

It Takes a Village to Train a Scientist

David Y. Barefield

Training for a career as a scientist is a demanding process that requires guidance, critique, and motivation from many different sources. Even the most successful scientists have a village of mentors who help them continue to grow. At the start of my graduate training, I had the benefit of working with Sakthivel Sadayappan as he was establishing his first laboratory at Loyola University Chicago. As I was worrying about putting together my thesis committee, I was struck by Sakthi's work assembling his own mentoring committee to support him as a young investigator. I remember wondering: at what stage does mentoring end? I have come to appreciate that thankfully it never truly does. Reflecting on my training through graduate school and my current postdoctoral fellowship, I recognize the indispensable contributions of a host of mentors who are willing to invest their time to help me succeed. Here, I want to share some of the roles played by these people and why they are invaluable to a developing scientist.

One hard step in career development is choosing a PI to serve as your mentor. Realistically, it is unlikely that you will find a PI who perfectly meets all of your needs. That's fine; finding additional mentors to address specific topics is an important component of scientific training. If you feel that something is missing in your mentorship, I suggest that you search your institution for someone who can fill that role. I have found that if you bother a faculty member enough and show that you are working to learn what they have to offer, they will often actively develop an interest in your progress. With these relationships, I have had mentors that have held me to high standards by critiquing my work, cheerleaders who have kept me going when nothing was going right, and teachers who have been generous with their time by patiently educating me in new topics.

As we develop as scientists, we learn to take criticism, and having mentors you can trust to give you the hard truth while also having your best interests in mind is essential. I learned this lesson poignantly from my thesis committee. After some early successes in graduate school, I fell into the classic graduate student trap of complacency and stopped working to improve my abilities. I also failed to notice how serious it was that I needed to step it up. Thankfully, I had Pieter de Tombe as chair of my thesis committee; Pieter is



excellent at clearly and succinctly cutting to the heart of a problem. After a solid reality check, I embraced the effort and lifestyle required to develop into a competent scientist. Other mentors, including senior postdocs in my department, kept me on track by encouraging me when research became overwhelming, and I felt like I was burning out. Others provided a slap on the wrist (literally, once) when I needed to improve my efforts. During this time, I noticed that once I started putting in the effort, busy people started making time to discuss my problems, and my group of mentors continued to expand.

A postdoctoral fellowship is an opportunity to move toward independence and requires a mentor that gives you the space and resources to drive your own project forward and learn from your mistakes along the way. To receive this kind of training, I joined Elizabeth McNally's laboratory at Northwestern University. Beth has a large laboratory with multiple projects spanning diverse areas of biology. This provided a contrast to the smaller, more focused laboratory where I did my graduate work. Additionally, Beth's research is highly translational, with projects generated from and pertaining directly to patients. Having the opportunity to independently develop a research program, coupled with excellent mentorship and environment, has profoundly improved my capabilities as a researcher.

I have been fortunate that both Sakthi and Beth are enthusiastic about discussing my career progress and have put an emphasis on professional development; however, I am aware that not every mentor shares this emphasis. From my experience, this instruction is vital for career development, and trainees who are missing this component should seek out an additional mentor who can advise them in this area. Even though my mentors strongly support me, I regularly discuss

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my overall progress with researchers from other institutions. It is advantageous to hear the opinion of someone removed from both your day-to-day progress and institutional politics. These mentors have kept me on track by discussing the importance of meeting specific funding and publication goals. They have also reminded me to get back to the bench and not to obsess over the big picture. Building these connections throughout your training has the added benefit of developing a strong professional network of people who are familiar with your history.

As you grow into your field of expertise, another useful mentor is someone with whom you disagree with regarding open questions in your field. It was a notable coming of age for my own training when I realized I knew enough to have a defensible position on a subject and was comfortable debating with established investigators. (Obvious caveat: be respectful and don't overstep your expertise.) These discussions will make you memorable, especially as a new voice in your field.

When I first started informally advising junior graduate students, I was able to appreciate how much I had learned about science at the bench and as a career and realized how little I knew about mentoring someone else. I am working toward becoming an independent academic researcher, which will require me to effectively mentor trainees. During my informal mentoring of laboratory members and other colleagues, I have kept in mind the most helpful roles that my own mentors have played. I aim to live up to the examples they have set and hope I can be a useful member of someone else's village of mentors. To improve this skill, my own village will have to continue to grow as well.

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