Thorneywork Lab Handbook

Thorneywork Group

August 8, 2025

Contents

Mission Statement

Our current goal to comprehensively understand fluctuations and transport of materials in driven, out-of-equilibrium systems. Understanding transport is important in a wide variety of different scenarios, from exploring biological dynamics to improving state-of-the-art molecular sensing and DNA sequencing devices. Moreover, elucidating the statistical mechanics of non-equilibrium systems represents a significant fundamental challenge.

We are based in the Physical and Theoretical Chemistry Laboratory at the University of Oxford. We use soft matter physics to solve fundamental problems drawn from a diverse range of fields, from condensed matter physics to biology. To achieve this, we build novel experimental model systems that allow us to probe complex phenomena at the micro and nanoscale, exploiting a range of techniques, including microfluidics, optical tweezing, colloidal suspensions, nanopores and DNA nanotechnology. Working with this variety of techniques allows us to probe phenomena from the single-particle to continuum limit and to identify universal physical behaviour across different length and time scales.

1 Roles

The group contains researchers at almost every stage of their career, from undergraduate interns to a principal investigator (PI). Every lab member has a different role to play, and to help newer or younger researchers we have briefly outlined the main responsibilities of each role here.

1.1 Principal Investigator (PI)

It's the job of the PI to structure the lab's big picture research. The PI shapes the scientific ideas and projects the lab works on, and they are responsible for managing the group and securing funding for us. As well as research, writing, grant applications, and other science work, they usually have teaching and lecturing responsibilities, committee roles, and reviewing and external projects.

1.2 Post Doctoral Researchers (Post Docs)

Post docs are researchers who have completed their PhD but haven't yet got a faculty position. They tend to have more independence in their research than more junior researchers, and can pursue their own projects within the broader scope of the group's research. Often they have specific areas of expertise and experience from their previous research which can be a great asset to the group. As with other researchers, they may have teaching responsibilities, and they also can supervise master's students and interns.

1.3 DPhil (PhD)

PhDs are usually completing 3-4 year research projects under supervision of the PI. This is usually a scientist's first "big" research project. Day-to-day, they are usually running experiments (or simulations), analyzing data, reading papers, or sometimes teaching. They also often take responsibility for supervising master's students or interns. Sometimes they will be busy working on papers, and late-stage PhDs should be found writing their thesis.

1.4 Part II Students (Master's)

Here at Oxford, Part II students are fourth year chemistry undergraduates who are completing their first research project as the final year of their degree. The project is about 7 months, or three 10-week terms, and finishes with a report and viva (spoken exam/discussion between the student and two senior researchers). The project can be a steep learning curve after the taught undergraduate course, which is very structured with lectures, supervisions, and exams. However, there is plenty of support in the group, from PhDs to our PI. Part of the importance of this year is also to work out how to learn and work independently, which is useful for the future even outside academia.

In the first term, there will be a big focus on learning experimental techniques to produce really "clean" data, using Python and some mathematical tools for data analysis, and reading papers to get familiar with the project. This should provide a good base for running experiments and analysis in the second and third terms, and lead to a well structured report with some really nice research in it.

1.5 Undergraduate Interns

Interns are usually in the group for anything from 4-10 weeks during the summer. Internships can be an excellent opportunity to experience research first hand and figure out if a PhD or academia is for you. Normally the PI and a PhD or post doc will have a well-defined project for the intern; it should give them a chance to run some experiments and practise data analysis, which is quite different from undergrad labs. The research outcome is often very useful to the rest of the group too, so even with a few weeks you can contribute something to science!

2 Open Science

Open science is a research approach which promotes sharing knowledge, including data, results, code, and publications (e.g. through open access). We aim to practise this and its relevance is outlined in specific sections below. Part of open science is building a cohesive group environment - we often have coffee/tea and lunch together, which is encouraged! On Friday we have a tradition of going to Najar's for falafel wraps (*Falafel Friday*).

2.1 Sharing Chemicals and Lab Resources

As part of your onboarding to the group and training, you should be informed of which chemicals and lab resources you can use. In general, we aim to share materials wherever possible, but you must make sure you have received the appropriate training and safety inductions. We have a chemical stocklist and all have a responsibility to monitor the levels of the different chemicals and consumables we use in the lab. If you notice something running low, please let a senior PhD/postdoc know so they can order more.

2.2 Sharing Code and Version Control

There are a number of different techniques we use for data analysis in the lab which are useful for a lot of experiments. We therefore are keen to implement a collaborative approach to coding, where for example particle tracking code or a function for calculating the PSD of a time series are shared between everyone.

A valuable resource is the group GitHub, where standard analysis techniques can be found and you can upload your own code. Github is also a helpful tool for version control. More generally, though, if you are editing a piece of "lab code" or someone else's code, always save your own copy of it to edit, rather than changing the original. This is especially true of LabVIEW on lab computers.

2.3 Lab Collaborations

We have a number of collaborators who we work with on various projects, both inside the department and wider university and in different research institutions and countries. Collaboration is absolutely crucial to scientific research.

If you meet someone at a conference or seminar or come across their group's work and think they'd be useful for us to work with, let someone know! There are always gaps in what we as a group can do and it might be that this person can help us.

2.4 Publications and Authorship

As a lab, we don't put everyone's name on every paper; this does not reflect the fact that different people work on different projects and very rarely will everyone have worked on one research output.

However, just like we said above, collaboration is key! If you have been contributing to someone else's project (running experiments, data analysis, etc.) that will be reflected on the paper. Almost every project should involve some degree of teamwork and collaboration within the group.

3 Communication and Logistics

Communication in a group is very very important. Our main methods of communication (other than talking!) are Microsoft Teams and email; the university tends to frown on other options like Slack or Zoom. There is no expectation to reply to messages outside normal working hours - in general though, it is good practice to reply within one working day.

Similarly, the expectation is that you should be working roughly 9-5 in the office and/or lab. The advantages of this are that it gives you structure and increases your overlap with other members of the group, so if you need advice or want to chat about a problem there is someone around to discuss it with. Additionally, it leaves you free time in the evenings and at weekends, which can be just as valuable to your creativity or problem solving as hours spent at work.

There are obviously exceptions to this - if you are in the midst of writing a paper or a report, it might suit your working style to spend time in the library or a coffee shop, and this is absolutely fine. You might also prefer an 8-4, or a 10-6, and these are fine too. Work also might be busier at some points than others, and you might find yourself spending a few extra hours on particular projects or problems.

3.1 Meetings

As we are a relatively new group, and we expand every year, we are still trying out different meeting styles. Broadly, however, we have one whole group meeting every Monday morning at about 11.00am, to discuss what is happening that week and sort out logistics of sharing equipment. It is likely there will also be a meeting on Friday for a more in-depth review of progress, but this is probably split between PhDs and interns/Part IIs every other week.

4 Resources

The biggest central collection of lab resources is on the Q Drive (`Q:\`). Here you can find:

- experimental protocols (`Q:\Protocols`)
- lab maintenance information (`Q:\LabMaintenance`)
- LEAF information - the department sustainability initiative (`Q:\LEAF`)
- safety forms and risk assessments (`Q:\SafetyAndRAs`)
- soft matter club presentations (`Q:\SoftMatterClub`)
- useful past theses from this and other groups (`Q:\Useful Resources`)

If you have any further safety/LEAF/equipment manuals or forms which are relevant to the group, add them here!

The Department of Chemistry intranet also contains helpful resources and links to IT help, poster printing, etc.

5 Onboarding 101

A list of key things to know and do for new starters!

1. Attend any department-wide induction sessions
2. Know where the three group offices and labs are, and your desk
3. Laser safety training
4. Complete the safety forms and risk assessments for your work
5. Complete the code of conduct
6. Make sure you have IT access and card access to the building
7. Create a folder for your work on the L Drive (`L:\`)
8. Get a lab notebook, coat, and glasses from stores

6 Offboarding 101

Offboarding is just as important as onboarding. For everyone else in the lab, it is super important that you leave the data you have collected and the work that you have done organized and clearly labelled. This applies to physical experiments and samples in the lab, as well as data and results on your computer.

1. Go through all your samples in the lab, and discard ones that are not needed
2. If any lab samples are important to keep or will be useful, let other people in the group know that you are leaving them. Label them clearly with your name, date, and what they are (although this should already be the case...)
3. Similarly, go through the data and results on your computer. Any data which has been used for figures in publications should be clearly labelled as such and put into a named folder. Any data which may still be used should be also labelled with your name, date, and details of the experiment, and also set aside in a named folder. Lastly, move all your work that is no longer in use into the M Drive (`M:\`).

7 Ethics and Safety

All lab members should treat each other with mutual respect and kindness. There is no toleration of bullying, harassment, or discrimination. If you experience any of these or witness this behaviour, there are a number of people you can reach out to:

- your PI
- chemistry or MPLS Harassement Advisors, who can be found here
- *Report and Support* which is a university resource that can be found here
- the university harassment webpage contains further resources

As part of behaving responsibly, we also should be careful to follow safety guidelines in the lab. Although we are not an organic lab, it is still a place with risk, and we have risk assessments and safety protocols in place for a reason. In particular, you should have completed laser safety training. Always be aware of your surroundings and how what you are doing in the lab could affect others. Headphones are not allowed; however, you are welcome to play music out loud.

7.1 Sustainability

We are trying to making our lab practices as sustainable as possible. In keeping with this, we participate in LEAF, the *Laboratory Efficiency Assessment Framework*. It is a standard set by UCL which now involves over 95 institutions; it aims to address sustainability in lab-based research. By joining the LEAF program, we are committing to reducing our carbon emissions and using environmentally-friendly practices where possible. More information is available in the LEAF folder at `Q:\LEAF`, or online at `https://app.ucl.ac.uk/leaf/leaf_external`.

See also the 12 principles of green chemistry in Appendix A.

8 Money and Funding

Purchasing is done by the university R12 system, which you have to be trained to use. If you need something for an experiment, speak to the PI or a PhD/post doc about getting it. Purchases >£1000 require additional quotes and information to be supplied, which we can discuss.

Funding for conferences, etc., will depend a bit on your college/research stage but speak to other people in the group about what options are available. Also check out this page for information about travel and this page for information on expenses.

9 Accounts

The lab email (thorneywork.lab@chem.ox.ac.uk) has a number of different accounts associated with it. These are listed below:

Platform	Username	Password	Notes
Github	Thorneywork-Lab	RubberDuck22github	The github contains lab code repositories. These are key for collaborative coding.
Instagram	thorneyworklab22	RubberDuck22	We can share news and updates on Instagram.
Twitter	n/a	n/a	This is an alternative place to share news and updates.
IDT	Thorneywork Group	RubberDuck22IDT	IDT stands for Integrated DNA Technologies, an American company that manufactures custom DNA.
Gmail	thorneywork.lab@gmail.com	RubberDuck22gmail	

Table 1: Group accounts and passwords.

Appendix A

The twelve principles of green chemistry are outlined here:

1. Waste Prevention
2. Atom Economy
3. Less Hazardous Chemical Syntheses
4. Designing Safer Chemicals
5. Safer Solvents and Auxiliaries
6. Design for Energy Efficiency
7. Use of Renewable Feedstocks
8. Reduce Derivatives
9. Catalysis
10. Design for Degradation
11. Real-time Pollution Prevention
12. Safer Chemistry for Accident Prevention

These were first introduced by Anastas and Warner in *Green Chemistry: Theory and Practice* (1998). More information can be found here. They are more geared towards organic synthesis but the principles still apply to our work.