

Group Goals & Expectations

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Schedule & Meetings

1. Individual Meetings & Weekly Research Progress

I have regularly scheduled meetings ~once/week with each group member. The time of this meeting is set according to our schedules at the beginning of each term. The general purpose of these meetings is to discuss progress (anywhere from plans to results to coding bugs) and identify next steps. At the end of each meeting, we will identify task items for next week. It is generally easy to cancel or move a regular meeting time if you're busy with classes/other research, sick, traveling, etc. If you ask to move the meeting, advance notice is appreciated to ensure that our schedules can work out to find a substitute time that week.

Please do not wait to work on your weekly research tasks until right before the next meeting. Research is non-linear, and we are all likely to face coding bugs, puzzling results, etc. Please always feel welcome to email or Slack message me with research questions in between meetings. If a topic is more involved or too urgent to wait until our next regular meeting (particularly applicable around conference times), you can always email me or send a Slack message to set up a separate/additional meeting time.

I know exams, illness, and unexpected events may arise. It is understandable to occasionally have no questions or updates (without having planned time away; for that see next page). If you have not had time to work on any of the task items identified at the previous meeting *and* you have everything you need to continue making progress, it is your decision to either cancel or to join for a brief check-in (e.g., 5 mins to make sure everything is okay and that you have everything you need to continue making progress). This clause is meant to prevent using the meeting time to “plug-and-chug” on items you can do yourself, which may limit growth. Individual meetings are meant for collaboration and discussion, and your task items are meant to help you learn and grow into an independent researcher. If you cancel your meeting two or more weeks in a row (without having planned to take time away), please do come to check-in briefly so I know everything is okay ☺

2. Reading Group – Hybrid

I aim to host bi-weekly (once every two weeks) reading groups, and group members should attend when they are in town and free (although I understand that travel or the occasional impending deadline/exam can sometimes interfere). The time of this meeting is determined by a poll sent at the start of each new term. At these meetings, students may optionally share research updates with each other at the beginning. Each meeting, someone will informally present a recent paper of topics related to our group's research. Questions/comments are welcome throughout the presentation. When new several students join the group at a similar time (e.g., this spring term), the “off weeks” may be used as a coding workshop. New students are expected to come, and continuing students (>6 months) are encouraged to participate as time allows.

3. Group Meeting

For students on campus, I strongly encourage you to attend the Wordsworth group breakfast held ~every other Friday at 9am. (Obviously if class times pose a conflict, classes come first.) These meetings are held as an informal breakfast/chat in the first half, and in the second a group member gives an informal presentation/update on their work. The presenter is scheduled ahead of time on a shared google doc.

Communication

We have a group email list, which is primarily used to communicate reminders about the hybrid reading group meeting, conference announcements, and other events of interest to the group.

For questions/communication in between our individual meetings, I can be reached over email (dadams@fas.harvard.edu) or Slack. I may have a faster response time to Slack messages, while email

may be helpful when including external colleagues or discussing important items for which we may want a record (e.g., conference funding, authorship, important plots). My cell may be useful for urgent items (e.g., broken code within 48 hours of a deadline/presentation, last-minute meeting scheduling, etc). I ask that when possible you please use professional contact channels (Slack/email).

As emphasized in this document, I encourage you to email/Slack me with questions. I do also encourage you to ask your peers for help, and a Slack group channel is set up for everyone to share coding bugs/tips, exchange plots, and share recent papers.

Conduct

All members should abide by the AAS Code of Ethics (<https://aas.org/policies/ethics>). Science is a very collaborative endeavor, and enthusiastic participation in informal discussions will benefit us all: to generate new ideas, facilitate collaboration by sharing different skillsets, and cultivate a feeling of support and belonging in science. It is important to approach discussions in a welcoming, supportive manner and to treat each other with respect. Please reach out to me if you have suggestions to contribute to a positive group culture; if you have a disability and there is an accommodation I can make to support you; and/or if you have an interaction with a group member that did not meet these expectations.

Questions/De-bugging Code

There is no dumb question, and I encourage you to send all questions my way! To grow as a scientist and programmer, it is often helpful to make an attempt to field your question yourself. This will also allow us to discuss the question!

If your question relates to a coding bug, please make an attempt to resolve it yourself. The following check-list may be helpful:

- Always always always try to compile/run your program.
- If you get a syntax error, try to google it. Stackexchange often has a lot discussions about common errors, and more often than not, the advice is helpful.
- If you're stuck in a while loop or you have a logical error (getting results that don't make sense), it may be helpful to add print/write statements throughout the program. How far into the program did the code run? Do the values of intermediate variables make sense?
- Always double check indices! Most of my logical errors relate to improperly indexed arrays/lists!

If your question relates to a plot, please make an attempt to explain it. For KINETICS outputs, think about the reaction pathways: you can search the output for "PRODUCT." to learn what reactions contribute most to a species' prod/loss at a given altitude. It can also be helpful to draw a cartoon of the chemical network.

Work/Life Balance

Schedule: Academia comes with a lot of flexibility in your schedule. My schedule varies; in particular I have a habit of replying to emails at night. If you receive an email/Slack from me at irregular hours, please know I don't expect you to be working then. (In fact, it is healthy to spend time away from your emails/Slack after hours and on weekends.)

Academic year: Undergraduate courses are notoriously tough, and classes come first! Please no worries if you need to postpone an individual meeting to focus on your classes. Generally, I encourage students to set aside ~6 hours/week for research time (including meetings) during the academic year.

Summer terms: During the summer, most undergraduates work on a research fellowship, and group members are expected to work the equivalent of a 40 hour week. (Academia is not a 9-5 type of job, so this should be averaged out. For example, if you work day-and-night to get preliminary results for an

abstract deadline, some time off the next week would make sense.) I encourage you to attend in-person lunches, seminars, and office time some weekdays to facilitate interactions with other group and department members.

Programming-based research comes with a pro/con: when & where you work are very flexible. I have found that the lack of a schedule (particularly during the summer with no classes and fewer seminars) can be tricky for researchers at all levels. I encourage you to develop a (semi-) regular schedule that fits best for you. Finding a regular sleep/work/life schedule and leaving your room to work from populated areas often benefits your health.

During the summer, I have noticed that social support for students may change and pre-freshman coming in are new to campus. I try to organize occasional after-hours excursions (e.g., art museum, movies, dinner, etc.). These are meant to be team-building ways to support each other and make friends, but are always 100% optional.

Academic breaks/holidays/vacation: As noted, research is flexible. Balancing research and courses is tough, and I encourage you to rest and recover in between terms. During long breaks (e.g., several weeks between terms), it can be helpful to use *some* of the time to accelerate research progress with classes out of the way. As exams and academic breaks arise, I will do my best to check in about which weeks you would like to pause research and I encourage you to communicate about needing to pause meetings for exams/vacations as well.

Health (incl. Family Emergencies) always come first. Science will always be here for you when you get back! Please let me know if there is anything I can do to support you, or if you'd like help connecting to on-campus resources.

Conference Attendance

At the start of the research position, a research objective is identified. Once preliminary results are made (may take anywhere from a few months to a year+), it is important to gain experience presenting your results at conferences. Conferences are a chance to get external feedback on your work, build collaborations, and improve visibility of your future paper. There are many relevant conferences, and in the past students have attended AGU, DPS, and AbSciCon. To present at a conference, you must first submit an abstract a few months in advance.

In past years: Most conferences have a travel grant to apply to. In the past, in-person conference attendance is fully funded if you have been awarded a travel grant. (The grant pays ~half or more, and research funds cover the rest.) If you are not awarded the grant, only online attendance is covered by research funds. Exceptions exist, and funding changes year-to-year. Any exceptions to this will be recapped in email before submission of the conference abstract, and you will be notified of any changes.

After presenting at one conference, it is expected that you will obtain new results before attending a next (e.g., a notable change to your methods, a follow up with something new reported, etc.). 'New results' includes the submission or acceptance of a paper (upon which the paper will be online and presenting the work will improve visibility).

Research Process & Output

A research notebook of some type will be useful. (Need not be pen/paper.) Most important is to save an explanation of input/output files as you create them. Imagine if you walked away from your research for 2 years? 5 years? The notes should make it easy for your future self to pick up right where you left off. (Otherwise, it is easy to forget the subtle differences between inputs and model runs.)

As you create important plots (e.g., preliminary results) it may be helpful to store them in a google/word document or a power point. I prefer to save and annotate my plots as if I were creating slides for an

informal presentation, or creating the draft of a paper. Explain how to read the plot, summarize the key takeaways, and note anything puzzling.

As you learn the ins/outs of KINETICS and general coding, it can be helpful to keep a notebook of what you learned. For example, explaining what a cryptic error means and how you fixed it; noting in what subroutine you changed a rate coefficient; etc.

A major research output is to present at a conference (see above). Leading up to a conference, we will meet to practice presentations and q/a.

The final goal of research is a publishable manuscript. (Although this takes a lot of time to reach.) For the introduction, it is important to gain context for your project: what have others done? What set the stage for your specific research question? The best way to do that is to read. Read. READ. Once you have that story arc in mind, I encourage you to close all resources and open a blank document. Make an outline and then write the first draft of the introduction as if you were explaining the background and context of your project to a knowledgeable friend outside of the field. (You wouldn't want fancy jargon and you wouldn't want to throw irrelevant details in. That would confuse them!) This will help you find your own voice. Then refer back to the papers to fill the details in & add references. In the results section, it is often helpful to add the figures and fill the captions in first. Identify the key takeaways, summarize your main result, and then later add in the details.

All writing must be in your own words with your own voice. It is generally okay to re-use *your own words* for conference abstracts and program proposals. Submitted/published manuscripts must be in original wording (cannot match even *your own* past manuscripts). Co-authors may directly edit the writing or directly contribute text (at the 1st-author's decision). Please share your abstracts and manuscripts with all co-authors ~2 weeks before submission, and you are encouraged to share all writing materials with me earlier for help with wording/structure/etc.

Authorship

Students are each working towards their own 1st-author paper for the project agreed upon at the time of joining.

I strongly encourage collaboration and working together. The more the merrier on a paper! Co-authorship is granted if you have made a contribution to the *science*. (This can mean providing an idea key to the paper, but generally doing science means contributing to or carrying out some sort of experiment/model run.) The best way to gain co-authorship is to be attentive at meetings, engage in discussions, and think about ways the work you have done could be relevant to improve someone else's project. I will also do my best to initiate collaborations between students when I see ways for their projects to connect.

External Research/Programs

Your early career is a great opportunity to test the waters of different research topics, methods, and fields. I encourage you to get your feet wet in as many topics as possible. Working towards two or more projects (especially during classes) will be demanding, so I encourage you to communicate about a schedule/load that works best for you. (An example may be meeting every-other-week instead of every week to reduce meeting time and to give you more time in between to work on your tasks.)

KINETICS

KINETICS is not an open-source program, per the authors (Yuk Yung and Mark Allen). Please abide by the KINETICS user agreement, which states the source code may not be shared or posted publicly.