Kristen's Guide to Success in Spinlab

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This guide is a collection of things that I have learned/observed during my time as an undergraduate student researcher in Spinlab. Your experience may vary.

I. Starting at NSCL

1. Don't fret if you don't know something

    - This job revolves around learning
    - Be clear about what you don't know so the group can find a starting place for you

2. Set goals with Jaideep

    - Keep these goals in mind during your work

3. Grab a logbook or two

    - Some prefer one logbook to record everything from meeting notes to calculations
    - Some prefer one logbook for meeting notes/to do lists and one for working on their research project
    - Make a table of contents, title all entries, and update the table of contents

II. Time Management

1. Use your Outlook Calendar

    - Plan your week here so you don't forget
    - Inform others of when you are busy

2. Ask yourself questions before working

    - Does this help me accomplish my goals? OR does this help the group?
        - If not -> don't do it
    - Is this important?
        - If not -> you should probably work on something else
    - Do I have enough time to accomplish the task?
        - If not -> is this the most efficient way to do the task
    - Do I have the prior knowledge necessary for this?

- If not -> read a book or talk to someone
- It can be unsafe as well as a waste of time if you don't understand what you are doing

- Are there safety documents or procedures that I need to follow?
  - If not -> are there any possible hazards?
- Are there enough people performing the work?
- Are there too many people performing the work?

3. School is important

- Designate time every week to work on your research, without schoolwork
  - If you commit to a research position during the semester, you should be making some progress
- Don't bring your schoolwork to work
  - If you are in the lab, you are taking up space that is designated for the group's research
  - If you are in the lab, it's expected that you can help others when necessary
  - You can be distracting

4. Figure out what helps you focus

- Working in the lab? At home? Listening to music? Working at a certain time of day?

5. Don't let something hinder your work

- If you have put in a lot of effort towards understanding something - reading, etc., but you still need clarification,
  - Schedule a meeting with someone who knows more (Jaideep, grad students, experienced undergrads)
- If you were given a suggestion and it's not going as planned, it may not work
  - Don't believe that it has to work since the suggestor is more experienced than you
  - Look for solutions on your own, meet with the suggestor and arrive at a new solution

6. Don't waste the time of others

- If you have to present at a meeting, PREPARE
  - Know what you want to say and show
  - Articulate what you are still trying to figure out/need help on
  - Present the work in a clearly readable way
  - Make it succinct, every detail is not important

- If you have questions for someone
    - Know what you are asking, say it clearly so as to avoid pointing the conversation in the wrong direction
- Write down detailed notes from discussions
    - If you forget what was discussed, the meeting was a waste of time

III. Experimental Physics Practices

1. Become a problem solver

- Device isn't working?
    - Read the manual
    - Look online
    - Ask others who may have used it
- Need to perform calculations or analyze data?
    - Write a program
    - Make plots
- Don't have what you need?
    - Look around stock rooms of NSCL
    - Find what you need online and order it
- Is your experiment going as planned?
    - Know what the data you are collecting should look like and check the data as you are collecting it
        - If the data looks wrong, think about why that might be

2. Keep a log of your work

- The product of our work (papers,results) depends on logging all of the details (it could be dismissed as inconclusive otherwise)
- Record the date and time in your logbook frequently, with this we can
    - Learn how long something takes
    - Look up when something was done
    - Match a fluctuation in the lab environment's conditions to a fluctuation in experimental data
- During an experiment, record
    - Purpose of the experiment
    - Sketch of the setup & devices used
    - Device settings
    - File names
    - When you turn devices on/off
    - When you do certain steps in the procedure
    - Any problems/solutions & why
    - Any unexpected results & why

        - Any expected results & why
        - Summary & suggestions for the future
- Use an experiment's logbook as well as your own
    - Sometimes things should be written in both logbooks for clarity
- Use the ELOG
    - The ELOG is great for summarizing your work and writing your current conclusions
    - Provide all necessary experimental details and numbers, so that the experiment can be well understood and the results can be analyzed
- Store data in an organized fashion
    - For ex. SAM's data files go like so: spinlab_data\SADiCS\YYMMDD_TIME_EXP where EXP is a short name for the experiment, inside of this folder is a raw_data file, a data_analysis folder and a README
    - Make detailed READMEs
        Short description of the experiment
        Relevant logbook pages
        Data file and analysis file naming explained
        Important experimental parameters given

3. Do independent research

- Read books on the theory behind your research project
- Read books on experimental methods
- Read books on programming
- See if what you've learned applies to your research
    - Perform quick calculations and estimates

4. Present your research

- Go if you are asked to present at a conference or university event
    - Build your network of connections
    - Learn about various research topics
    - Learn more about what physics research entails
    - Build your social skills
    - Go somewhere new!
- Be professional
    - How you act/dress can leave impressions on others
    - Be prepared - practice, practice, practice! Ask someone to listen to you practice
- Preparing your presentation
    - Be succinct - time is limited and you want to tell them as much of the story as you can
    - Find balance in the amount of text you use

- Use plots - large, descriptive axes and tick labels, pick axes ranges to center data and display as clearly as possible
- Use diagrams - make these on inkscape, adobe illustrator, etc.
- Use pictures - use discretion with these, diagrams are usually easier to follow
- Give credit where applicable
- Have backup slides prepared

IV. Resources

1. Spinlab has many resources

    - Wiki
    - Books
    - Tools/Parts
    - Desktop Computers/Laptop Computers with many useful programs installed
    - People!

2. NSCL has many resources

    - Programs - Mathematica, Matlab, Solidworks, Origin, Remote Desktop - Connection, etc.
    - Books
    - Tools/Parts - Stockroom
    - Office space
    - Meeting rooms
    - People!

3. MSU has many resources

    - Programs through MSU Computer Store - Mathematica, Matlab, etc.
    - Books/Articles through MSU Library & Google Scholar
    - People!

V. Graduate School

Do you want to continue doing research? Are you willing to dedicate 5-7 years to your degree?

1. Apply for graduate fellowships

    - These give the admissions committee good reason to admit you

2. Study for the Physics GRE, but not relentlessly

- This is one component of your application, it will not be the determining factor unless you are an outlier
- This test is designed to see if you've learned something as an undergraduate (not to see if you can memorize everything), but there is unfortunately some strategy behind it
    - Many websites talk about this
    - Be quick, answer questions only when you can eliminate a choice or two
    - Buy and read the book Conquering the Physics GRE - I made flashcards from it in order to improve my problem solving speed

3. Learn the format of the General GRE, take the test

* I didn't study because I was more focused on other things, I still did fine with the knowledge I've gathered as an undergrad
- The format and wording can be confusing, learn how the test is written and what to expect

4. Ask for Letters of Recommendation

- Ask well in advance
    - At least 4 weeks
- Ask potential letter writers if they will write your letters in a polite manner
    - "Do you have the time to write me a strong letter of recommendation?"
- One to two professors
    - Talk to your professors while you are taking the class, show them that you think about physics
    - Ask professors who have given you a decent grade
    - Consider asking well-known professors
- Research advisors
    - Ask Jaideep and any other research advisors for letters
    - Work hard while in the research group so your advisor has things to write about
- Make an effort to make this process easy for them
    - Provide them with a CV and personal statement
    - Meet with them to discuss things about yourself

5. Write a Personal Statement

- Write a well thought out draft first
    - Some online sources tell you to write some abstract story, I would avoid this, it tells the reader nothing about you besides your creativity (waste of the reader's time)

- Tell the reader why you are great, otherwise they will not know
- Ask someone to read it and give you feedback
    - Friends
    - Professors
    - Advisors

6. Apply to lots of schools that you would be happy to go to

    * I applied to 10
    - These schools should have multiple faculty members that you would be interested in working for
    - Contact faculty members prior to application reviewing time and express interest in their research
        - Do your research on their research
        * I contacted 2 per school with a personalized email, I skyped two (out of 20) of the faculty members before I received a response from admissions
    - Start applications early so that letter writers can submit letters as early as they would like

7. Visit the schools you get acceptances from, if possible

    - Work with your professors if you have to miss class
    - Do your research again on faculty member's research so that you have a lot to talk about when you meet with them

VI. Summary

1. Plan - Use your time efficiently
2. Communicate - Clearly and concisely communicate with others
3. Work - Put in the work to see the results
4. Think - Be a problem solver
5. Consume - Learn from the many resources available to you
6. Reflect - How did things turn out? Why? What should you do next time?