Expectations of Laboratory Members in the Fitch Research Group

General.

The purpose of your research experience in this laboratory is meant to increase your knowledge, technical skills, and hopefully interest in science as a career. The project(s) in which you are involved will be challenging and likely very different from your prior experience. You will be expected to read the literature provided for your project as well as investigate the literature on your own. As part of your training, you must learn to be a colleague and collaborator.

You are not a robot or a "pair of hands" for doing the grunt work alone. There are things that must be done in the laboratory – keeping your space up, washing your glassware, maintaining the balance area, etc. However, your purpose in this lab is to learn about your project and the execution of the scientific method for answering the question or solving the problem set before you. You are to learn what it is to be a scientist. The answers to the questions before you are not always known. In fact they are most often unknown and it is up to you to solve the problem. I am here to serve as a guide, but I do not hold all of the cards. It is up to you to invest the time, effort, and interest to get the job done.

I do not keep exact tabs on your comings and goings, but I expect you to be on time, put in effort while you are here, and be productive. We do science here and it is unacceptable for you to spend your time on the phone, web, instant messaging or text messaging friends or otherwise wasting your time and my time, money, and space. If you are not serious, you do not need to read further, nor do you need to be here. I am flexible with schedules within reason and can deal with emergent events as they arise. I am less interested in your precise schedule than in making progress. In order to make progress, you must be here and you must work while here. Science is not drudgery, if you are interested, but it requires serious effort to get results.

I expect a high degree of effort from all laboratory members. However, each person's research progress is based on their effort, the difficulty of the question being asked, and the level of knowledge that can be brought to bear on the question at hand. I expect more progress from upper level students, graduate students and postdocs than from undergraduate freshmen because they are supposed to know more. Your level of progress should be commensurate with your education level. Having said that, you should make every effort to understand the problem at hand and the science of your project as thoroughly as possible. Read everything you can get your hands on about your project and the reaction or target you are pursuing. A good hunter understands his/her quarry. Likewise a good scientist understands the science even if he/she is trying to elucidate an unknown problem. The more you know, the better your odds of solving problems.

Group meeting/journal club

The laboratory will meet on a weekly basis for 1 hour (longer for poster proofing sessions) where we will discuss the progress of the projects of all group members and hear journal presentations. These meetings will generally be on Monday afternoons, but other times are possible depending on schedules, especially during the school year. We will generally start with any housekeeping issues and move into short discussions by each member on what they did over the preceeding week, what worked and didn't, and what they plan to do for the coming week. Following this, a couple of selected members will present a paper. Each member of the group will be assigned a scientific journal to keep up with. This helps to keep people in the lab

current with the scientific literature and allows individual members to learn about science other than solely our group's work. The member will give an oral report of the science from the journal which they have been assigned. This will get each member used to giving a "chalk talk" in which they present material off the cuff from hand prepared notes (no transparencies or powerpoints here).

Periodically (weekly in the summer, semimonthly during the academic year) the department has a group meeting for all students engaged in research under the banner of CHEM 399/499 and/or summer research students. These will be similar to the lab meetings except that all of the research students in the department will present. These may be done using powerpoint or transparencies. I recommend trying both. These presentations are limited to five minutes except for the final presentations of the term, which are 15 minutes.

Departmental, University, and Extramural Seminars

The chemistry department has a weekly seminar program during the academic year. CHEM 399/499 students are required to attend these as part of their course grade. I expect all lab personnel to attend these seminars regardless of enrollment in CHEM 399/499. Further, I will advise the lab when other seminars come up that may be of interest. Occasionally, we will go as a group to seminars at nearby venues if someone of particular interest is speaking. I strongly recommend attending seminars as they keep one from getting "cubicle syndrome" wherein you tend to focus your attention only on your particular problem and area. Exposure to a wide variety of science will improve your knowledge and you never know when that knowledge might come in handy. More than once I have been at seminars that I thought fairly unrelated to my own work. Yet there was presented information that impacted my own research in one way or another. So do not sell these short, especially if it is a well known speaker or someone doing controversial work. The former have lots of knowledge to pass on and the latter often break new ground that challenges longstanding dogma that perhaps the former frowned on. Either way there is much to be learned.

Posters and presentations

Your communication skills are at a premium. The knowledge you will develop is worthless to anyone else if you cannot communicate it. As part of your project(s), you will be required to give progress reports at the lab and departmental group meetings and compose and present posters and oral presentations at local, regional, and perhaps national and/or international meetings. We do work here that is meant to be internationally important and you are to be a full participant in this process.

The best way to overcome shyness and nerves is to face it and stare it down. No person has come into my lab and been unable to present. Some have been unwilling, but none were incapable. Some have been redfaced, some stutter, most grasp for words at times, but I have not yet had anyone fail or faint. If you are here long enough, you will do both poster and oral presentations. Generally people like to start with posters. That is a good starting point because you do not need to script your talk entirely and you are not generally standing in front of a lot of people, which some find intimidating. However, oral presentations are in some ways easier because you have a script to work from and you can control the conversation somewhat because you guide it. Either way, you will need to field questions and have a firm grasp of the material you are presenting. The best prevention for frayed nerves is a confident understanding of the subject matter.

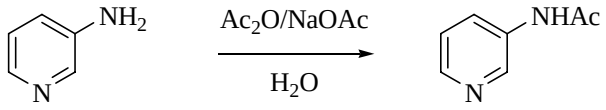
Notebooks

Your laboratory notebook is your statement of the work you have done. It is a legal document and should be treated as such. Data from your experiments are to be recorded promptly and in as much detail as is required for someone to repeat the experiment successfully, without being overly verbose. If you have not kept a notebook previously, there is a general layout for you to follow on the next page. There are two primary pieces of data that should be recorded, the process and the results. The process includes the reaction scheme, table of reagents and procedures followed. The results are the observations that you made while performing the experiment and the characterization of the compound(s) obtained, including physical (mp/bp) and spectral data. Record your NMR data in tabular format including chemical shift, integration, and splitting pattern. Assignments can be made on the printed spectrum, which should be filed. Likewise, IR, rotation, HPLC/GC and MS data should be included as appropriate. If your data are stored electronically, provide a location and filename for the data, so that they can be reexamined or obtained for publication. A representative TLC for the reaction mixture should be included. Try to reproduce the TLC plate exactly. This is most easily done by tracing the TLC plate while laid on your notebook page in the margin (make sure back of the plate is wiped clean with a moist paper towel first to avoid putting acid on the page). A better reproduction is to scan the TLC plate on the flatbed scanner and print it on the attached color printer. Then staple the TLC plate into your notebook along the margin (cut the TLC from the rest of the paper). Try to be as neat and concise as possible. An example page follows for those doing synthetic work.

Printed spectra should be three hole punched and kept in the appropriate binder. This data will be invaluable for comparison among different batches of the same compound and similarly structured synthetic intermediates. NMR, IR, and mass spectra should be kept together. Do not be lax in this. If for some reason we lose all our electronic data, this is our only proof of the compounds characterization.

Notebooks for the pharmacology and natural products lab are a bit different. Much of the data associated with this work will be computed and in the form of printed matter from electronic files. Nonetheless a new page should be created for each new extraction or bioassay. The data associated with these are to be three hole punched and kept in binders by notebook number. A cross reference for structures is also useful. For each new isolated compound a notebook number and ID will be assigned. For pharmacological data, the description of the bioassay should be recorded, including compound(s) and type of assay. If it is a templated assay form, then the first page, which contains most of this data should be printed and affixed to the page along with some indication of where the printed and electronic data reside..

Notebook Example



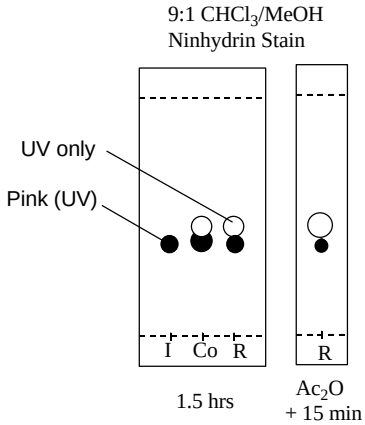
I **II**

5-15-03

Compound	Amount	M.W.	moles	equivalents	density
I	0.942 g	94.12	0.010	1	
HCl	0.9 mL	12 M	0.011	1.1	
NaOAc	2.72 g	82.03	0.033	3.3	
NaOH	1.7 g	40.00	0.043	4.3	
Ac_2O	6.36 mL	102.09	0.067	6.7	1.082
H_2O	22 mL	Solvent			
II^T	1.362g	136.15			

To an off-white slurry of **I** in 10 mL distilled water in a 25 mL Ehrlenmeyer flask was added 0.9 mL concentrated HCl via pipette, resulting in homogeneous orange solution. Approximately 200 mg (microspatulaful) of activated charcoal was added and the solution was vacuum filtered on a Hirsch funnel into a 50 mL Ehrlenmeyer flask, removing most of the color. Acetic anhydride (2.36 mL, 2.5 equivalents) was added via syringe, followed by sodium acetate (dissolved in 10 mL water with a 2 mL water rinse). This resulted in slight precipitation of **I**, which persisted for some time. After 1.5 hours of stirring, sodium hydroxide pellets were added in an unsuccessful attempt to bring the solution to pH 10 by litmus. A pH of ~8 was attained. TLC of an aliquot (10 uL in 50 uL of EtOAc) showed approximately 50% progression. At 2 hours, an additional 2 mL of Ac_2O was added. TLC after 15 min showed ~75% completion. An additional 2 mL of Ac_2O was added, and the mixture was allowed to stir overnight at room temperature.

The reaction was worked up by saturation of the solution with sodium bicarbonate and extraction with 5 x 10 mL of EtOAc. The combined organic extracts were washed with 50 mL of brine, dried over Na_2SO_4, and stripped of solvent to afford an off white solid. Yield (1.18 g, 87%). Mp 130-133°C, lit. mp 131-135°C (Crider, A.M.; Lamey, R.; Floss, H.G.; Cassady, J.M.; Bradner, W.J. *J. Med. Chem.* **1980**, *23*, 848-851).



^{1}H NMR (300 MHz, $CDCl_3$) δ 8.0 (br s, 1H, NH), 7.70 (m, J=6.8, 1H, H5), 7.65 (s, 1H, H2), 7.54(dd, J=6.8, 5.5, 1H, H4), 1.95 (s, 3H, acetyl).

^{13}C NMR (APT, 75 MHz, $CDCl_3$) δ 154 (quat, C=O), 140.1 (quat C3), 138.2 (CH, C2), 136.8 (CH, C6), 132.3 (CH, C5), 130.0 (CH, C4), 22.5 (CH_3, acetyl).

FTIR ν_{max} 3345, 3022, 2987, 1662(C=O), 1621, 1419.

Cleanliness and organization

I am not the person to chide anyone on neatness. However, some measure of organization is absolutely required for accomplishing your science. Clean, dry glassware and a bench that has at least some useable space is a minimum. Do not underrate the need for cleanliness in your glassware, septa, stir bars, needles for balloons, etc. It is commonly the case that a failed reaction can be traced to poorly cleaned or wet implements. You should make a point of cleaning your area periodically, including your bench, rotary evaporator, hood, and sink area. The sink is a particular point of concern. Do not get in the habit of leaving dirty glassware in the sink, the tap water will leave calcium deposits that can be very difficult to remove. It is a matter of courtesy to your labmates to avoid making them clean up your mess. Also, do not leave drying glassware on the rack for days at a time, as your labmates may need to dry their glassware as well. Also as a courtesy, make sure the glassware you put away is your own. There is occasionally a need to borrow a piece of glassware from a labmate. If so, make sure to ask first and return the piece promptly and in good condition when you are finished with it.

Behavior

As mentioned above, I expect you to work while you are here. I also expect you to make every effort to get along with the other people in the lab. There will be disagreements from time to time. This is normal. I would recommend that the parties involved attempt to resolve the matter between themselves first. However, if a serious conflict arises, or you are unable to resolve your issue, let me know and I will intervene if necessary. Under no circumstances should the conflict degrade into verbal or physical assaults. Any violence will be grounds for immediate dismissal and perhaps police intervention. I will not tolerate such behavior.

Laboratory property and security

The equipment, glassware, and instruments in this laboratory are quite expensive and I expect you to take care of them. You have also been issued a key to this laboratory. When no-one is in the lab, the doors should be closed and locked. The materials in an organic laboratory are of particular interest to drug dealers and manufacturers. Balances, glassware and reagents are the most common items stolen from laboratories. Please safeguard these, as I cannot afford to replace them on a regular basis. Nor do I not relish the idea of my glassware being used to produce methamphetamine or my balance used to weigh out crack for some drug dealer.

Also, notebooks are not to be taken home with you. If you have need of the information in your notebook, you can feel free to make a photocopy, but the notebooks are the property of, and are to remain in the lab. If you take the notebook home and lose or damage it, you have destroyed much of the work of everyone whose data are in it.

Finally, I hope this never happens, but anyone being caught stealing from the lab or from anyone in the lab, will be dismissed on the spot and referred to the police for prosecution.

Scientific Ethics

Science is borne on the back of data and honesty is paramount to maintaining one's own career and the reputation of scientists in general. Persons guilty of dishonesty hurt the entire scientific enterprise. The most serious of these is the fabrication or falsification of data. We all want our experiments to go as planned and produce useful, hopefully publishable results. When this does not happen, we try to figure out what happened and fix it. As frustrating as it may be to deal with a failed reaction or poor yield, it is inexcusable to fabricate data for a reaction or forge

a yield. By doing so, you will waste substantial amounts of time, energy, and money for the person who tries to follow you in this lab. Second, if it makes it to print, many others may have the same fate and you will have embarrassed me in the process, because my name goes on whatever gets published, which is my stamp of approval. No scientist ever wants to print a retraction, as these can seriously damage a scientist's credibility and career.

The second ethical breach in science that should be of concern to you is plagiarism. When writing papers or giving talks, it is important to cite the work of persons who performed the work that is the basis of your experiments, especially if you are repeating their work to produce a compound for your synthesis, a method for analysis of your compounds, etc. As Issac Newton said "We all stand on the shoulders of giants." Every scientist builds on the discoveries of those who came before and it is our responsibility recognize them, both for its own sake, as well as to refer those who study our work to the work that forms its basis. To fail to do this is claiming their work for ourselves, a serious lie and theft of intellectual property. Unfortunately, we do this all of the time by being lazy about doing our literature survey. This can cause us to reinvent the wheel and/or claim an inappropriate discovery for ourselves. Purposeful plagiarism is inexcusable and deserves serious punishment, including dismissal. However, even unintentional plagiarism is a misdemeanor that deserves reprimand. Make sure when you put together your posters, talks, and hopefully papers, that you do not make this error.

A serious breach of ethics, especially falsification of data, is a career-ending offense for a scientist. Do not ever allow yourself to consider such a path. It is the nature of science to correct itself, and if you forge data, it will be found out. Anyone caught lying at any time about anything significant, science or otherwise, will be dismissed immediately and without appeal. If you cannot be trusted, then you have no place in my laboratory or in science.