Guidelines for Undergraduates/Summer Students in the Holland Group

Research experience is valuable because it combines the concepts from your different classes, and you to put them to use tackling a scientific question that no one knows the answer to yet! As a result, students who do research typically end up with a firmer grasp on the fundamentals of chemistry, and on how to test scientific ideas. Research students also learn how to express themselves through presenting their research, and form long-lasting friendships with others in the lab. If you work with dedication for multiple semester/summer times, you are likely to earn coauthorship on a research publication from our group. Being a co-author on a scientific publication is a valuable addition to your resume that will greatly increase your chances of admission to a top graduate school or employment position, because it shows that you know how to address scientific questions effectively in the laboratory.

Research in the Holland group is especially beneficial because we use a combination of organic chemistry, inorganic chemistry, biochemistry, analytical techniques, and synthesis. Therefore, group members learn about a number of topics, including many that you may not have learned from your classes. As part of your time in the group, you will formal presentations about chemistry (scary at first, but an essential skill for any scientist!). Previous undergraduates from the group have gone on to be high-school and college chemistry teachers, professionals in industry, Ph.D. students, and medical students. Holland group research is known worldwide, and Pat regularly presents group results (maybe yours!) at international conferences and seminars.

<u>Rights & Benefits</u>

- You will have a project that defines your research goal. It is typically related to the project of a more senior group member, who acts as your mentor. Your mentor and Pat will give you guidance in new techniques, new compounds, and most importantly how to think about unknown chemistry.
- You will be involved in the cutting edge of research in our group. Your accomplishments will be part of a publication in a chemistry journal, if they become part of a complete story.
- You will have scheduled meetings with your mentor and with Pat every 2 weeks to help you refine your research direction as it evolves.
- You are a full member of the group, and are invited to all group functions. We have group parties and group outings every few months! You will get to know graduate students personally, and experience what life is like in a leading chemistry research group.

<u>Responsibilities & Requirements</u>

- Please call Pat "Pat," not "Prof. Holland," or "Dr. Holland." ☺
- Before starting work, you must read the safety information on the department's website and sign the safety sheet to show that you have read it. Ask other group members about safety issues before doing a new procedure, to assess potential dangers.
- Undergraduate research during academic year requires at least 12 hours of lab work per week. Summer undergraduate research requires at least 40 hours of lab work per week.
- Come to one of the weekly group meetings (1-2 hours) every week and become acquainted with other group members' research.
- In the first two weeks of research, write up the background and research plan for your project, to make sure that you have a grasp of the project.
- Make a 10-minute presentation on a literature paper once per semester/summer (you will receive guidance!), and also present your research to the group once per semester/summer.

Grading Guidelines (when research is done as a formal class): Several criteria will be used to determine your grade:

1) safe behavior in the lab; using PPE appropriately
2) good communication with your mentor and with Pat
3) devoting sufficient time to your lab work (see above)
4) giving quality presentations in research and literature meetings

Here are guidelines as to what it looks like for students who receive different grades. "Plus" and "Minus" may also be applied.

A: No unsafe behavior in lab; asks occasional questions in group meetings; dedication to research (generally 15 productive hours/week or more); consistently communicates effectively with mentor and with Pat; presentations thoughtfully prepared and consistently improving in quality. (We don't expect it to be perfect when you start - it will be a learning experience!)

B: No unsafe behavior in lab; no questions in group meetings; insufficient work ethic (less than 12 hours/week); variable levels of communication with mentor; lack of improvement in presentations.

C: Any one of the following: irresponsible behavior, lack of communication, habitual absences, or unsafe practices.

Written report: At the end of each semester/summer, write a brief summary of your research that will help others to repeat your work. You should submit a copy of this to Pat one week before the end of the semester/summer, so that he can offer suggestions and you can revise it before completion of your time in the group. This helps you make sure that your studies are thorough and complete.

Senior thesis:
The Yale guideline (Chem 490) is that students write a capstone report ("thesis") on their research, which is typically 15-25 pages in length; the final version is due on the last day of classes. Students also present an oral or poster presentation at the end of the year.

You should give Pat a draft of your report/thesis two weeks before the last day of the semester, and this will form a basis for “wrapping up” experiments and revision of the thesis, leading to a high-quality product that you will be proud of!