

## NeuroView

## Mentoring: A three-generation perspective

Inbal Goshen,<sup>1,2,\*</sup> Raz Yirmiya,<sup>3</sup> and Adi Kol<sup>1</sup><sup>1</sup>Edmond and Lily Safra Center for Brain Sciences (ELSC), The Hebrew University of Jerusalem, Jerusalem 91904, Israel<sup>2</sup>FENS Kavli Network of Excellence (FKNE)<sup>3</sup>Department of Psychology, The Hebrew University of Jerusalem, Jerusalem 91905, Israel\*Correspondence: [inbal.goshen@elsc.huji.ac.il](mailto:inbal.goshen@elsc.huji.ac.il)<https://doi.org/10.1016/j.neuron.2022.01.009>

This NeuroView is intended for graduate students who are not sure how to choose or what to expect from a mentor as well as mentors who are uncertain what to give mentees. Two principal investigators and a current mentee will share their perspectives on this bidirectional relationship.

Your mentor is going to be a significant part of your PhD; in fact, the specific research question you ask is not that important in comparison to your choice of a mentor. A good mentor not only will influence your performance and achievements in graduate school and prepare you for a good postdoc but will have a major impact on your long-term career trajectory and research productivity, including publication and grant success.

Mentoring is, by definition, custom tailored, and not everyone needs the same kind of mentoring. Students should get mentored based on their strengths and weaknesses, their pace, their specific interests, and their source of motivation. At each stage of your scientific development, the mentoring should be fine-tuned accordingly. Another fact that is not often discussed is that one person cannot be a good mentor to everyone. No matter how great a mentor is for some students, there still needs to be some basic compatibility between mentor and mentee. Sometimes the match just does not work, and we fail.

A mentor-mentee relationship is not an unbreakable bond. It can, and should, be broken by the student as soon as possible if the fit is not good. Mentors are more careful at the beginning, so whatever bothers you (and cannot be resolved by one-on-one discussion) is only going to get worse, not magically disappear. If your mentor doesn't feel like the right choice within 2 to 3 months, you should seriously consider cutting your losses and finding a different one.

Below, we discuss some of the basic guidelines, as we see them, of mentorship. You can use them to look for a good mentor or to avoid a bad mentor

from the start, to better understand your mentor's perspective of your mutual relationship, and to request some of the things we think students deserve to receive from their mentors. It is written by two principal investigators (PIs), Raz and Inbal, who were once a mentor and a mentee, and a present graduate student of Inbal, Adi, representing this truly bidirectional relationship.

**Hands off, but gradually...**

**Inbal Goshen and Raz Yirmiya:** Micro-management is the basic instinct of PIs. Good mentors have to fight it. Mentoring, from the PI point of view, starts with giving someone else the power over experiments. Moreover, as new tools are absorbed into the lab, which the mentor may not even know how to use, even more trust is required. However, no student can start by running experiments by themselves when they have no experience. So, at the beginning, a mentor is very hands on, not necessarily in teaching (a student can learn a lot from the lab manager or from other students) but in asking about every detail of what you have learned. As the student matures, the mentor can gradually take their hands off. The aim of this process is to let you know that your mentor trusts you to run the experiments, to solve problems, to ask the right people for help, and to come talk with them when you need to. Yes, there may be some frustration, but the success will be felt even stronger. A mentor who sits with you at the rig all day definitely prevents this frustration, but they actually teach you that they don't really trust you, and because the easiest thing to do is constantly ask the

ever-present mentor for help, your progress toward independence will be hindered. And don't worry, your mentor makes sure to know everything, there are ways...

**Adi Kol:** Only when you practice a new technique, rather than just follow a list of instructions, do you acquire a new skill. For example, after the exciting moment of witnessing a neuron fire for the first time, I decided to learn electrophysiology. At the beginning, I read books on the patch-clamp technique and witnessed others perform intracellular recordings, but I truly started to understand how to patch cells only when I did it myself. In fact, most of the "ah ha!" moments I had were when I was alone at the lab with the electrophysiology rig.

There is no magic rule as to when to seek help, but when you feel stuck for several days, and don't have any clue as to what to do next, it is time to ask someone with more experience. There is a difference between an educational process and a frustrating dead end.

**Time, the most valuable resource**

**IG and RY:** Time is in constant shortage, and there is no grant that can get you more. A student is entitled to some mentor time that is theirs alone. An open-door policy is great but is often more a principle than an actual possibility because mentors are too busy to meet every student whenever they wish to. This is why the mentor should save half an hour a week for each one of their students. Often you don't use it, rarely do you take the entire time, but this time is yours!



**AK:** The continued availability of your mentor is crucial to your doctoral progress, as it can fuel, in real time, the momentum needed for optimal advancement of your various projects. Insist (nicely) to have your weekly scheduled time, and talk to your mentor, even for a few minutes and even if you have nothing new to show. This is when they remember the conference they heard about and want you to go to...

**IG and RY:** Your mentor should teach you time management by setting an example, defining deadlines, and being reasonably flexible about them. You may initially think that the deadlines are very permissive (“surely, it won’t take me that long to do it!”) and then ask for an extension. That’s the way science moves—very, very slowly. As for work-life balance, the only thing your mentor can do (besides setting an example) is remind you that the balance changes from time to time, and it is fine.

**AK:** Doing a PhD takes a long time. In addition to striving to accomplish your academic duties, you will probably experience big changes in your personal life (relationships, kids). One great piece of advice that Inbal gave me was that life-work balance is dynamic. There are times when I needed to focus on specific deadlines and invest extra time at the lab, and there were times when I wanted to be more at home with my wife and family. Letting go of the rigid expectation for fixed priority helped me decide what is right for me at any given moment.

### Optimism versus realism

**IG and RY:** Your mentors need to be optimistic! There’s a good reason for it; to get to where they are, some of their experiments had to work out in the end, but these experiments were not a walk in the park—far from it. A good mentor knows pretty early whether there is a good likelihood that a project will work, so trust them even if all seems lost for you. The other side of the coin is that your mentor may recognize that a certain project is likely to fail, so even if you feel invested, it may be a good time to cut your losses.

**AK:** When you are at a junction and wonder which is the best way to continue a project, sit down with your mentor and put all options on the table. If you think of a crazy idea for an experiment, present it to them; as long as you can make logical

arguments that support it, do not give up and try to convey the motivation and enthusiasm behind it. This dialog can uncover critical caveats in your idea that should be addressed, and anyway, your mentor’s blessing for a project is necessary.

### Feedback

**IG and RY:** Feedback is the only formal way for you to know what your mentor thinks about you and your work. It is a great way to show that the mentor sees what you are doing, and it’s definitely fun to get positive feedback! But what about the more difficult feedback? When something needs to change? Feedback should be honest, even if it is hard, and it should come from a place of empathy because without it, there is no chance it will be received properly. As much as they can, a mentor should give feedback that suggests how to implement a change rather than just complaining about an issue and letting you figure out a solution. Also, it would be better for them to raise one issue at a time, as no one can process more than that. Remember, feedback is the mentor’s way to show they care, even if it is harsh, and should be viewed as a gift.

**AK:** Feedback assimilation is a powerful tool for both personal and professional growth. The feedback is usually given at a sensitive moment, for example, when we present our long, hard work. At that moment, we expose the way we comprehend and interpret our data and can be defensive about it, which is why hearing feedback can upset us and prevent us from accepting constructive advice.

Thus, the best way to get feedback is to ask for it! When you ask for feedback, you mentally prepare yourself for the moment you will receive it, and be open minded while examining it, which highly increases the probability that you will learn from it.

**IG and RY:** You can give feedback, too, and help your mentor become better. Mentors love getting honest feedback from their students on what they are doing well and what they are not paying enough attention to.

### Teach them science, not just experiments

**IG and RY:** Your mentor is supposed to teach you how to do science. This in-

cludes not only planning, conducting, and analyzing experiments but also the soft skills of how to write and talk scientifically. Without them, you will finish your graduate studies like an excellent technician, but not a true scientist.

Talking is an important skill in science. A mentor’s task is 2-fold: to allow you to speak and to let you practice. Your mentor should let you talk, even if there is someone else who can do a better job. Even the students who are not great public speakers must talk, or they will never learn. Before each talk, you should present it to the whole lab, and the mentor must approve the slides; while anyone can flip their words during a talk, there really is no excuse for typos.

A mentor hopefully has at least one paper-writing experience with each student. You can’t (and there is no point to) sit with the mentor on every draft but try to meet with them at least at the beginning (on the figures) and the middle and make sure to ask them to explain in a comment when they make serious text changes. At the end of the process, the paper will look nothing like the first draft, but, hopefully, it will be much better, and you will have learned a lot.

Manuscripts are not the only kind of writing that graduate students have to learn. Writing scholarship applications is also important. Look for scholarships! There are plenty of them around! First, research the specific scholarship, understand exactly what they are looking for, and write specifically for that. If there is a scientific part, you can ask your mentor if you can read one of their grants that covers that topic and then write it in a simpler way for lay people. Your mentor should read the whole application as well as your CV. Listen to them. It is important to know what comes first, which part (high school jobs) is no longer necessary, how to quote papers, and how to make the CV look more appealing—things that you only need to learn once but that you won’t learn without your mentor.

**AK:** When I started my PhD, I had a lot of questions about the brain that I was curious about, and I wanted to use scientific tools to try to answer them. But an important (and exciting) part in every project is to share your results, and your interpretation of them, with the scientific community. This mainly includes writing

the paper itself and presenting it in conferences. Don't be discouraged if you get a lot of comments on these skills at the beginning. On the contrary, such criticism means that the person who heard you speak listened carefully and wants to help.

### Generosity

**IG and RY:** A good mentor is a generous one. Generosity is reflected in a lot more than money.

Conferences are a crucial part of scientific life. In a well-funded laboratory, your mentor should be able to send you to one conference abroad (a flight away, at any rate) and one local conference every year. Choose them well! Going to the wrong conference, just because it happens to be nearby, is a waste of time. At the beginning of your PhD (first 2 years), you should be sent to a conference without any requirement, and after that, you should present something if you want to go. This a great motivator!

Conferences provide a great opportunity for mentors to be generous by helping with your first steps in scientific socialization. If your mentor goes to the same conference, it is their responsibility to introduce you to other PIs. It will make it so much easier to approach these researchers (and others) when you look for a postdoc or when you just need advice. When the mentor gives a talk, they should mention your name when talking about your experiments and preferably show your face in the relevant slides, not just the acknowledgments slide.

**AK:** Conferences allow you to share and discuss your data and ideas and to hear about the latest research in the field. For this dialog to be successful, attend conferences with experts in your field to gain constructive feedback. In addition, dare to approach and talk with your academic heroes.

You should get funding sources to cover your travel expenses. That way, you can save the lab's money for other opportunities and add the grant to your CV.

**IG and RY:** Another important gift a mentor can give you is an extraordinary recommendation letter. The letters from your PI are exceptionally important because no one knows you as a scientist

better than them. The letter should be: (1) strongly worded—no one can doubt that your mentor whole-heartedly supports you; (2) full of praise—for many areas of competence: planning and running experiments, analysis, writing, time management, social skills; if you have a problem in one of them, your mentor won't lie, but they won't write about it; and (3) long. This has several pluses. First, it shows that they are really familiar with you. Second, they give the individual reading the letter a chance to know you too. And third, it is impressive; the sheer volume shows that they had taken a long time just for you, so you probably deserve it.

Lastly, one of the most substantial things a mentor can do for you is to let you (yes, you!) be a mentor. You and your mentor should interview the undergrad, and if both agree that they could be nice and helpful, it's the beginning of a new mentorship. Some students are ready to be mentors earlier than others. Some can juggle three undergrads and some just one. Some can't. But all students at least deserve a chance. This is where you start to understand what being a mentor means: trusting someone else with your experiment, giving them feedback, and providing them with optimism. It's a start!

### Mentoring never ends

**IG and RY:** You should feel that whenever you will need your mentor, they'll be there, even long after your graduate studies are over. You will need their advice when choosing a postdoc lab, but you will also need their counsel when writing a research proposal and while choosing a position after your postdoc is done. Even when you have a job, you may want them to read your first grants and manuscripts and be reminded that, once in a while, at least one person is wholly on your side!

### Summary

**IG and RY:** The mentor-mentee relationship has a great influence on the student. We kept this NeuroView on the professional aspects and did not write about consulting your PI on personal matters; this depends on the level of trust and can vary greatly between students and

PIs. Similar to parenting, a good mentor should set a personal example for all the values they wish their students to develop: integrity, scientific rigor, hard work, tenacity, determination, enthusiasm, and intellectual excitement. If they exhibit these qualities themselves, you will adopt them, probably for the rest of your scientific career.

Choosing your mentor is one of the most important tasks of your graduate studies and happens when you are a young student. But even young students should know when something feels wrong. It is alright to ask for a meeting with your PI and say what is bothering you—it might help! And if it doesn't, don't waste your time, and leave.

So do your homework seriously when choosing a PI! Talk to the current students, make a rotation in the lab, join a group meeting, and get the vibe. You really want to make sure that you choose a good mentor who will help you finish, write, and publish your work, will help you forget the daily life struggle and focus on the bigger picture, and will take you (drag you, if they must...) out of your comfort zone and support you in achieving great goals. You deserve it!

**AK:** Your mentor will be more than just another one of your teachers. They will likely be your scientific role model. Pay attention to the way they manage their time, keep deadlines, solve problems, collaborate with colleagues, and deal with pressure. I find this implicit learning critical for my academic career and also fruitful for my well-being. Emulating your mentors' work habits can guide you in how to spend your time and energy wisely, allowing you to reduce stress, exhaustion, and frustration and even flourish in difficult times.

### ACKNOWLEDGMENTS

We thank Tomas Ryan, Ami Citri, and Tizah Kreisel for commenting on the manuscript and our funding sources, the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement No. 803589 to I.G.), the Israel Science Foundation (ISF grant No. 1815/18), and the Canada-Israel grants (CIHR-ISF, grant No. 2591/18).

### DECLARATION OF INTERESTS

The authors declare no competing interests.