies (including publishing papers and graduating/securing a tenure-track faculty job in 5 – 6 years) as a form of art, you should know that it is going to take practice, take efforts, and take sweats from you when you sit in front of the benches doing experiments. It also requires your undivided attention when you perform experiments, collect data, analyze results, and interpret their meaning. It does not mean you must work in front of your bench 24/7, including every weekend and holiday, but it definitely is not a 9-to-5 job. It just isn't. Like all the work that involves creativity, it also requires you to think, listen, and read from others to find new inspiration. Learning how to balance all the above tasks and use your time efficiently in the lab while taking care of yourself and others is the most important thing that you need to learn as a trainee.

Everyone is different.

A research laboratory is one of the places where you can meet talented people from everywhere around the world. However, sharing the same passion for science does not necessarily mean sharing the same personality or philosophy for life. I will try my best to avoid having problematic and toxic personalities in the lab, but one thing that you need to learn, and I guarantee it will help you to go a long way in the future, is to work with people who you do not necessarily agree with. Be professional, as this is a place of work. Learn to distinguish issues between morally unacceptable ones or different personal preferences. Come see me and let me know immediately if you believe you've encountered a morally unacceptable situation. Please also feel free to come to see me if you are unsure and we will discuss it together.

I would also like to emphasize that everyone has different strengths and weaknesses, as well as different goals in their lives. I will provide individual lab members with distinct kinds of help and guidance to suit their needs and help them achieve their goals. One thing that I learned

and helped me the most through graduate school is to not compare myself to other lab members/colleagues. Again, I will try my absolute best to avoid having a bad apple that makes our lab smell intolerable, and please do let me know if you think there is one in the lab as I may not spend all my time in the lab as a PI. While I am dealing with any issues, try to focus on what you need to achieve during your time here and maintain your standards. As the wisest Nietzsche once told us, “The worst enemy you can meet will always be yourself.”

Everyone is different, but experience has value. *(This part is extracted and only slightly modified from the Freeman lab research philosophy, as my PhD mentor, Dr. Marc Freeman, has stated it perfectly. If you are interested in what else he said in his lab research philosophy, tell me, and I can send you a copy.)*

“The lab is as smart as everyone in it put together, and cumulatively our group has deep expertise in the things you will want to learn. Exploit this fact to your benefit. Ignore it at your peril. If you need to do something new, ask for help. Have others done this before? What is their protocol? Is there anything not written down on the protocol that I need to know? What are the most critical steps? Be persistent and always try to keep things going. Do not just grab a protocol and try it on your own. Go through it with someone with experience. It is good to try to be independent, that is encouraged. Trying to get things written down efficiently so you do not have to ask a person the same question over and over shows respect for their time and effort mentoring you. But for experimental approaches, tools, or other lab-related procedures, it is prudent to ask others with more experience, and continue to ask questions until you really get it. This openness to learning from those that came before you could save you a lot of wasted time. Always be hungry to learn from the others around you. Be willing to say: ‘I have no idea, please teach me.’ Be a productive receiver of information and tutelage. In the end, you will learn things more quickly, be shown the most efficient protocol on earth to do what you want, get the inside scoop on all its idiosyncrasies, and you will not run into as many protocol roadblocks.

Follow the directions. NEVER change a protocol before you have been through it the first time. It is written the way it is for a reason. Do not think you can just change whatever you want and expect success.” If you accidentally fail to follow the protocol, document it immediately in your notebook. We are all fascinated by the stories of scientists who accidentally made breakthroughs by mistakes, but those are all under the premise that they kept their books and documented their mistakes well.

Vacation policy and working hours.

My personal belief is to “Work hard, play hard.” Take vacation when you feel you need to and take it as long as you need to. Please remember that, if you are receiving paychecks from UVA, you are subject to the standard allocation of paid leave. As your supervisor, I also need to know ahead of time if you are going to be gone for more than a week. Ensure to plan your experiments accordingly to minimize interruptions, and ask your colleagues for assistance with your lab duties when you are away. Additionally, assign a surrogate to oversee your mouse in your absence.

As we are a wet lab where we perform most of our work on the bench with in-house equipment, I expect that you will spend most of your workdays in the laboratory. As a former

night owl, I do respect your personal schedule and individual biological clock. However, as your supervisor and mentor, I do require enough time to see you to ensure you are on the right track. There are also seminars, trainee presentations, and lab meetings that you should attend at regular hours. Therefore, please adjust your working schedule to have at least 4 hours of overlap each day with the society-defined working hours, i.e., 9AM to 5PM, Monday to Friday.

When doing research in this laboratory is not fun anymore...

My biggest hope is that you can have fun while doing research in this lab, because I always did, and I think it is the best driving force for me to continue to finish my PhD, my postdoc, and the crucial force for me now as a faculty and as a PI. The best indicator to determine if you are happy is whether you wake up in the morning feeling excited to come to the lab. It is unavoidable to have setbacks when doing research and solving questions that nobody knows the answer to, but we can still have fun and enjoy this journey together. With that said, it is OKAY to not feel happy and think that you may have made the wrong decision coming to graduate school/staying in academia as a postdoc/working in this laboratory. Feel free to let me know if you begin to have this idea in mind at any time. If this becomes a consistent pattern, we can discuss what would work best for you moving forward. You define your own success; DO NOT let anybody else tell you the other way.

However, do not quit on a bad day. I can't remember if it's Lindsey Vonn, or the other one of the greatest athletes in the world, who said during the interview that she often cried and wanted to quit when she was still a little kid receiving all the training to become the best in the game. Her mom would always reply, "I get it. Let's do this one more day though. If you still want to quit tomorrow, we will quit." She never felt that again on the next day because she really loved this sport and wanted to be the best. This interview inspired me a lot. Distinguish whether you genuinely dislike it or if it's just a bad day. Give it some time; I can't tell you how many times I've had similar thoughts about quitting, but they all turned out to be just one of those bad days. My favorite science fiction writer, Philip K. Dick, once said, "Don't try to solve serious matters in the middle of the night."

Strictly Prohibited Behaviors (Violators will be immediately banned from the lab)

1. Lie about your experiments and fake/fabricate your data.
2. Sexually harass or abuse any other human being.
3. Discriminate against your lab mates in any way possible.
4. Physically attack your lab mates and anyone in the department under any circumstance.

Appendix A

Advice to young scientists by Dr. David Ho (6/14/2014 in Cambridge, MA)

1. The primary ingredient for success in science is **the passion for science**. In front of you is the century of science and medicine. Challenges and opportunities abound. A strong passion for science will sustain you.
2. **Do not be afraid to take a chance**. Success in research, as is the case in most endeavors, requires bold decision-making and a willingness to take informed risks. As so eloquently stated by Harold Shapiro, the former President of Princeton, “an excessive zeal to avoid all risks is, in the end, an acceptance of mediocrity and an abdication of leadership.”
3. It is a given that you must acquire the knowledge and develop the skills in your chosen field. However, I urge you to **read broadly**. Go to meetings and listen attentively. Talk science with colleagues from other disciplines. Do not narrowly focus only on your own field, for the breakthroughs may, seemingly and unpredictably, come from “left field.”
4. **Always maintain a deep commitment to excellence**. Never permit the quality of your work to be compromised. Never write a bad paper. Never give a bad talk. Never lower your standard of excellence.
5. **Always seek the truth and learn to challenge phony authority**. Blind respect for authority is the worst enemy of truth. Learn to distinguish between truth and dogma. Unsubstantiated dogma restricts the free thinking that is essential to arrive at the scientific truth. Send out “dogma alerts” in your own mind when you hear personal biases presented as established facts. Do not let yourself be boxed in by dogma.
6. **Know the difference between the words “could” and “should.”** Too often young scientists do the experiment they “could” do rather than the experiments they “should” do. Think about this distinction when you come to each critical juncture in your projects. The former could get you stuck in a rut while the latter could elevate you to new heights.
7. **Strike the right balance between thinking and experimenting, and between “vision” and “action.”** All of us were taught to work hard. Thus, too many young scientists grind away relentlessly, carrying out experiments one after another, without ever reserving sufficient time to read and think. Make regular appointments with yourself for a quiet time to think and to strategize. Remember this old Japanese proverb: “vision without action is a dream; action without vision is a nightmare.”

Appendix B

Resource from the BIMS Mentoring Workshop: Define Research Independence

Here is the domain knowledge that constitutes a working scientist, and how PIs think students should perform in each domain at different career levels. It is just for your reference, and we can discuss together to make one that suits your career development the most.

Domain	Beginning PhD Student	3 rd Year PhD Student	5 th Year PhD Student	At Your Thesis Defense
Knowledge of research area	<ul style="list-style-type: none"> • Familiar with the papers that are directly related to your research topic. • Know what's known and what's unknown. • Know what you know and what you don't know. 	<ul style="list-style-type: none"> • Be able to point out caveats or weaknesses in both published papers and preprints. • Understand why the knowledge gap in your research field is not resolved yet. 	<ul style="list-style-type: none"> • Be able to design experiments to address the knowledge gap in the field. • Familiar with the work from prominent labs in the field. • Begin to expand readings into other fields. 	<ul style="list-style-type: none"> • You should be THE expert in the field and even familiar with your research topic more than your PI! • Have sufficient knowledge for your next adventure and ready to go.
Research methods and study design	<ul style="list-style-type: none"> • Know the basics of study design – e.g., including controls, making records. • Familiar with the principles behind the major techniques you are using. • Practice, practice, practice. 	<ul style="list-style-type: none"> • Familiar with most methods used in the lab and able to teach others. • Be able to design troubleshooting experiments. • Be able to optimize methods. 	<ul style="list-style-type: none"> • Be able to bring new methods or establish a new system in the lab. • Be able to design and propose a project. • Know what a “killer” experiment would be and focus on that. 	<ul style="list-style-type: none"> • Be able to design a research project even outside of your own field.
Scientific writing	<ul style="list-style-type: none"> • Collect papers that you think are written very well. • Attend writing workshop and course. • Establish your Zotero database. • Practice, practice, practice. 	<ul style="list-style-type: none"> • Familiar with the scientific proposal writing style. • Be able to incorporate feedback from others. • Know useful word skills (textbox, bibliography, high-res figures, etc.) 	<ul style="list-style-type: none"> • Familiar with how to write a research paper from scratch. • Explore other writing styles if interested (e.g., journalist, educator; scientific review, etc.). 	<ul style="list-style-type: none"> • Finish writing a beautiful PhD thesis that you can feel proud of.
Oral communications of research findings	<ul style="list-style-type: none"> • When attending seminars, note what you like and do not like about the presentation. 	<ul style="list-style-type: none"> • Have accumulated sufficient slide decks for data. 	<ul style="list-style-type: none"> • Know what it takes for you to give a good talk. • Give a good talk at a conference 	<ul style="list-style-type: none"> • Give the best public seminar of your life.

	<ul style="list-style-type: none"> • After presenting at the lab meeting, think about what you can do better next time when conveying your project/results. 	<ul style="list-style-type: none"> • Have good intro slides for your project. • Practice, practice, practice. 	<p>so everyone remembers you as a good speaker after your talk.</p> <ul style="list-style-type: none"> • Practice, practice, practice. 	
Teaching/Mentoring Excellence	<ul style="list-style-type: none"> • Explore your own learning style, which usually reflects your teaching or mentoring style. • Save all the materials from your courses just in case... 	<ul style="list-style-type: none"> • Focus on your own research first. • Attend workshop or courses if interested. • Explore potential opportunities to mentor or teach and plan ahead. 	<ul style="list-style-type: none"> • Begin to mentor students or teach if interested in teaching career. • Begin to understand what it takes to establish a research lab if interested in this career. 	<ul style="list-style-type: none"> • Have a full understanding of your mentoring style. • Ready to focus on your teaching career.
Leadership management (taking ownership and agency for their research career)	<ul style="list-style-type: none"> • Try to say yes to things that you have never tried, or you are not familiar with, i.e. learning to step out of your comfort zone. • Be comfortable making mistakes and own the mistakes. • Meet the standard of the graduate program and the lab. • Learn, learn and learn. 	<ul style="list-style-type: none"> • Time to consider quitting if you hate research or can't meet the standard. • Be able to articulate why you are here and what your research can be meaningful. • Explore the next step for PhD. 	<ul style="list-style-type: none"> • Be able to convince your PI your idea is better. • Begin to plan the next step after graduation. • Be able to set priorities and manage your time well in and outside the lab. 	<ul style="list-style-type: none"> • Have an awesome plan after graduation.
Collaboration	<ul style="list-style-type: none"> • Learn how to work with people in the lab. • Understand what it means to "have the expertise." • Be the expert of what you do first. 	<ul style="list-style-type: none"> • Be the expert of what you do. • Contribute intellectually to other people's projects. • Learn what other labs are doing by attending seminars or happy hours. • Build relationships. 	<ul style="list-style-type: none"> • Help other people's projects if necessary. • Learn what other labs are doing by attending conferences. • Build relationships. 	<ul style="list-style-type: none"> • Have your collaborators cheering for you in the audience!