Graduate Student and Postdoc Responsibilities in the Weck Group

In the Weck group, you are given a high degree of independence in a project, which may or may not be well thought out. The major key to a successful graduate career is ***expertise in ones project area***. It is your job (1) to become familiar with the literature in the area; (2) to determine through that examination if the work is really new--never assume I know what I'm doing; (3) to turn that germ of an idea into a project in which you bring your own ideas and your own critical thought; (4) to execute experiments which test that idea; (5) to generate new experiments *on your own* which allow you to bring that idea to fruition in a completed research project. In general, for any research project the possibility of failure is always high. However, well-executed research that yields a negative result is just as valid as a well-executed research yielding a positive result. Obviously, it is not a good idea to produce consistently good negative results, but a valid paper can be written on good negative observations as long as the benefit others. Most of the thoughts below apply equally to postdocs and graduate students. They are both training positions and there are great deal of interactions between the postdocs and graduate students that benefit both.

A Ph. D. is *earned*, not awarded, on the basis of an independent body of work. The earning of a Ph. D. is a complex process, in which you bear the primary responsibility.

1. **Dissertation**. The primary documentation for that work is the dissertation (or thesis). The dissertation should have an introduction and a beginning (background), a thesis (description of rationale for experiments based upon background), a description of the experimental data, and a discussion of the conclusions based upon that data. It should be *complete* as to references and background, which document that this is a new piece of work and not just a repetition of prior art. It should be detailed as to the description of experiments which confirm *beyond doubt* the claims made, allow an independent investigator to reproduce the experiments described and confirm the identity of the materials or data produced. Remember that the experimental part is the only part likely to have meaning beyond a decade or two.

2. **Publications**. A good thesis should lead to 5-8 publications. Ideally, all of those should be submitted, accepted, or published before you leave. Rarely do students write papers after they leave (I never did. I am still waiting for paper drafts from former students and postdocs). You are in a new situation with new responsibilities, and it's hard to deal with the leftover ones. Also, publications give you thesis chapters. The main difference between publication writing and thesis writing is that the level of detail in the latter is not allowed in the printed form.

3. **Notebook.** The primary source for the experimental part of the thesis is a well-written and complete notebook. Neatness counts less than completeness. Data should never, never, never be written on scraps of paper for later transcription! The notebook should be dated regularly, and work of potential patentable nature should be countersigned by a labmate and dated. Write down why the particular experiment was done, the working hypothesis that you are trying to prove and all your immediate observations. At the end of the investigation, write down your conclusions. Always add your analytical data to your notebook. The notebook never leaves the laboratory.

4. **Experiments**. Thoroughly document and date all experiments. This is for your information, as well as for technology transfer to those who arrive after you have gone on to greatness.

5. **Hours.** Graduate school is probably the last opportunity you will have for flexible hours. Don't abuse the privilege. If you take 8 years to get a Ph. D. because you spend 20 hours a week in the lab, then the time you took is costing you your prime earning years. A good graduate student works nights and weekends. If you come in at 10, don't leave at 6. Vacations are in a similar vein. You are "entitled" to 2 weeks a year. Don't take that much. Sometimes you need a vacation and you should take it. Sometimes you should say "no". However, the primary issue is not hours but work. A good Ph. D. student should complete one experiment per day. Because experiments generally involve reaction times, work-up, analysis, etc., this means you generally need to be doing three experiments or more at a time. It is difficult to accomplish that within an 8-hour day. Also, nothing gets done if that day consists of hours playing computer games, which also interrupts others' access to the computer.

6. **Safety**. YOU, and OTHER PEOPLE as well, have a RIGHT to work in a SAFE environment. YOU MUST NOT, BY YOUR CARELESS ACTIONS/NEGLIGENCE ENDANGER OTHER WORKERS. YOU have the RIGHT to DEMAND - other people in their work observe proper safety procedures. If you observe that somebody in the lab does not follow a safe procedure tell me about it. It may be the lack of information on the part of the offender, which can be easily corrected. There are no penalties unless the offense is repeated.

   You should know the properties of the chemicals you work with. Especially important is that you are aware of health hazards they may pose. If you don't know, always assume that the chemical is a health hazard. When using new chemicals always consult the MSDS and/or the Merck Index. If in doubt ask your more senior colleagues. Make sure you package all the chemicals that you store in the lab properly, in closed bottles/flasks/jars, clearly labeled (see **Label it!)**.

   Almost all commonly used solvents cause serious health effects upon exposure, and many of them are carcinogenic. Open bottles/containers containing solvents free to evaporate into the lab space pose a serious safety health risk to you and those who enter your laboratory. Remember, if you display a careless, negligent attitude as far as the safety issues are concerned you victimize not only yourself but your colleagues. There are measurements that you could perform alone in the laboratory. However, you should never work alone if working with particularly hazardous chemicals or doing any large scale synthetic work.

Items 1-6 involve personal responsibility. However, earning a Ph. D. is an apprenticeship, which means you learn from others. Creativity and individuality are crucial in becoming a good researcher. As much as it is important to challenge the accepted status in science, there are rules and regulations of the workplace, which must be followed in order for other researchers to be able to conduct their work efficiently. Therefore, for a common good, your individuality must take a back seat here. Do not be afraid to ask questions if you are unsure! Everyone is there to help you. Since this requires a high degree of collegiality, there are some obligations on your part to the rest of the group:

7. **Fix it!** Especially if *you* break it, get it fixed. If an item of equipment is broken, even if you are not responsible, take steps to get it fixed. If there is a person assigned to the equipment,

notify him or her. But don't let it stay broken. If you are the person assigned to a piece of equipment, keep it in good running order at all times.

8. **Clean it!** Even on your bench, accumulating dirty glassware is a safety and health hazard. If you have a spill and do not clean it promptly, ***you*** *must accept responsibility for deliberately and knowingly exposing others to danger*. ONLY YOU know what kind of equipment you left around and how to **properly** and **safely** dispose of it. Areas around equipment (and computers) are for everyone to use. Your experiment must be contained to those work areas. They need to be thoroughly emptied and cleaned upon completion of your experiments, so that the next user does not have to guess about safety of the stuff you left behind. Areas around computers need to be uncluttered, so whoever needs to use them, can do his/her work efficiently. Make sure you have removed all of your materials: notes, spectra, etc. when you are finished.

   Since all the research laboratories are subject to the safety inspections by internal as well as external bodies, there comes the time, where our labs need to be cleaned/reorganized, and all the group members must feel responsibility to contribute. It is mandatory, that you participate in these activities.

9. **Label it!** Make sure labels are securely fastened, generally with tape. Use only dark ink on the labels. Never put an unlabeled flask on the shelf or in the refrigerator.

10. **Make sure things get ordered!** If you use the last of a common chemical or other supplies, talk to Caroline to get it ordered. If you break something that can't be fixed, replace it.

11. **Return it!** When you need to borrow something, ASK FIRST! If the person is not available, take a few moments to write a note. If nothing else, common courtesy calls for returning what you have borrowed as soon as possible. Returning an empty chemical bottle or a piece of glassware that is less than impeccably clean- is not good enough! Tools, cuvettes, and other common equipment should be returned to their storage place immediately after use.

12. **Enforce good security.** Challenge people you do not know walking in the lab. Ask for identification. Don't be afraid to demand their reasons for being in the MDI. Call security if someone refuses to provide identification.

How to get along with the boss:

Never ask if I'm busy. I'm always busy. But I'm always available for you, unless I'm in a meeting that would be rude to interrupt. You can ask, "Do you have a few minutes?" and I'll be happy to oblige. You're the major reason I'm here; so don't put yourself too far down on the totem pole. Run in when you have a success. Tell me what experiments you're going to run next - don't make a habit of always asking me what to do next. Come to group meetings, unless there's a good excuse. It's insulting to me and the other group members if you're too busy. Know the literature. Be prepared to tell me what it says. Remember, you are the world's expert on your project.

On a different note:

I work hard. Most professors do. You work hard. Most graduate students and postdocs do. However, hard work is often not enough, especially when you compartmentalize your work to the lab alone. Being a scientific apprentice means that you work hard ***in every single aspect of your job.*** This means that NOTHING should be done without taking some level of PRIDE in doing it well.

This includes presenting talks, writing abstracts, writing papers, ordering things, keeping track of your expenditures, etc. I should never have to point out to you that something was done carelessly and I should never have to remind you to do something – that is a waste of my time and yours. Typically, if I ask you to perform a task, it is worth doing. Therefore, you should do it! If you don't know why it is important, just ask. If you don't want to do it, tell me why and we will discuss the subject. However, don't just blow me off – that is insulting and inconsiderate.