Welcome to the Hamers group!

This document is intended to outline how we work together as a group to train scientists toward advanced degrees. It is divided into three sections: (1) Expectations for group members, (2) Expectations for Bob, and (3) General hints for being an effective experimentalist.

Expectations for Group Members: (What is expected of you as a member of the Hamers group)
We (the Hamers group) are working together to help advance each other as research scientists to achieve our career ambitions. As a Hamers group member, you are expected to put in effort to make and achieve your goals. Bob will serve as a mentor to help you along the way. You need to be highly self-motivated to move forward in the field of scientific research. Your primary purpose in graduate school is to conduct cutting-edge research.

General Expectations for Each Group Member

- Develop a strong understanding and use of the scientific method
- Form creative, rational scientific hypotheses related to your work
- Always be honest & ethical
- Perseverance
- Take interest in what other members are doing & collaborate to solve problems
- Treat group members & anyone visiting the labs with utmost respect
- Treat all lab equipment with care & properly maintain equipment you are assigned
- Complete your degree

Personal Responsibility
Research progress ultimately leading to the awarding of the Ph.D. degree is ultimately the responsibility of each student/postdoc. As a candidate for the Ph.D. degree, it is your responsibility to demonstrate that you are able to independently create new, significant knowledge in the field of chemistry. Other group members and Bob will help you in your quest, but ultimately it is your own responsibility to fulfill the requirements for the Ph.D. degree.

Goal-setting
Every student has their own goals in life. In order to progress toward the Ph.D. degree it is essential to set clear goals for your research and your broader professional development. Individual development plans (IDPs) are strongly encouraged.

Participation in scientific community
Students/postdocs are expected to present and publish your work. It's important to stay current with scientific literature and know what has been done and published previously in your area of research, so that you can focus right away on what is "new".

Group Meeting
Developing good presentation skills is an essential part of graduate student professional development. Group meetings are intended both to hone your presentation skills and as a forum for learning what others in the group are doing. Group meeting presentations are expected to be polished and practiced talks. They should be planned to be about 20 minutes long with time allowed for questions. Every group member is expected to attend and actively participate – this is a great time to ask questions. So please stay off your smartphones and related devices and pay attention. Group meetings are a great way to stay connected to other

students' work since we are a highly interconnected group. In general group meeting presentations should be sent to Bob at least 24 hours in advance; this is done to allow time for Bob to provide feedback and to ensure that group meeting presentations are not done at the last minute. Students who are not presenting are expected to actively participate by asking questions and providing helpful comments. At various exams (TBO, RP, etc.) I will expect that you are knowledgeable about what every other student in the group is doing based on the work they have presented at group meetings.

Lab Notebooks: Lab notbooks belong to the university, and your lab notebooks must stay here when you finish. All students are required to use the standard Lab Notebook Notation. This is essential so that when you have various data files you must be able to determine exactly what you did to get those data files. According to the Freedom in Information Act, anyone could ask for copies of you lab notebooks (for example) and you would be legally required to provide the information. If you don't have good records, you could be in big trouble. Please see the separate document about the standard Lab Notebook Notation.

Meeting your requirements
You are expected to complete your exams (TBO, RP, 4th year meeting) in the appropriate time frame as given by department deadlines. In general, everyone is expected to graduate by the end of the 5th year, and encouraged to graduate sooner provided you have met the expectations for graduation.

Creativity in Research
Students are strongly encourage to demonstrate creativity in the conduct of your research. While every funded project has some specific pathways and targets outlined, nearly all projects benefit from new, creative approaches to the science. To this end, you should try to come up with and explore your own ideas, and not just follow what was outlined in a proposal that you're funded on. That's often what makes science fun, and in general students do best on projects when they take ownership of the ideas. If your ideas are in a direction different from the grant on which you are funded, talk with Bob and he will work to see if there are ways of accommodating a shift in direction.

Integrity and Honesty
You will be held to the highest standards of integrity and responsibility. Any dishonest alteration or fabrication of any data or results will have severe repercussions, including potential legal action. It is also important to be open and honest with Bob about other issues. The adviser-advisee relationship is fundamentally built on trust, and if Bob feels that you have been deceitful or have lied (about anything, such as working hours, communication with other students, or other issues) then that trust relationship has been broken. Any form of dishonesty is grounds for dismissal from the group.

Graduation
You are ready to graduate when you have demonstrated the ability to conduct a sufficient quantity of significant, independent research. In general that requirement is met when you have *published* three peer-reviewed first-author papers. Publications are the currency of academic research. Students are strongly encouraged to attempt to complete a first paper by the end of the second or early in the third year. Do not save your writing until the end. Bringing segments of your work to closure as you progress, by publishing along the way, will make it much easier to get your Ph.D. in a timely manner.

Publications

Students are required to write papers and publish their research in high-quality peer-reviewed journals. Publication or submission of at least 3 first-author publications is a *guideline* for graduation, with exceptions made depending on individual circumstances. Separate guidelines for writing and publishing papers will be found on the "resources" section. Many students do not fully understand the scientific method or how to bring a work to closure until publication of their first paper. Working to close this loop early in your graduate career will make you more efficient in conducting research, will make it easier for you to progress, and will look better on your CV when you come close to graduation. To a recruiter, having 5 papers "in preparation" is not nearly as meaningful as having 1-2 papers actually published.

Time Management and Working Hours:
One of the keys to getting through the Ph.D. program is learning to manage your time. Good time management also requires good goal-setting so that you are not just "busy" but are also *effective* in making progress toward your research. In the end, how you spend your time is more important than how much time you spend. Some students may need to spend 12 hours/day if they are not efficient in how they use their time, while others will be highly productive at 8 hours/day. Learning effective time management is a very important skill to learn. A few important keys to effective time management include: (1) Having clear goals of exactly what you are trying to accomplish (often to the level of testing a very specific hypothesis, with appropriate control tests mapped out); (2) Making a list of what you want to accomplish in the next week or two. (3) At the end of each day, making a prioritized list of what you need to do the next day. Students are strongly discouraged from watching streaming videos/television programs during the day, even during lunch times; you'd be better off spending that time reading papers or other productive activities. One of the most common questions recruiters ask about students as prospective hires is how well they manage their time, and Bob will give honest answers based on his perceptions and daily observations. The extent to which you demonstrate good time management skills therefore has a big impact on your success in getting a good job.

Leadership Skills
Developing good leadership skills amplifies your effectiveness and is one of the skills that recruiters look for when they are considering hiring students. All students are encouraged to develop and practice good leadership skills through formal and informal leadership training. Reading and practicing the "7 Habits of Highly Successful People" is a good starting point. Mentoring an undergraduate student, high school student, or 8th grade student from EAGLE are all good ways you can develop good mentoring and leadership skills.

Managing Stress
Getting a Ph.D. is a stressful process with high demands, so a certain level of stress is intrinsic to the process. Unusually high, unhealthy levels of stress are often a result of unclear expectations, lack of clear goals, and/or poor time management. Individual development plans can help by providing a clear place to articulate your goals, and working with Bob to ensure you have clear goals and expectations can often help to reduce stress. If you are experiencing an unusually high level of stress, you should talk to Bob or a mental health professional to identify ways to reduce stress.

Professional development
You should take advantage of the many programs on campus that help you progress toward your career goals. For example, the Delta Program is an excellent resource for those interested

in pursuing a career in academia and the Wisconsin Entrepreneurial Bootcamp (WEB) is week-long training session for those interested in start-up companies.

Vacation
Graduate students and postdocs are not legally entitled to "vacation". With that said, it is recognized that everyone needs some personal time, and I generally expect that throughout the year students/postdocs will be gone for a total of ~ 3 weeks/year. You are expected to notify Bob well in advance, and email the group via email at least a day (preferably more) in advance of when you plan to be absent, and you should also provide your cell phone number so that you can be reached in an emergency.

Weekly meetings
Each student is expected to meet weekly with Bob for a short meeting (~30 min). You are expected to prepare a short weekly progress form (see Resources) and email it to Bob 24 hours in advance of your weekly meeting with Bob. You should summarize your goals and recent data in a meaningful way that lends to good discussion of your progress, what stumbling blocks you may be encountering, and what Bob and/or you can do help your research progress. These meetings do not need to be long to be effective, and please come prepared so that you make good use of Bob's time as well.

Resources
Many of the documents mentioned are available on the archive in the group_info folder under Group resources.

Safety
Establishing and maintaining a safe work environment and strong safety culture is central to the Hamers group. Group members are expected to give laboratory safety equal importance as scientific productivity and are expected to consider fellow group members' safety as important as their own. Everyone has the responsibility to seek pertinent safety information (including but not limited to: MSDS, group standard operating procedures (SOP), and one-on-one conversations with experienced groups members) BEFORE any work begins. Any group member observing an unsafe situation has "Stop Work Authority," meaning that they have the responsibility to stop the work and inform others of the danger. Group members are expected to report safety concerns, near-misses, and accidents to Bob and the group chemical hygiene officer (CHO) in a timely manner. Headphones and/or earbuds are not allowed to be worn in the labs, and proper lab attire (long pants, closed-toed shoes) and appropriate eye protection are required in all labs. Additional protection (labcoat, laser goggles or UV-protective goggles, respirator mask) may be required for specific experiments. All group members are expected to participate in the safety culture of the group through "Safety Moment" presentations at the beginning of weekly group meetings. All students (including undergraduates and volunteers) must pass the university's chemical safety training before being allowed to work in the laboratories. Anyone using nanomaterials and/or biological materials must also complete the appropriate nanomaterial training and/or biological safety training.

Equipment and Room Responsibilities
Each student is expected to play a role in maintaining the overall infrastructure of the group. Most major pieces of equipment are assigned to one or more graduate students. If you are assigned to a piece of equipment, it is your responsibility to make sure you are the "expert" in how to use that equipment, how to maintain it, and you will be responsible for training others on the proper, safe use. In the event of an instrument malfunction, you will be responsible for

making sure it is fixed, either by yourself or by someone else (e.g., the electronics shop, manufacturer, or someone else). For instrumentation that requires particularly high levels of training and upkeep (e.g., the XPS system) it is reasonable to be rewarded with co-authorship if your training contributed to the resulting scientific results or if you were directly involved in supervising "new" users in taking and interpreting their data. If you are assigned to be in charge of a room, then it is your responsibility to ensure that that room is clean and does not pose any safety violations. If someone is using that room and not following property safety and/or cleanliness procedures, then you are responsible for bringing that person back into compliance.

Expectations for Bob (What can you expect from Bob, as your Ph.D. adviser)

Bob's primary role is to serve as your advisor. In that role, Bob will provide advice on your research and will be an advocate for you as an individual. Bob also plays a major role as a mentor with regards to how to conduct scientific research, how to effectively communicate, how to decide on future career choices, how to develop and practice good leadership skills, and how to poise yourself to be a successful and professional scientist whether in industry, academia, or other career path.

Open-door policy
Bob maintains an "open-door" policy in which any student is free to come and talk to me whenever you feel the need to. The most effective student researchers are usually those who have short, frequent contacts. If you are having a major problem, do not wait until the weekly meeting time. If it requires lengthy discussion or if Bob is tied up with something else it may be necessary to arrange a specific time to talk.

Advocacy
Bob is here to encourage you and to stand as your advocate. Be open and free to talk about your future and any concerns that you have. If there are opportunities for professional development (workshops, internships, etc.) that you want to take advantage of, let Bob know and he will advocate for you.

Safety
Bob will balance lab safety with productivity and will listen to safety concerns of group members to help them identify procedures that appropriately balance safety with the need to progress forward. Mike Schwartz is responsible for safety training within the Center for Sustainable Nanotechnology and will also help to maintain good lab safety procedures across the group in addition to his specific role within the CSN.

Personal/Health Issues
In some cases students may have specific issues such as health problems or personal issues. While in general Bob does not need to know details of your personal life, if there are problems that are getting in the way of your productivity it is often helpful to talk about them to see how to best accommodate or resolve the problems. If these problems are a severe impediment to making progress, alternative strategies (e.g., semester off, etc) might be explored. Bob will treat any revelations of health issues with an appropriate level of confidentiality; in some cases Bob may need to consult with others (typically Matt Sanders or health professionals) to determine the best course of action.

RA/TA Funding

Bob will attempt to secure RA funding for each student who has demonstrated the ability to make good progress toward research. It costs approximately $56,000 each year to fund a graduate student on an RA; in most cases this comes from the taxpayers through federal grants, and it is Bob's responsibility to ensure that these funds are used wisely. Ideally each student wants to be funded on an RA rather than a TA, and historically students are typically funded on RA starting the first semester of their second year. However, past performance is no guarantee of future success. Bob will attempt to secure funding for each student as an RA, provided that student has already demonstrated good time management and is making good progress toward research. In cases where a student might not be making good progress due to issues such as poor time management, below-average chemistry background, or poor research skills, Bob reserves the right to put a student on a TA for funding until the student can demonstrate improvement. Students might also be placed on TA funding if grant funding is especially tight, if grants are not funded, or if a student is staying beyond the end of the 5th year. It is essential for each student to stay focused on the goals of whatever grant is funding your research. The most effective way of ensuring RA funding is to be as productive as you can in getting research done and papers published.

Weekly meetings

Bob will make a strong effort to be available for a weekly meeting with every Ph.D. student. However, there are often unplanned meetings that must be scheduled (especially in the spring, with TBO's, RPs, and 4th year exams) that will often require shifting the weekly meetings. Therefore, weekly meeting times with students should be expected to be somewhat fluid and as rough targets, not precise times. The goal is to make sure we are in good contact regarding your progress and any stumbling blocks you are encountering, rather than being held to a fixed schedule. Everyone can help by keeping these one-on-one meetings focused and short so that you don't run into someone else's time. In some cases where an advanced student has demonstrated exceptional ability to direct their own research, we may bypass weekly meetings in favor of less-frequent meetings.

Student evaluations

Bob will be happy to provide you with an honest and frank assessment of your individual strengths and weaknesses. Should you desire such a comprehensive assessment, please let Bob know a few days in advance so he has time to prepare. Since recruiters will often ask Bob these types of questions, knowing what Bob would say to a recruiter might be useful information to you, and you can use the results of that evaluation to improve and perceived weaknesses and thereby improve your future marketability.

Letters of Recommendation

Bob is willing to write reasonable numbers of letters of recommendation. Because in most cases these letters are individualized to each specific institution or recipient, please keep the numbers modest (say, no more than 10-15 if you expect them to be individualized to the specific recipient). Note that Bob must be perfectly honest about strengths and weaknesses in these letters. So, getting an individualized evaluation in advance is a good idea so you will know what is likely to be in the letter.

Tips on being a successful experimentalist:

Experimental research is always hard, but there are some important individual behaviors that make a tremendous difference in whether experiments are successful or not.

Focus on the end goal, not on the intermediate steps. When doing an experiment that involves many different steps in sequence, you should still try to push through the sequence all the way through. That way you will identify most of problems right away instead of finding (and possibly solving) them one at a time. Approaching a difficult experiment via step-by-step optimization only ensures that it will take you a long time to get there and decreases your chances of success by not recognizing that often there are many paths to the end goal, so optimizing one path step-by-step is slow and doesn't improve your chances of success. The best option is always to push to the end goal, and if unsuccessful, then go back and try to identify the weakest points in the experiments (which are often not what you might have expected).

Hope is not a strategy for success. When an experiments doesn't do what you expect it to do, spend the time to understang why it failed. Don't make assumptions about what went wrong, and don't simply hope that re-doing the experiment will give you a different answer. Spending the time to characterize what went wrong in a unsuccessful experiment is usually more time efficient than simply trying an Edisonian approach of repeating and/or changing variables one by one. In the end, the only failed experiment is one where you didn't learn anything from it.

Cut your problems in half: When things aren't going as you expect in a multi-step experiment, you can help yourself by cutting the problem in half, testing certain key aspects of the experiment to identify the weakest spot in the experiment.

The person doing the experiment is an integral part of any experiment. If you don't believe an experiment will work, you will stop taking the proper care that is often necessary to make the experiements successful. This is a downward spiral in which the experimentalist is unconsciously dooming the experiment to failure. It is always essential that you go into experiments with an attitude that you will do everything necessary to make the experiment successful – whether it's using the cleanest water, making sure you are consistent in all the experimental parameters, or other variables. This is simply using good scientific technique. Good experimentalists ***make*** their experiments work, rather than simply ***letting*** them work. Similarly, poor technique or lack of attention to details can make an experiment fail that, in principle, can work. Your own psychology and attitude have a lot to do with success and/or failure.

Turn lemons into lemonade: It is often the most unexpected results that are the most interesting and important. In general, if every experiment shows what you expected, then you're not really learning anything new. So when you get an unexpected result, grab on it, as it's probably telling you that there's something interesting going on. Many of the most important scientific results have come when someone got a result they didn't expect and they had the foresight to recognize that and follow it through.

Test your own technique. If an experiment is highly variable and/or you don't' know whether to trust a result or not, test your own technique. For example, repeat a "control" sample multiple times and see if it is consistent. If not, figure out why not. Often times big errors arise from small differences in experimental techniques, and often times it's simple things that matters (e.g., good pipetting technique, weighing, etc).

When you have a working experiment, learn how to do several experiments in parallel. We have a great machine shop, and often you will need to repeat experiments several times under different conditions. Instead of doing things one sample at a time, learn how to set up to do multiple experiments running concurrently. This also leads to better data, as variables such as time, temperature, and other factors are more likely to be consistent among a set of samples all synthesized/functionalized/characterized at the same time.

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