

## **A Guide for Undergraduate Researchers: What to Expect in the Research Group of Glen P. Jackson**

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### **1. Background**

Our group is diverse, both in terms of scientific interests and in terms of ethnic and cultural backgrounds of its members. We typically have members from different academic departments and from different countries. My goal is to foster a culture in which we are ethical, responsible, and productive as scientific researchers, while being cordial, professional and compassionate in our interactions with each other. I would like you to experience a thriving and nurturing environment in which you can have fun and grow as a scientist and as an individual.

To ensure that we both get the most out of our relationship as an undergraduate advisor/mentee, I have compiled this document to summarize both my expectations of you and what you can expect of me. You are welcome to suggest modifications or additions to this document. After we discuss the document, I will ask you to sign a copy as acknowledgement that you understand and agree to these expectations.

During our interactions, if I observe that your work does not meet the expectations defined here, I will first remind you of what is expected and what I would like to change. If the behavior or problems continue or repeat, I will call a formal meeting with you to discuss your performance. I

will summarize our meeting in a “Clarification of Expectations” memo in which I will detail how my expectations were not met and what actions, if any, we agree must be taken to resolve the underlying problem(s). My intention with this document is to communicate clearly and early about my expectations so that you will be able to get the most out of your undergraduate education here at WVU. In cases where these expectations are egregiously or consistently not met, you may earn an I, U or F for research, and it may be necessary to terminate our professional relationship.

## **2. Work schedule, absences and vacation**

Assuming expectations are being met, I will not impose a set schedule on you. Success in research requires a strong work ethic, a professional approach to time management, and is not a “clock punching” endeavor. I care more about your productivity than I do about hours spent in the lab, but there is a correlation between the two. As such, if you are in good standing, I trust you to manage your individual work schedule within the guidelines provided below. However, as with most employers, I do have some expectations as to working schedules and absence reporting:

- 2.1 Provide the lab with your schedule at the beginning of each semester so that we can schedule weekly group meetings.
- 2.2 Schedule permitting, you must attend lab meeting each week.
- 2.3 Your lab hours should be scheduled for the same time block(s) each week and should overlap as much as possible with ‘core’ hours between 10-4 p.m. The same core hours are expected of graduate students and are meant to facilitate collaboration and peer learning.
  - 2.3.1 Undergraduate students are strongly discouraged to be in the lab alone, especially outside of core hours. If you need to be in the lab outside of core hours, please communicate with me or another student in the group to make sure someone can be in the lab with you.
  - 2.3.2 You are welcome to take a lunch break and breaks during core hours so that you can eat and drink outside of the lab.
- 2.4 If you are not able to be in the lab during a day when you are normally scheduled to be in the lab, please communicate that to me and/or your supervising graduate student as soon as possible. Emailing or texting/calling my cell are the preferred ways to communicate an absence. Only in exceptional cases is it acceptable to communicate lateness/absence/illness after the fact. This is simple professional courtesy and important when working in teams.

## **3. General communication**

- 3.1 If you have a question or communication to share with me that will obviously not take more than 10 minutes and my office door is open, feel free to knock, enter and talk to me. If you have some communication with me that will take more than 10-15 minutes, please schedule a meeting with me, in person or by email, to ensure I can give you my full attention for the time required.
- 3.2 Email communication should always be via your WVU (mix) account. Remember, this account is a public account, and everything you send and receive is legally subject to review by a third party via an open records request. In other words, be careful because big brother might be watching!
- 3.3 I will often communicate important requests and ideas by email. If I ask you a question or make a request by email, I generally expect a response within 12-24 hours. If I ask you to

complete a task that takes longer than a day, I still expect a response to acknowledge the request. This is a professional courtesy, and you should expect the same of me.

- 3.4 If you do not understand something that I have asked you to do, it is your responsibility to seek clarification. Don't waste time.
- 3.5 If I provide feedback on your work, I expect you to consider that feedback thoughtfully and respectfully. Don't say yes and then fail to follow through. This behavior would be considered passive-aggressive and should be avoided. You might have a good reason for not completing an action, but if you do not talk to me about the issues, I might form the wrong impression about your intentions. I also expect that you will clearly communicate with me regarding how you plan to address my feedback and suggestions.
- 3.6 With outside speakers, visitors, and colleagues, you must remain cordial and polite in your communication. It is fine to disagree on scientific ideas and ideologies and to debate those differences in a respectful and academically rigorous manner. However, I expect you to remain respectful of other people and to remain hospitable and cordial.
- 3.7 Actively participate in the Jackson group's GroupMe. This is the quickest/easiest way for the group to communicate updates and urgent matters, such as power cuts and instrument malfunctions.

## 4. Safety

**In case of an emergency in the lab or university building, call 911!**

You must keep up to date on all necessary safety training, ethics training and IRB training during your studies. If you have any questions or concerns about lab safety, please talk to me (304-680-0548), Roger Jefferies (304-293-0323), or Crys Povenski (304) 293-6925) (in that order).

- 4.1 All group members should be familiar with the ECAS Lab Safety Manual at: <https://safety.eberly.wvu.edu/safety-manual>.
- 4.2 All group members should complete WVU's required safety training as specified at: <https://www.ehs.wvu.edu/training/hazard-comm-hazardous-waste-lab-safety-training>.
- 4.3 Group members working on federally-funded projects (e.g. NIJ, NSF, NIH), should also complete Responsible Conduct of Research training, at: <http://oric.research.wvu.edu/services/responsible-conduct/education-training/online-rcr-course>.
- 4.4 Researchers working on projects involving human or animal subjects should also complete the appropriate IRB training. Details can be found on the kc/koali website within WVU's on-line training programs.

## 5. Dress Code

Attire for conducting research is at your discretion but should be appropriate. General safety and professionalism requirements are:

- 5.1 No shorts or skirts above the knees.
- 5.2 No open-toe shoes.
- 5.3 No crop tops.
- 5.4 Nothing offensive or political.

- 5.5 Clothes should be clean.
- 5.6 Pants should ideally have zippers (i.e., no pajama pants or leggings, unless worn with a long top or dress as a top).
- 5.7 WVU branded clothing is encouraged (not required) because they help reinforce our brand.
- 5.8 When presenting research (i.e., at a group meeting, or in a talk outside the university), my expectation is that you should dress in a professional manner that is consistent with the venue and conference format. Please ask if you have any questions at all about expected formalities at different venues.

## 6. Conducting research

The main duty of an undergraduate student researcher in my group is to conduct research under my direction. I expect that as you become more advanced in your undergraduate career, you will become more independent in your efforts to design a research plan, gather and analyze data, and to write up your results.

Initially, you will be assigned projects that are consistent with the broader research focus of the group, and you will be closely mentored by myself and/or a more senior member of the group. Whereas I will make some recommendations as to reading materials and resources to get you started on your project, you will also be expected to take initiative and look up/learn about topics with which you are unfamiliar. This is your time to learn! You must also become up to date on relevant bodies of literature within your area of research. Within your project, you should seek out and read literature related to your project and maintain your own Endnote database of your literature. This database will serve as the foundation for all the citations in your reports, manuscripts and presentations.

As you become more advanced in your studies, it is paramount that you become the person driving the research forward. You will have the opportunity to develop new research directions if they are compatible with the broader efforts of the group. Of course, at any stage, I will be happy to discuss and guide your research. If weekly group meetings are not frequent enough venues to communicate with me, I am always open to one-on-one meetings. Just ask or schedule a time to meet.

Successfully conducting research includes but is not limited to:

- 6.1 Staying current on the scientific literature related to your project.
- 6.2 Researching and clearly articulating research methods to be used in your work.
- 6.3 Designing and implementing research plans.
- 6.4 Qualitative and quantitative analysis of data, as appropriate to the project's goals.
- 6.5 Communicating findings to members of the research team.
- 6.6 Preparing graphs, tables, and figures that clearly show research results.
- 6.7 Outlining and drafting research manuscripts.
- 6.8 Preparing and executing research talks for oral or poster presentations.
  - 6.8.1 Please use the group's WVU-approved PPT templates for posters and PPT presentations.
- 6.9 Regularly backing up your computer files.

- 6.9.1 For Apple computers, you should have Time Machine configured to regularly backup all computer files every hour.
- 6.9.2 For other computers, such as PCs connected to instruments, you should regularly back up your data files onto external hard drives or, if they are connected to the Internet, onto a cloud sharing system like Dropbox, Google Drive or OneDrive. These file sharing methods are free, so there is no excuse for loosing data files if/when a computer crashes.

## 7. Documenting your research

Formally documenting your research has many benefits to you and the group; it enables you to remember what, when and why you performed certain experiments and analyses. A detailed notebook can help defend patent applications and can help justify co-authorship on publications. A detailed notebook can help save time, especially if it prevents you from having to re-run experiments. The recommendations below are to help explain what and how to record your productivity.

- 7.1 You **must** keep a hardbound, contemporary, and contiguous research notebook. You will leave the notebook(s) in the lab at WVU at the end of your studies. I will provide you with a research notebook when you first join the group.
- 7.2 The requirements are that you make regular (e.g., whenever you are in the lab) dated entries and keep detailed records of your motivations for conducting experiments, what you expect to achieve, details on sample preparation and data analyses and how you interpret the results. The goal of a research notebook is to enable someone else to know why you conducted a particular experiment and how they would reproduce an experiment if they wanted to verify your findings.
- 7.3 To avoid unnecessary duplication, it is perfectly okay, in fact recommended, to refer to previous notebook entries instead of re-writing repetitive information.
- 7.4 Beyond these requirements, the details, format and what to include in the notebook are left largely up to you.
- 7.5 For electronic research notes and all electronic files, you are expected to store files in an organized manner and back up files regularly to Dropbox, Google Drive or an external hard drive. All file names should contain, at a minimum, your three letter initials and the date (e.g., "GPJ\_2-24\_CTD\_insulin\_090622.xls". In this file name; "GPJ-2" refers to me and my second notebook; "24" refers to the page number in my notebook; "CTD\_insulin" provides some details of the file, which is helpful in the absence of a notebook; and "090622" is the date the data was collected.
- 7.6 If you are spending a significant portion of your workday reading the literature, I expect you to document what journal articles you are reading and what you learned. Records could be kept in your notebook or through storing annotated notes with the articles in your Endnote library.
- 7.7 When you leave WVU, you must leave behind all notebooks and items belonging to WVU, and you must provide me with a copy of your computer password(s) so that other group members can access your data files after you leave.
- 7.8 Your research products belong to you, me (as your PI), and WVU, so please understand that after you leave, it is very likely that a future student in the group is likely to pick up your

project where you left off. If you are contacted by a member of my group after you graduate, please respond and be as helpful as possible. It is quite likely that if we continue to use your ideas, data, and your interpretations, we are also likely to include you in future presentations and publications. Our hope is that your ongoing assistance will be compensated through future co-authorship.

## 8. Communicating research progress

You will be expected to report to me on your research progress on a regular basis. We will schedule weekly group meetings, and you will each have a designated period to provide an update on your progress and seek feedback. Use this time to offer explanations for why experiments might not be going according to plan. Perhaps we are making incorrect assumptions, or perhaps we have overlooked the importance of certain experimental factors. Each failed experiment can be a valuable opportunity to learn something new, since this is the experiment that provided an unexpected result.

- 8.1 Proper reporting at all meetings includes presenting summaries of findings, along with supporting data in tables or graphs or figures as appropriate.
- 8.2 When we meet in person about your research, I expect that you will have prepared all graphs, tables and figures necessary to communicate your research. I also expect that you will have thought about interpretations, what can be learned and what other experiments need to be completed to support or refute an idea. In other words, bring ideas with your research results.
- 8.3 Unless all your experiments are going according to plan, it is rarely sufficient to generalize your progress. If your experiment “didn’t work”, be prepared to describe the exact details of the unexpected results, and what assumptions or hypotheses may have been overlooked or incorrect. Why didn’t the experiment work, and what experiments do you propose to complete to address these new ideas?
- 8.4 Be prepared to show results on a screen so that the entire group can participate in the discussion. Also, bring your research notebook to all group meetings and have a plan for how I can quickly access raw data files. I cannot help you interpret data or experiments without the proper context. Such details should be found in your notebooks and data files.

## 9. Publishing

Publishing manuscripts is an important and necessary part of the scientific process. Without publishing, knowledge gained through research would remain private, which stands against our ethical responsibility as publicly funded scientists to make our ideas public. Publishing research should therefore be considered the ethical, responsible, and necessary thing to do, not a bonus.

I expect all members of the research group to play a role in generating manuscripts, even undergraduates. In the earlier stages of your undergraduate career, I may ask you to contribute sections of a manuscript on which I, or another member of the group (e.g., a senior graduate student), are lead author. I will help you to identify what information to include in the paper and will provide feedback on draft sections of the manuscript. The order of authorship will be negotiated based on the contributions of each author.

I encourage you to be consistent with your professional name. I use Glen P. Jackson on *every* professional communication I send. Other professionals go by their middle name, such as R. Graham Cooks or C. Randall Clark. Still, they are consistent with the use of their names. You should, too,



because it will help distinguish you and your scientific record from others. Your name is your brand, so keep it consistent, starting now.

## 10. Miscellaneous

There may be times when you are asked to share your expertise with other group members. For example, I may ask you to teach others how to run an instrument or prepare samples. Assisting other scientists with their research is simply the right thing to do, but your ability to document your contributions on projects outside your primary project may enable you to justify co-authorship on other projects.

Students in the group often need to prepare for an oral or poster presentations for a classes or upcoming conferences. I request that you offer your time as an audience member to one another so that you can all count on having an actively engaged audience for when you each need to practice your presentations. Please provide constructive feedback to help other students improve the quality and effectiveness of their talks.

10.1 **Desks:** The undergraduate bench and the two Mac desktops are available for **shared** use. Other spaces are available if necessary. You may leave supplies and decorate the benches if the decorations are respectful and appropriate.

10.2 **Food:** No eating in the lab.

10.3 If you have a question, ask it! The graduate students and I are here to help you learn. If you don't understand something, or if you are unsure about how to make progress on your project, please ask for help.

## 11. What you can expect of me

My goal is that your work in the group will offer you the opportunity to engage in research projects and become an independent scientist. I strive to provide novel and important research projects, a stimulating environment for learning, and I will assist you in gaining recognition as a contributor to your discipline. As your mentor, I am always happy to discuss research progress or any other questions or concerns you may have. I am typically on campus between the core hours of 8–5 p.m. each day, though my day-to-day schedule varies.

I believe in honing strong presentation and writing skills, and to this end I will work with you on both preparing talks for conferences and on writing manuscripts. This means that I will provide constructive feedback of your written work and presentations, and I will work with you to identify how to address that feedback. Please see the appendix for my recommendations for good scientific writing.

I believe that attending workshops and conferences is a critical part of professional development, and I will therefore make every effort to support your participation in such events. Conference participation will be negotiated based on funding and your research progress. At conferences, and in general, I will make every effort to promote your work and to help you network and meet people important to the next phase of your career. You are always welcome to discuss with me other ways that I make your time in the group as useful to your career as possible.

## 12. Summary of expectations:

- Use Macs and Microsoft office as much as possible.
- Be around during core hours of 10-4 p.m. (when not in class or teaching).
- Use Endnote for bibliographic databases and citations in Word documents.
- Use ChemsSketch, SPSS, MatLab, Labview and other software packages, depending on research needs. Dr. Jackson will pay for licenses for any required software.
- Keep a contemporaneous and detailed research notebook of all your activities, including reading journal articles and attending seminars. Take all notes first time, one time, in ink, in notebooks; i.e. do not take rough notes outside your notebook, then transcribe into the notebook later.
- Back-up data and computers regularly (external hard drives or file-sharing/cloud methods).
- Be proactive in keeping up to date with the literature and with safety training.
- Follow the Golden Rule and help and support other group members. Examples include editing their work, attending their practice presentations, helping with their data interpretations, assisting with heavy lifting and answer their questions. They will reciprocate.
- Keep the lab clean and tidy.

### 13. Signatures

Please sign below to affirm that you have read this document and have discussed any questions or concerns. Keep a copy of these expectations for your records.

\_\_\_\_\_  
Undergraduate student signature

Date: \_\_\_\_\_

\_\_\_\_\_  
Undergraduate student printed name

Advisor signature:

\_\_\_\_\_  
Dr. Glen P. Jackson

Date: \_\_\_\_\_



## 14. Tips for effective scientific writing

14.1 Write in paragraphs that build coherent blocks of thought. Each paragraph should provide logical arguments that support a statement or idea. The statement or idea you are describing or defending should be clearly worded in a topic sentence, which is best placed at the beginning of the paragraph. Notice that the first topic sentence in this paragraph is a simple topic sentence and the remaining sentences all describe or support the first sentence.

14.2 Use short declarative sentences and avoid flowery or unnecessary expressions. Examples of unnecessary expressions to avoid are:

*In order to; It is shown that; It can be noticed that; It has to be mentioned that; It should however be noted that; It is clear that; Regarding this fact that; It is given by the fact; Based on our experiments/understanding; As can be seen from Figure (table); It takes into account the fact that; It is identified that.*

Such expressions can usually be deleted without altering the message.

14.3 With the exception of the experimental section, always write in the active voice and not the passive voice. Passive voice often shows up with the words *was* or *were* and often with verbs ending with *ing*. In the passive voice, one usually cannot tell who or what is making the action happen. Learn to write in a style where subjects or nouns directly act on other nouns.

Not: The two solutions *were mixed*, and a blue color *was observed*.

But: The reaction mixture *turned* blue.

Not: A needle valve *was used* to regulate the pressure

Nor: The pressure *was regulated* with a needle valve.

But: A needle valve *regulated* the pressure.

Not: No evidence *was found* that A caused B.

But: A *did not cause* B.

14.4 Use specific and quantitative comparisons instead of vague or subjective comparisons:

Not: The crystals grew *larger over time* until they were *really big*.

But: The crystals exceeded 50 micrometers in length in less than five minutes.

The following terms are vague, weak and subjective, so consider them **forbidden terms**, **unless** they are used with quantitative qualifiers or context.

*Very, not very, big, small, large, little, nice, good, bad, okay, quite, really, got, get, low, high, believe, think, this, that, these, those, it.*

14.5 Avoid starting sentences with vague demonstrative pronouns like *this* or *it*. Instead, use the actual noun or subject. At an absolute minimum, provide a qualifying noun with the pronoun.

Not: *This* is because the temperature was *higher*. (Also contains a forbidden term!)

But: *The reaction* proceeded 20% faster at 60 °C than at 50 °C.

Not: *These* are always found together.

Nor: *They* are never found apart. (Also contains a double negative)

But: *The two stereoisomers* always co-occur.

14.6 Always have a space between numbers and units, and use units in a manner consistent with IUPAC conventions.

E.g. 5 m/s or 5 ms<sup>-1</sup>; 22.4 g/mol; 43 kg; 5.4x10<sup>-3</sup> Pa, 45 F, 78 °C

The only two exceptions are percent and degrees: i.e., 54% & 360° (degrees in a circle)

- 14.7 Never use two spaces after a period or comma, or ever! (<https://slate.com/technology/2011/01/two-spaces-after-a-period-why-you-should-never-ever-do-it.html>).
- 14.8 Only use parentheses to cite figures/tables, to cite companies or manufacturers (Thermo Fisher Scientific, Palo Alto, CA), or to provide an abbreviation for the first time you introduce an abbreviation. If information is important enough to include in a passage, provide the information outside of any parentheses.
- Not: Several classes of compounds have been successfully detected on fingerprints including drugs (*both over the counter and illicit*) and explosives.
- But: Several classes of compounds have been successfully detected on fingerprints, including illicit drugs, over-the-counter drugs and explosives.
- E.g. A plot of instrument response versus quantity injected provides a ~~good~~ linear response with an  $R^2$  exceeding 0.95 (Figure 2).
- E.g. ...as determined by the Fourier Transform Infrared (FTIR) Spectrometer (PerkinElmer, Waltham, MA).
- 14.9 Use existing conventions and don't make up your own rules! Use existing style guides. This rule applies to: formatting documents; formatting citations; designing and labelling graphs and charts; organizing figure legends in, above or below figures; writing sentences; using mathematics; conducting experiments; proposing acronyms. It is your job to become informed about conventions in your discipline.
- 14.10 Avoid double negatives. The affirmative is faster and easier to understand.
- |                                       |                           |
|---------------------------------------|---------------------------|
| Not: We <i>never doubted</i> that...  | Not: Do <i>not forget</i> |
| But: We trusted that...               | But: Remember             |
| Not: ...is <i>not a bad</i> way to... |                           |
| But: ...is useful to...               |                           |
- 14.11 Learn to use terms correctly. When using comparison terms, you have to provide the comparison. *While* means *at the same time*, not *in contrast to*. *Over* means *above*, not *greater than*.
- Not: *While* A happened, B did not occur.
- But: Whereas A happened, B did not occur.
- Not: *Over* 200 grams of reagent were added to the mixture... (which is also passive)
- But: After 2 minutes, more than 200 grams of reagent reacted with...
- Or: The addition of 200-250 grams of reagent completed the reaction.