Standard Procedures Manual

Duties, Responsibilities, and Expectations for Participation in the Group[1]

This document is a declaration of the principles, policies, and intentions of the lab, and is primarily intended for students working in the lab. "The lab" describes not just a physical space, but a group of people working together. Being a part of the lab is a rare and extraordinary opportunity to work on cutting edge research problems in computer security. What does this involve?

Research is the discovery of new knowledge. Working in Optical Science and Nonproliferation (OSN) research is an opportunity to participate in the development of new theories, systems, and knowledge pertaining to nuclear security and other areas of focus important to not just the research community, but the nation and beyond. Every piece of work done in the lab is aimed towards developing new understandings of nuclear security science and policy, and new applications for the knowledge that is discovered here.

Some of you are getting paid with funding that comes out of the grants that we, the faculty, have received in our academic careers. It is essential that we perform well on these grants if we are to continue receiving such funding. To perform well, the research must be performed with the same rigor and intensity of that coming out of the top research labs in the country. We expect to be counted as one of the world's top security groups, and that our research will appear at the best venues within the community. Look to how researchers within the larger academic and research communities, as well as the alumni from this group, perform as a model for what to be doing. Work as hard as students and researchers at the top schools.

I. General Expectations

As an Optical Science and Nonproliferation (OSN) student or scholar member, you are expected to:

1. **Safety is the number one priority.** You should first and foremost be **trained** and **knowledgeable** on the **safe operation** of equipment as well as **safe experimentation** practices. Violation of laboratory safety guidelines will be documented and included on evaluations which may impact reappointment.
2. It is **your duty** and responsibility to inspect, question, challenge and, if need, be stop unsafe practices, and most importantly report them to PI Prof. Kyle C. Hartig (KCH) and the rest of the OSN members. If you see something, say something!
3. Promote a culture of safety. Safety comes from knowledge. Make sure you know and are prepared for the worst possible scenario when performing an experiment. Be aware of your surrounding in general!
4. You should be the first person in the world doing the specific research you oversee. Focus on novel, scientifically sound, hypothesis-driven experimentation and analysis.

[1] Adapted from Prof. Juan Nino as well as from the UF FICS Manifesto written primarily by Prof. Kevin Butler.

5. Before trying something new on your own, first talk to your OSN peer and senior group members. For new experimental setups, please talk to Prof. Hartig first.
6. Realize that likely you are not the first person doing something in the group, particularly when it comes to general, routine non-experimentation activities such as python programming or HiperGator usage.
7. If anyone in the group besides me knows it, or if it is written in the OSN documents, you should know it! Therefore, exhaust your communication within the group before you contact me.
8. Do NOT distract anyone (waste their time) by asking things that you can learn from templates, SOPs and other documentation (including YouTube or Kaggle for simple topics like PCA analysis).
9. DO ask questions after you have informed yourself. Question everything and only accept science-based answers!
10. Have open, sincere, and direct communication with all the members of the group (all in a respectful and professional manner) and especially with your advisor (KCH). This includes during group meetings, where feedback and a spirited discussion of the science is expected.
11. Do not gossip.
12. Be efficient in all your work. Focus!
13. Be effective in all your work. Take pride in it and produce impactful results!
14. Provide clear "YES" or "NO" answers (when applicable). If you don't know, say it, don't guess. Write it down, look it up later, and learn it!
15. Provide a clear answer to WHEN something will be delivered, finished, etc. ["When" implies, exact date and time, to the minute if possible]
16. It is expected that you will work with Prof. Hartig to jointly develop and agree to a schedule of deliverables for the work you are performing on a routine basis.
17. Every activity in the group has a template, a guideline, and/or procedure. Therefore, if you are doing anything in the group, follow the procedures (i.e. use the template). If needed, inform the group of lack of procedure guidelines or templates.
18. Be responsible and accountable. This includes being on time for meetings and providing advance notice if you are running late or need to be tardy.
19. Take ownership of your research, duties, and expectations.
20. Apply for scholarships and fellowships. Be recognized for your hard work, unique background, and skillset!
21. Exert all effort when performing your tasks.
22. Take pride in your work and timely completion of deliverables.
23. Be dedicated.
24. Be a star!

Work:

As a rule of thumb, work is hard. Sometimes it is also stressful. Sometimes dull. Sometimes tedious. In general, when you are working, there are other things you would rather be doing, such as drinking a cappuccino at a cafe´, reading a magazine, surfing the web, reading non-research-related email, skiing, hanging out with friends, spending time with a spouse or romantic partner, watching TV, and so on. Sometimes, but not always, when you are working, you find yourself in a "flow" of activity during which time passes by quickly while you are also being very productive, and during which you are being challenged at exactly the right level. This is great. But you cannot get into a flow activity

with every piece of work that you do. Though sometimes tedious, working is always a dignified activity, and it builds discipline and self-respect.

To earn a Ph.D., you need to dedicate your life to it. For a period of time, this will have to be the most important thing you do in your life. If you sleep 56 hours in a week, then you will need to be spending at least 57 hours a week on your Ph.D. We realize that if you are funded as a research assistant, your committment is for 20 hours a week. However, you should also consider the research credits that you are taking as well as well as time reading, thinking, and planning, you will be spending beyond those 20 hours on your degree.

Communication:

1. OSN members use Slack as a primary communication platform. At the time that you will join the group, and after registering for a Slack account, ask Prof. Hartig to send you an invitation to join the workspace through your UFL email. You can download Slack on your phone, laptop or use it as a web-based platform.
2. Your participation in the research group approves the posting of your contact number on a group contact information chart. This information will only be used internally within the group and will be posted on the group server drive and/or in a secure location on the group website/wiki.

Safety Training:

Safety is the number one priority. You should first and foremost be trained and knowledgeable on the safe operation of equipment as well as safe experimentation practices. It is your duty and responsibility to inspect, question, and challenge (and if needed stop) practices performed by the group. Most importantly, report unsafe practices to KCH and the rest of the OSN members. Before working in the lab, everyone must be safety trained, pass a safety exam, and sign the necessary forms stated below.

Additionally, online training found at my.ufl.edu > Main Menu > My Self Service > Training and Development >myTraining is required to be taken for safety and proper lab conduct.
The classes that are required are: EHS833 Laser Safety, EHS861 Chemical Hygiene Plan/LATCH; EHS862 Lab Safety Actions & Reactions; EHS863 New Researcher Overview of EHS; and EHS809 Hazardous Waste Management. These courses must be completed before work can be done in the lab.

You may complete the Chemical Hygiene Plan (CHP) Training Form, PPE Usage Form, and Hazardous Waste Training form prior to passing the safety quiz.

The Safety quiz will consist of 2 parts:

1. <u>Part one oral safety exam:</u>
   The oral safety examination will consist of 2 questions from each of the following areas: Lab Safety (Lab safety manual/safety pamphlet), Laser Safety (UF Laser Safety Manual and Pamphlet), Chemical Hygiene Plan/LATCH, and OSN Procedures (i.e. this document).
2. <u>Part two in-person practicum:</u>
   The in-person quiz will consist of a walk through with the laboratory PI (KCH) where a detailed discussion will occur regarding how to safely handle and operate the various

equipment in laboratory as well as a demonstration on how to safely setup a laser beamline and experiment (first with laser off and finally with the laser on).

After successfully passing the safety quiz and demonstrating proficiency with the laser systems, Prof. Hartig and the student will sign the EH&S Statement of Laser Training and Experience form that officially authorizes the student to undependably operate the laser systems. This form will be maintained in the lab information binder and a copy will be provided to EH&S.

At minimum you should receive the following documents in preparation for your lab safety exam:

1. UF Lab Safety Manual
2. Laser Safety Manual, Laser Safety Handout, and Laser Emergency
3. Hazardous Waste Management
4. Emergency Pamphlet, MSE Emergency Procedures Guide, & Emergency Information Sheet
5. Chemical Hygiene Plan (CHP)
6. Research Misconduct Flyer
7. Export Control
8. MSE Safety Day Activity
9. Statement of Laser Training and Experience
10. Standard Operating Procedure forms (folder on Dropbox)
11. Chemical Inventory & MSDS Sheets (is now available on GatorTRACS/LATCH)
12. Select Equipment/Facilities Manuals & MSDS Sheets (folder on Dropbox)

Rumsfeld Rule:

Unknown known! I don't know that you know there is an issue unless you tell me.
1. Unless I hear otherwise, I expect and assume that everything is going perfectly and exactly as planned (time-, completeness-, and success-wise).
2. Be creative and try as many new and exotic experiments and analyses as you want. However, every time you are implementing or trying a new process, test or experiment make sure you inform Prof. Hartig.
3. Do not wait until our individual or group meeting to address rhodium rules 1 and 2!

Graduate Student Offices:

Offices for graduate students are available for the group in the Nuclear Annex and a key can be obtained by filling out a key request form found on the MSE Department Intranet or by contacting MSE Facilities. Cubicle/hot-seat space exists in the Nuclear Annex that may be used by undergraduate students; however, this space may only be accessed during the day when the building is unlocked or in coordination with a graduate student member of the group (space is not assigned to undergraduate students per policy). Please make sure that the Nuclear Annex main door or the door to individual student(s) offices are closed and locked if no one is present to avoid possibility for theft or items being moved or borrowed without our knowledge.

Lab Door Code:

OSN's lab is located in Rhines 141. Access to the lab in Rhines Hall is gained using a four-digit code given out to each individual by Prof. Hartig.

Leave:

1. Prof. Hartig maintains a group calendar. All travel, vacation, and meeting dates must appear on the group calendar prior to taking leave.
2. All leave, personal or otherwise, outside of University holidays must be pre-approved with Prof. Hartig and reported officially. The approval process requires posting of all leave to the group calendar. It is strongly suggested that you make such requests as early as possible; however, be aware that required meetings and reviews related to the work you are supporting may be scheduled with only two to three months notification (requests made more than four months out may not be approved until such events are known). Students that are employees of the university are allotted five (5) personal days per semester that can be used for any reason and include both illness and vacation. As exempt employees, you can "flex" your time; however, per HR policies you are expected to make up flexed time within the same pay period and obtain approval from your supervisor prior to flexing your time. For example, flexing can be used to work in a three-day weekend or take half-days for visiting family/friends or doctors' appointments that you do not want to use a personal day for. For students on fellowship, we will assume that the fellowship sponsor wishes you to align with UF leave policies unless instructed otherwise (such information may be found in a fellowship handbook or other guidelines document).

Information Management:

1. All students are required to maintain a non-electronic laboratory notebook. There is an official notebook for the group. It has a blue cover with gold writing. Each notebook is numbered and assigned to specific students. The notebook is the sole property of Prof. Hartig and must be returned to him prior to approval for graduation. All research data should be cut and pasted in the laboratory notebook (when feasible) and the location of the electronic data must be referenced by computer and file name (including documents and presentations). You are required to bring your laboratory notebook to all meetings, and record in it all tasks, comments, and other insights discussed in these meetings relevant to your work. Prof. Hartig may ask at any time to review your laboratory notebook to ensure that you are adhering to the established laboratory notebook maintenance practices.
2. Data includes all raw and processed measurements, algorithms/simulations, and results generated in support of your work in Prof. Hartig's group. All data (including word documents, presentations, raw data, etc.) must be stored in the group dropbox folder according to the groups adopted data storage schema discussed during group meetings. The location and name of data files must match verbatim those in your laboratory notebook. Powerpoint file-type (i.e. pptx) versions of all presentations must be stored in the group Dropbox folder. When your laptop is stolen or your hard drive crashes–and I guarantee that these things will happen eventually–my first and perhaps only question will be "Did you lose any data?" The only acceptable answer is "No. It was backed up in the group Dropbox folder." Best practices for documenting algorithm development (e.g., a well-marked-up Jupyter notebook) will be observed by all members of the group for the use of such work by other students and for possible submission to journals and/or patent applications. Information generated by members of the group in support of projects shall be considered confidential to the group and authorization by Prof. Hartig must be obtained for removal, archiving, and/or sharing of this information. These practices align with UF's guidelines regarding research compliance, intellectual property protection, and export control guidelines and regulations.

3. When creating computer files, please be sure to use meaningful name that are NOT at all generic. A file name "Abstract.docx" is essentially useless. If all of you send me an abstract and call it this way…" Therefore, use meaningful names like "INMM 2020 - Hartig – Abstract.docx" That way it is very clear where is the abstract going to, who is the author, etc. Upon my revision, you will receive a file "INMM 2020 - Hartig – Abstract - KCH.docx" thus indicating that I have reviewed and edit it. Apply the same meaningfulness to all your file naming.
4. Prof. Hartig is to be copied on all emails to editors and collaborators. Communications regarding education and outreach activities that pertain to the group must also copy Prof. Hartig.
5. When sharing presentations with groups outside of the University be sure to never send a PowerPoint. Always save the file as a PDF with a watermark (semitransparent text) reading "Optical Science and Nonproliferation Group" diagonally (inclined up from left to right) across each slide. Also, always make sure the release of the presentation, and data within, has been approved by Prof. Hartig.
6. A conference presentation or paper submission requires nearly a years' worth of preparation and effort; therefore, interest in attending a conference or submitting your work for dissemination must be expressed early on (i.e., a year out). Any such request must be approved by Prof. Hartig who will then work with you to develop a plan for submission and/or presentation of the work. Additionally, oral presentations at conferences will be prioritized over poster presentations unless previously discussed and agreed upon (posters may be a better format depending on the specific conference or event).
7. All abstracts, manuscripts, and presentations must be approved by Prof. Hartig prior to submission (even entering of draft information into an online system). After submission, all follow-up emails must be forwarded to Prof. Hartig (do not assume I automatically get a copy).

Hours:

Dr. Hartig's expectation is that you will be in your office no later than approximately 10 AM on weekdays, and that you will be here throughout business hours. If you plan to be away or have been working late and will be arriving late at the office, you should let him know. If your plan is to come in early and leave early, also let him know. It is important during the day that Dr. Hartig is able to find you because of sometimes fast-breaking requirements that are the nature of our field.

For this reason, Dr. Hartig also expects that you will check your email periodically throughout the day, although you must not let it become a distraction. In general, you are expected to respond to emails within three (3) hours if you are in the office, and generally within 24 hours if you are not (must have prior communications with Dr. Hartig if you are out during business hours). Dr. Hartig will attempt to do the same for you. You should have these expectations of your fellow labmates as well. Ensure that you read every word of all research-related emails. This group communicates through other channels as well such as Slack; please ensure that you are available but keep conversations focused on research.

- It is strongly suggested that you utilize a desktop email client to stay on-top-of all emails and calendar events instead of a web-browser based email client. You may setup notification snooze settings on your email client that restrict notifications outside of University business hours if you choose (Dr. Hartig has notifications snoozed after 7pm on weekdays and on weekends; however, he still periodically checks his emails during these times). Similar guidelines are strongly suggested for use of group Slack and MS Teams channels.

Research is not a 9 to 5 job; there are times when deadlines will be upcoming and sometimes short, and these will require work outside of regular business hours. You should be prepared to work at night if necessary, and weekends, particularly close to degree, paper, conference, or sponsor deadlines. If the work is collaborative in nature, you should make every attempt to do this in the lab – often the best ideas come when you are collaborating with a labmate in the evening without other distractions. If you have any concerns about safety or other issues relating to working after hours, please let Dr. Hartig know immediately. He is generally reachable through email or Slack, but, if necessary, you may also contact him on his cell phone.

You should have our numbers, and we should have yours as well (see preamble document in group shared folder or training Canvas site [in progress]).

Meetings:

Come to every meeting with a list of agenda items written down, and leave with action items, stating what they are at the end of the meeting. Your summary should include a recap of what you are working on. We each have many projects on the go at any given time and cannot remember every esoteric detail of your work without a short refresher. Be focused during the meeting and pay attention. Make sure to capture the important take-aways. Your memory is not as good as you think it is. Do not be fumbling with your phone or act otherwise distracted during the meeting; if there is a crisis you are facing, we are better off rescheduling than wasting both of our time on an unproductive meeting. The next meeting time should also be established or at least discussed at the end of each meeting and should be at least weekly. If one of us is traveling, we should find other methods of meeting, such as through videoconferencing.

An important part of being in a lab is the collective synergy gained from everyone working together. As your role in the lab matures, you will find that you are self-regulating and accountable to each other. Nowhere is this better manifested than through the lab scrums, which we hold once a week. This is an opportunity for you to update others on the work that you have been doing and to solicit help with challenges you are facing, as well as being a forum for disseminating news of interest to the group, to present new research, and to prepare for upcoming external presentations. Attendance at this meeting is mandatory, and important for group cohesion.

1. Individual meetings will occur on a weekly basis for graduate students. It is the graduate student's responsibility to schedule individual meetings at the beginning of the semester with Prof. Hartig. Bring your laboratory notebook and research data to all individual meetings. All individual meeting discussions should be documented in the notebook. Do not bring any other notetaking device to individual meetings. Meetings may be conducted in-person or virtually through Zoom or MS Teams and you are expected to be able to share your screen to display and discuss your work and results. Individual meetings may occur anytime during University business hours. You may choose to participate in virtual meetings at an on-campus location (e.g., lab, graduate student office, quiet place in union, etc.) if you are uncomfortable with having a camera and microphone on in a personal location.
2. Group "scrum" meetings will occur on a weekly basis and scheduling will be worked out during the first group meeting of the semester. Attendance at group meetings is mandatory for all students working in Prof. Hartig's research group. Group meetings provide an avenue for each student to practice presenting their research in a well-organized manner and fielding questions from their peers. Additionally, group meetings are also a time for non-presenting

students to gain deeper insight into other research projects, methodologies, and techniques. Engagement in group meetings by all students is required. Cellphone and laptop use, reading miscellaneous items, and other non-research related tasks are strictly prohibited. Virtual meeting participation guidelines for individual meetings will apply to group meetings as well. Following lifting of pandemic restrictions, the group will pivot from use of virtual with an exception for members are out of town or on assignment to a lab or agency who may join the in-person meeting virtually.

3. You must be on time for group and individual meetings. Prof. Hartig must be notified off all absences or delays in advance. If you are running behind by greater than five (5) minutes, please contact and notify Prof. Hartig or another member of the group (who will let Prof. Hartig know) via email, text message, chat, or phone call.

Promoting and Supporting Students:

As described above, we will promote all the students that are working in the lab. This may take the form of discussions with other faculty or at departmental meetings/seminars, or externally with our professional colleagues within academia, industry, and government. Dr. Hartig and the group will include you as collaborators when discussing the work with colleagues and at conferences. The group will include you as co-authors for any publications in which you contribute significantly to the research and to the writing of the paper. Dr. Hartig will write you letters of recommendation (see section below on this topic).

Promote each other. Take opportunities across campus to mention in passing the research projects that other lab members are working on. Everyone should be able to briefly summarize the research that everyone else is doing. We give very short elevator talks to our colleagues all the time, promoting our work in ten words or less. Take note of how we emphasize the research and the lab: we will say things like "Our first research group meeting is tomorrow morning," or "We just got a paper accepted at SCAB," or some other constructive research-related comment that comes to mind. The effect is vastly different from idle chatter about the weather, or having to rush off to class, or how busy you are. Take every opportunity you can to speak constructively about your research. Contribute to a research community. Create a research community. Remember that as members of this group, success for one of us is a victory for all of us.

We will support the students working in the lab. Support takes many forms. The most important form of support in helping students learn how to do research is to provide them with an intellectual forum in which they can exercise their mind in the formation and carrying out of original ideas on how to look for, capture, represent, and write about new knowledge. This forum can take many forms, but the most valuable is when a research advisor is willing to focus his or her brain power, over an extended period of time, seriously considering, critiquing, and engaging a student in the student's work. This is the most important form of support that we endeavor to provide students working in the lab.

As a general rule, successful faculty are highly selective in terms of who they will engage in intellectual debate, and in terms of whose ideas they will engage in a critical discussion. This is to a large extent a healthy survival mechanism to make sure they stay focused on their own inquiry and research. Thus, successful faculty are in general not willing to focus their brain energy on a lengthy engagement discussing your research. When you find someone who is willing to engage you, and you get along with them, and you find their suggestions to be consistent and helpful, work as hard as you can to

engage this person in the highest and most advanced discussions that you can. Go to every meeting as prepared as possible and having made as much progress as possible.
Other forms of support that we will endeavor to provide to students working in the lab include: the resources that they need to do the work, including lab materials, software, hardware, books, and so on; forums in which the students can have their work and ideas constructively critiqued by other faculty, and preparation for these encounters; a supportive, positive, and constructive environment in which other students are working on similar problems; providing you with access and making introductions and connections to people in the field who can help to further your research and your career; and various guidance for developing as a professional researcher, such as the wealth of guidance contained in this manifesto, much of which is intended to support students by helping them to become self-directed researchers.

Another form of support is money. If you are getting paid to do research, you are living a life of luxury. We will make every effort to continue winning grants so that we can support as many lab members as possible with research assistantships. We will do our part by fulfilling our grant obligations as best as possible, attending conferences, workshops, and funding agency meetings beyond those we are required to attend, serving on review panels, giving talks to promote the research and potentially creating new funding opportunities, and making an effort to always be writing a new funding proposal for government or industry. We do these activities to provide you with the resources to be successful. For us to continue winning grants, we need your help. You need to work hard, produce high quality work, meet timelines, and help us to fulfill our existing grant obligations. In addition, by working hard and producing top-flight publishable research, you put yourself in a better position to win competitive fellowships. Not only are these highly prestigious markers on your CV, but they can guarantee your funding and also help free up funds for equipment, travel, and other lab members.

Intergroup and Interpersonal Interactions and Communications:

As members of the lab, you represent this group, the department, and the university, and the expectation is that you will take these responsibilities seriously and be seen as major contributors to the above. When there are opportunities to contribute to the effective running of the department, to improve the departmental culture, and to show leadership, we expect that you will take on these roles and that others will look to this group as being leaders in the department and in the field. If you are interested in an opportunity or leadership position but are unsure whether it is compatible with your research and professional goals, Dr. Hartig would strongly encourage you to talk to him.

A corollary of this is that our expectations are for you to conduct yourselves accordingly as members of this group. The lab is comprised of a selective membership and being a part of it is a privilege that will serve you well now and in your future career, as has already been demonstrated by the exceptional performance of this group's alumni. We expect that you will conduct yourselves with integrity and professionalism with regards not only to research, but also your coursework and interactions with those within and outside the department and the university. Science proceeds based on the personal reputations of individual researchers. It is of utmost importance that you record, report, and discuss your work and activities accurately and with complete honesty, and that you fully and accurately cite the sources of any materials that you appropriate. Anything less will potentially jeopardize the reputations of every member of the lab, past and present. Academic dishonesty in lab work or coursework will not be tolerated.

1. The University of Florida is an institution which encourages the intellectual and personal growth of its students as scholars and citizens. As an educational institution, the University

recognizes that the transmission of knowledge, the pursuit of truth and the development of individuals requires the free exchanges of ideas, self-expression, and the challenging of beliefs and customs. To maintain an environment where these goals can be achieved safely and equitably, the University promotes civility, respect, and integrity among all members of the community. Students are expected to exhibit high standards of behavior and concern for others and exhibit professional conduct representative of their status as employees of the University and academic scholars.

2. You are to abide by the University's student and employee codes of conduct when interacting with other students and employees in the group and on campus. Prof. Hartig will not tolerate any unprofessional behavior (to include yelling, harassment, mental/emotional or physical harm, etc.) in his group and will take swift action (to include referral to departmental leadership and HWCOE HR) when such behavior is reported. Prof. Hartig encourages students to report such concerns and conflicts promptly. Additionally, students in the group are under no obligation to interact with one another outside of the requirements of their academic and professional duties.

If you have concerns about any activities or behaviors, or you are disappointed or disagree with expectations or with how you are progressing, please direct these concerns to Dr. Hartig privately, ideally in a face-to-face discussion. He will listen closely to your concerns and encourage you to think freely and critically about your environment and what can be improved; the essence of the university is the free exchange of ideas. However, He expects that when decisions are made, and particularly if he is asking you to do something, that they will be followed. You are working with him because you trust that he can lead this group successfully. Outright defiance and insubordination will not be tolerated.

Timelines

Research explores uncharted territories. As such, it is difficult or impossible to predict exactly where a project will go and how long it will take. One of the best techniques to combat these unknown territories, and to make the fastest progress that you can, is to plan out the project as best as you can, and to stick to your plan as closely as possible. Sometimes it is difficult to break up the bigger chunks of work, and the bigger goals, into smaller pieces of work. However, attacking this difficult task head-on is part of your responsibility in this lab. Attacking it regularly will make you a better and stronger worker for every subsequent project that you pursue in life.

At the beginning of each term, you should provide Dr. Hartig with a printed timeline of what you will accomplish that term (this can be a part of and should expand upon your IDP document and discussion). This should include at least four milestones with corresponding target dates per term, based on what you expect to accomplish. This plan will undoubtedly change as the term progresses, but this is no excuse not to plan. As you progress in your career as a graduate student, you will get better at accurately predicting the outcome of your efforts. You will get better at "Calling the shot." Continually update the timeline throughout the term, including tasks completed and new tasks that were added. When planning, take into consideration how many hours you will have available for research from week to week.

Progress Towards Degree:

1. It is your responsibility to verify with advising and the graduate coordinator that you are making continued and satisfactory progress towards meeting the non-research (e.g., course and credit) requirements associated with your degree (e.g., M.E., M.S., or Ph.D.).
2. You are responsible for registering for class. Prof. Hartig will provide advice as to the appropriate selection of classes and must sign registration forms for graduate students.

Publications

Publications are the forum for distributing research findings; that is, the new knowledge that is discovered in the lab. Since every piece of work in the lab addresses important research questions, every person working in the lab has the opportunity and obligation to contribute to research publications. For every research initiative, there should be a potential venue for publication in mind. In this group, we place particular focus on the top conferences in nuclear engineering and optical science. The "Big-3" conferences for the group are INMM, ANS, SCIX. The MARC and LIBS conference are also considered top conferences for our group; however, they are not offered every year and recur on every two- or three-year basis. The "Big-3" journals for written publication the group's work are SCAB, JAAS, and Sci. Rep. The journals Opt. Express, JAP, and POP are also targeted by the group for particularly impactful work. What is in it for you? In academia and research, publications are the standard by which a person's work and intellect are evaluated. If you are an undergraduate, co-authoring a research publication will help you enormously when you apply to graduate school - it is now an important basis by which admissions at the top graduate schools and awarding of the most prestigious national graduate fellowships are made. If you are a graduate student, you should already appreciate that publications will help you with everything in your career, including internships, grants, awards (some that give you personally a substantial sum of money) and fellowships, and academic positions. Publications will also help you enormously if you ever apply for jobs outside of academia. The top industrial research labs expect applicants to have as rigorous a publication record as those applying to high-caliber research universities, while national laboratories and other industrial jobs look to your publication record to show that you have mastery of a topic and can communicate important research results.

Between publications, there are many opportunities to share your findings. These include putting up posters in the lab and in the building, maintaining a web page or helping to update the group's web page with your project information, and presenting your work to classes and other groups on campus whenever the opportunity arises.

Promoting the Research and Group

The effective communication of research initiatives and results is often as important as the research itself. If you are doing top-flight research but nobody finds out about it, its value is severely diminished. Communicating about your research requires a specific, concerted effort to win over your audience to appreciate your work and why it is interesting and important. Treat every talk as if it were a job talk – it can lead to one in the future. In academia and in research, ideas are a form of currency. In general, the hard truth is others are preoccupied with their own concerns and nobody cares about your research and what you are doing: it is your obligation to make them care. If someone in a position to think about and comment on your work is willing to listen to your ideas, you must take the opportunity to sell your ideas.

If you are working in this lab, you need to promote the lab and the research conducted therein. You should, at all times, have a 30 second elevator pitch that you are able to give on a moment's notice.

The pitch should incorporate the six points of describing a research inquiry: area, motivation, problem, solution, methodology, and takeaway. You should also be able to provide longer (e.g., 1- and 5-minute descriptions) of your work for when you are able to catch the interest of an enquiring party and have slides and appropriate figures ready to present about the topic. We all travel extensively around the world to locations within academia, industry, and government, with the purpose of promoting the research and students within the group. It is thus imperative that we can ask you for slides on late-breaking results and to have them available quickly.

The importance of the elevator pitch cannot be overstated. A successful pitch may result in a dean asking you to talk more about the topic on campus, or a senior person in the field asking you for a copy of the paper where the idea is described, or to potentially collaborate on a project or grant proposal. You should be practicing and perfecting your elevator pitch at every reasonable opportunity, including to faculty and students on campus.

Letters of Recommendation:

If you would like a letter of recommendation from Dr. Hartig when applying for grad school, a scholarship, an internship, or some other program or award, you need to write a set of bullet points to be included in the letter and then turn it in to Dr. Hartig for him to revise and put into his own words. You must include the name and contact information for the intended recipient and each topic you would like to have in the letter that is applicable to the specific award or program. These bullets should include information that Dr. Hartig does not know or may not remember, as well as key information about you (e.g., when you started in the group, any classes he taught that you took and when they were, what projects you have worked on, any extracurricular activities or clubs that you participate in, any other awards you have received/experience you have, etc.). A Release for Letter of Recommendation form must be obtained from the academic office or online and submitted (e-mail) to Dr. Hartig. **Make sure that you waive your right to review the letter and select the "other" option on information to include and type "anything".** You should turn in the draft letter as soon as possible but at least two weeks before you Dr. Hartig to submit his final version of the letter.

Travel:

All travel under the sponsorship of the university must be approved first by Prof. Hartig and then through the official Travel Authorization Process. All travel (international and domestic) must comply with university guidelines. International travel guidelines can be found at https://internationalcenter.ufl.edu/travel and domestic travel guidelines can be found at https://www.fa.ufl.edu/departments/travel/. Departmental fiscal staff will enter your travel on your behalf. Standard departmental Travel Authorization forms must be submitted at least 1 month prior to initiating travel.

Calling from the Office:

If the number you are calling is located on campus and uses the (352) area code, the first two of the remaining seven numbers should be 29. Those two numbers and the area code can then be omitted, and the last five numbers can be dialed to reach the on-campus phone (ex. If the number is 352.291.1100, only 11100 needs to be entered). When calling any other number, dial 9 before entering the entire number (ex. If the number is 367.291.1100, enter 9.367.291.1100).

Get Help:

Research projects and graduate school are stressful. Self-help books are useful, such as "Getting What You Came For: The Smart Student's Guide to Earning a Master's or Ph.D." and "A Ph.D. is Not Enough." Consider joining campus-wide support groups in which grad students get together and help each other to get through the difficulties of graduate school. You can also speak with your fellow students about the challenges you face, and you should not feel afraid to talk to Dr. Hartig about problems that you are facing. Dr. Haritg is not a trained counselor but can offer you advice based on his experiences, and can potentially refer you to others better equipped to help you. Consider visiting UF Counseling and Wellness Services if you become too overwhelmed by school, research projects, or life.

II. Standard Procedures and Best Practices

Sample Labeling:

All samples need to be labeled in such a way that a stranger could come into the lab and know exactly what every sample is. As everyone's labeling style will be slightly different there is a group labeling key. This key should be updated every semester.

Equipment List:

The listing of the equipment and significant materials and supplies available for use and where each piece of equipment is located as of Spring 2022 can be found on the group Dropbox.

Waste Pick Up:

Waste pick-up should be scheduled through EH&S by filling the appropriate form available online as well as calling for follow up and scheduling the pickup.
https://www.ehs.ufl.edu/departments/research-safety-services/hazardous-waste-management/

Labelling of New Chemicals:

New chemicals when opened should have a green sticker with month and year opened written on them. All chemicals must be logged into GatorTracs (online) and have a label displayed on the container clearly identifying the chemical. A complete chemical inventory of all chemicals found at the worksite (online through GatorTracs) is required to be maintained at all times. This shall be updated annually, made available for staff or compliance officer review and provided to EH&S when requested.

As required by the Hazard Communications Standard and Right-to-Know Laws, an MSDS must be available for each chemical used in the laboratory (online through GatorTracs). These must be available in the workplace for laboratory staff review. The MSDSs for all hazardous chemicals should be used during the SOP training of lab staff. MSDS forms are available online through https://chemicalsafety.com/sds-search/.

You are expected to review the below link on the EHS website regarding chemical storage and management and have and operating knowledge of the requirements and guidelines for chemicals in the OSN Lab.
https://www.ehs.ufl.edu/departments/research-safety-services/chemical-and-lab-safety/chemical-safety/chemical-storage-and-management/

Hazard Assessment:

The laboratory PI (KCH) will be responsible for assessing the hazardous situations, chemicals, biologicals materials, energy sources (including radioactive and laser), equipment, etc., that may cause potential exposure or injury to staff members working in the lab. The Hazard Assessment will identify the potential hazardous material, equipment or processes. It will also identify the methods used to mitigate the hazard, such as procedures for safe handling or personal protective equipment that will need to be worn.

Each hazard assessment must be recorded and are accessible on GatorTracs. The Hazard Assessment is used to develop the SOPs for each hazardous material or procedure found in the lab. The Hazard Assessments and SOPs must be reviewed with staff at the time of their initial assignment to the lab, whenever the processes or procedures using the hazardous material or equipment is changed or modified. Any new potential hazards associated with any change of procedures, new equipment, new chemicals to be used, etc., must be assessed and documented prior to being used by the lab staff.

Laboratory Inspections:

EH&S will conduct an annual Laboratory Safety Survey (LSS) of each research laboratory. The survey will concentrate on lab safety issues, such as chemical, physical, radiological, biological and general safety. The laboratory's complete chemical inventory will be required for review at the time of the survey.

During this survey, any safety deficiencies will be noted by the surveyor and explained to lab staff. A summary letter will be sent to each P.I. to identify these concerns and to offer recommendations to correct the issues. Follow-up surveys may be performed to ensure compliance. These safety issues must be corrected to ensure compliance. These issues may need to be included in the Hazard Assessment and the SOPs of the lab.

Fume Hood:

Good practices to follow:

1. Minimize storage
2. Minimize blocking of the rear baffles or the side walls
3. Work in middle of the hood (especially if the experiment releases fumes since there's an air dead zone created up to 3 inches from the walls)
4. Work 6-8 inches inside from the sash to reduce dead zones created by the individual
5. Don't place items near the air foil (the section on which the sash closes)

Additional points to remember:

1. If equipment has to be placed in the hood, the power supply cable can go from underneath the air foil.
2. Always close the fume hood sash (when done working or after setting up an experiment) to conserve energy. The fume hood won't shut down if you do this and there will be sufficient air flow to carry the fumes up.
3. A warning for Rhines Hall, the system lowers the exhaust from the fume hood to 60% after 10 PM every day and brings it back up to 100% in the morning. Therefore, if running experiments after 10 PM which release fumes, exercise caution.

Optics Cleaning:

Optics contained and used in the lab are extremely delicate and sensitive to touch and many environmental factors. Cleaning and handling of optical components is a routine task in any laser laboratory; however, particular care and attention must be taken to avoid any damage or premature degradation to expensive optical components. Please refer to the linked resource available through Edmund Optics (here) for a detailed description as well as YouTube video on how to clean various optical components. Additional training and in-person, hands on experience will be provided by Prof. Hartig prior to being allowed to clean optical components on your own.

Common reagents used in the cleaning of optical components include the chemicals Isopropyl Alcohol, Methanol, and Acetone. Each of these chemicals are volatile and have specific hazards; thus, care must be taken during their use. Both of these solutions are available in the lab in small, well-marked squirt bottles for easy application to optics grade wipes during cleaning, and are filled from bulk containers (wearing gloves, using a funnel, and in the fume hood) stored in the hazardous chemical locker in the lab. Cleaning of optical components should occur on a fresh Kimwipe placed on a clean and flat table or bench (not in the fume hood – we want to avoid dust getting on the optics). When applying these solutions to wipes you are to wear appropriate gloves and squirt a small amount of the solution (enough to wet it) onto the wipe, which is being held along one edge by tweezers. You will use tweezers and your gloved hands to handle and clean the optical components following the guidelines and examples described in the above paragraph and from your training with Prof. Hartig.

6 Tips for Handling Most Optics to Keep Them in Good Condition (from Edmund Optics):

1. Always wear gloves or finger cots. The oil on your fingertips can sometimes damage the coating on optics, and if a fingerprint is left on an optical surface for a long time, it can become a permanent stain.
2. Always handle optics by the edges. Never touch the optical surface with your fingertips, even while wearing gloves.
3. Never handle optics with metal tools. Reduce the chance of damage by using wooden, bamboo, or plastic tools to handle optics. Vacuum pens are handy for small optics.
4. Always place an optic on a clean soft surface, especially if the optical surface is convex. Resting on a hard or dirty tabletop can cause scratches on the optical surface.
5. To store optics, wrap them individually in clean, lint-free lens tissue and place in a low humidity environment. Never store unwrapped optics together in a box or bag, as contact between the optics will cause damage. Never store optics with heavier items on top of them.
6. Never blow on the optic. It is also recommended to not chew gum or talk while handling optics to prevent saliva contamination. Saliva particles will often stain the surface.

Vacuum Chamber Safety:

The vacuum chamber and pump system in the lab represents a vacuum safety hazard with possible pinch risks. The vacuum chamber lid weighs approximately 20 lbs and can be safely lifted onto the top of the vacuum chamber using a stool and handles present on the vacuum chamber lid. Ask for assistance if you have any worry about lifting anything safely in the lab. Using the handles on the vacuum chamber lid will avoid any risk of pinching of fingers or other body parts when the lid is set onto the top of the vacuum chamber. There is an SOP for the vacuum system that you must review in addition to the below best practices.

Best practices:

- Do not turn the vacuum pump on unless the chamber is completely sealed (i.e., all windows and other fittings in place).
- There is a valve in line with the vacuum pump and the chamber that should be closed prior to turning off the vacuum pump. There is a gas feed-through valve that can be opened to allow pressure to slowly build back up in a controlled fashion in the chamber, which will allow the chamber lid to be safely removed and access to the inside of the chamber (do not

attempt to remove the chamber lid prior to ambient atmospheric pressure being reached in the chamber).

- There is a pressure gauge present on the chamber to allow for easy inspection of the pressure present inside the vacuum chamber.

Laser Safety: You must also review the separate SOP document for Class 4 lasers. The below discussion is an excerpt of that document to highlight important safety and training requirements.

Radiation Control and Radiological Services is responsible for providing up-to-date information and training to the research community concerning the safe conduct of laser use in accordance with all pertinent local, state, and federal regulations, guidelines, and laws. To that end, we provide this manual as a resource to be used in conjunction with other safety manuals and resource materials available from Environmental Health and Safety.

The UF Laser Safety Manual defines the Laser Safety Program and required training for the University of Florida. This program has been developed to provide guidance to faculty, staff, students, and visitors for the safe use of lasers and laser systems. This manual also provides essential reference information on non-ionizing optical radiation.

Prof. Hartig will ensure that all laser users (LUs) under his control, as well as incidental personnel, are properly trained with respect to the safe operation of lasers and are made aware of the associated hazards before they are authorized to operate any Class 4 laser or laser system http://webfiles.ehs.ufl.edu/laserstatetrain.pdf. Prof. Hartig shall establish and maintain a list of current LUs that are approved to operate specific Class 4 lasers under his supervision and provide a copy of the list to the UF Laser Safety Officer (LSO)- a copy of which will be maintained in the laboratory safety and procedures binder in the OSN lab.

Laser users who operate a Class 4 laser or laser system in the OSN lab shall:

- Read the UF Laser Safety Manual
- Read all relevant SOPs (specifically the SOP for Class 4 Lasers)
- Read all manufacturer supplied safety instructions and manuals for relevant laser systems
- Receive PI training on the specific laser equipment to be used
- View the Fundamentals of Laser Safety presentation online
- Take the online UF Laser Safety Training and Exam (PPT available in group drive/site): http://www.ehs.ufl.edu/programs/rad/laser/laser-training/
- Take the UC Laser Safety Course (email Dr. Hartig results/certificate following the test): https://uctraining.wufoo.com/forms/r1v93qn90a2vbx0/

Safety goggles: Laser safety glasses rated for the wavelength of all lasers beings used in the lab must be worn at all times that the laser is in operation (when laser beam is present outside the laser system enclosure). The required OD rating (for specific wavelengths of laser light being used in the lab) is posted at the entrance of the lab. You may check the required OD rating for safety glasses based on laser wavelength, pulse duration, energy, and rep rate through the following link: https://www.lia.org/evaluator/od.php. A laser viewer and several fluorescent cards are available in the lab to assist with visualizing the laser beam while wearing laser safety glasses.

Prior to operation of the laser systems, you must verify that the door to access the lab is locked, blackout curtains on the windows are drawn, and the "laser in use" light on the outside of the lab is on along with all other PPE requirements and controls enumerated in this document and the laser safety manual are in place.

There is an SOP for the laser systems in the lab that you must review in addition to the below best practices.

Best practices for alignment: Alignment of laser beams is commonly considered **one of the most hazardous activities** during operation of laser systems in the laser and optics community. Extreme care must be taken along with adherence to procedures and best practices to safely align laser beams in the lab.

Best practices:

- NEVER bend over and squat down in the lab when lasers are operating in such a way that your eyes face and end up at the same level of the laser beams on the optical tables. If you have to pick something up off the floor or bend over in the lab when lasers are operating, you have several options to safely do so: (i) shutter or block the laser beam first or (ii) face away from the laser sources and squat down as vertical as possible to reduce laser beams "sneaking in" around edges of goggles.
- Always check that mirrors and other optical components (e.g., windows) rated for the laser wavelength being used are present down the beamline prior to operating any laser system to avoid unfortunate and costly damage to these components.
- Always have a physical beam block present at the beam exit from the laser unit prior to turning on the laser and/or opening of the internal shutter of the laser system.
- Always use the minimum amount of laser energy (emitted from the laser system) possible that allows for visualizing of the laser beam using a laser viewer and/or fluorescent cards.
- Always start alignment with a beam block at the closest point to emission of the laser light from the laser unit as possible before beginning alignment further down the beamline.
- Use two beam blocks to "leap-frog" blocking of the beam as you adjust mirrors or other optical components progressing down the beamline.
- NEVER remove or add optical components to the laser beam line without blocking the laser beam prior to the point at which the optical component is to be removed or added. Prior to removing the beam block following addition or removal of an optical component place a beam block (as close to the added or removed optical component as possible) at the point where the laser beam is expected to travel after interacting with the new optical component (if you think about it this makes sense as the new component most likely needs to be aligned to target the laser beam onto the next optical component down the beam line).
- Use the laser viewer to check for any stray beams following any alignment or addition/removal of an optical component prior to treatment of the laser beam line as "aligned" or ready for an experiment.

Part of the safety exam administered by Prof. Hartig will consist of a hands-on "practical" demonstration of laser beam alignment and other laser system operation best practices. Following adequate passing of the OSN lab safety exam and demonstration of experience, Prof. Hartig and you will sign a EHS Statement of Laser Training and Experience that will otherize you operate laser systems on your own.

Changes to experimental setups: Prof. Hartig will have to examine, discuss with you, and approve all new laser beam line setups and experiments that you want to perform in the lab prior to any manipulation of optical components or laboratory equipment.

Any violation of laser safety regulations is considered a serious violation of laboratory, college, and university safety standards that will be reported and may impact your reappointment in the group.

Laser Ablation:

A majority of the research in the OSN lab consists of laser ablation work. Laser ablation is what occurs when a high-power pulsed laser is focused on a sample surface and a laser produced plasma (luminous micro-plasma) is formed. These laser ablation plasmas emit light across a broad spectral range; however, the emitted light does not represent an eye damage laser. Laser light that was not coupled into the sample is diffusely scattered off the sample surface in many directions. Proper wearing of laser goggles and ablation occurring in the vacuum chamber adequately reduces the risk of this diffusely scattered laser light from the sample surface. Additionally, depending on the laser power and repetition rate, hearing protection may be suggested to avoid exposure to sustained high-frequency sounds being emitted from the laser ablation events. A HEPA filter exists in-line with the vacuum chamber to filter out any microparticles that are formed/ablated off of potentially hazardous (i.e., radioactive) samples. These microparticles be flushed out of the vacuum chamber by backfilling the chamber to ambient pressure and pumping the chamber down (through the HEPA filter in-line with vacuum pump) at least two times prior to removal of the chamber lid.

ICP Solutions:

Aqueous solutions of elements in water or dilute nitric acid exist and are used in the lab. These dilute solutions are commonly sold commercially as ICP standards for use in qualifying mass spectroscopy and optical emission spectroscopy systems. These solutions are used in the lab for generating aerosol sprays/plumes for specific laser ablation experiments. The solutions represent a minimal hazard due to concentration of the elements in the solution (limited chemical toxicity) and unlikely internal ingestion. Additionally, for aerosols formed using these solutions, the concentrations present are minute, and masks are worn to reduce the risk of inhalation. These solutions are stored in the chemical/sample locker located in the front of the lab.

Compressed Gases:

Compressed gases exist in and are used in the lab. Compressed gas cylinders are delivered to the Rhines Hall gas cage located outside on the south ground floor level of the building. A gas cylinder cart and key to the storage cage are available from facilities for use in transporting cylinders from the gas storage cage to the lab. When transporting cylinders, it is strongly recommended that you do so with an additional person to assist with opening of doors and handling of the heavy cylinders. All cylinders must be transported with the valve cap securely screwed onto the top of the cylinder and secured to the transport cart with a safety chain. Cylinders stored or in use in the lab should always be

chained to the cylinder storage rack located at the back of the lab. A best practices related to safety and operation of compressed gas cylinders is posted in the lab next to the g

Electrical Safety:

As of this revision of the lab standard procedures manual there should be no modification of electrical systems occurring in the lab. Simple low voltage and current connections (e.g., BNC cables) between oscilloscopes and antennas or photo diodes are present and used in the lab, but they do not represent an electrical hazard.

Updates to the Procedures Manual:

When updating the procedures manual, all new changes should be highlighted and the group should be notified via email of the changes made. The document will be checked once a semester by the group to note all new (highlighted) sections and remove highlighting for an updated document. You are to sign the new version of the standard procedures manual contained in the laboratory information, training, and safety binder in the laboratory during your next visit to the lab.