

## The Challenge of Mentorship

Sarah M. Schumacher

It is hard to pinpoint a particular event or experience that prompted me to get into science in the first place, probably because science has always been an interest and part of my life. I am continually fascinated by the complexity and adaptability of nature and the process of scientific inquiry. It all began with catching bugs, making plant concoctions in my playhouse, and dyeing part of my mom's new carpet blue with my first chemistry set. Fortunately, I had parents who recognized and fostered this passion from an early age. They allowed a constant stream of insects, reptiles, and amphibians to be caught and observed in my terrarium and each mentored a junior high Science Fair project all the way to the state competition at the University of Illinois. This acceptance and support bolstered my passion for a life of scientific discovery.

My career in science officially began during my undergraduate years at Indiana Wesleyan University. As a student in a small liberal arts college with a strong science department, I had opportunities one might not have at a larger state or private school. I had the privilege all 4 years to serve as a laboratory technician and undergraduate student instructor. Initially, this work involved organizing stocks and preparing laboratory supplies. As I progressed in my studies and began my independent research with Dr Burton Webb, my responsibilities expanded to include running laboratories, aiding in the design and testing of new laboratory experiments, and delivering a few laboratory lectures. Working in Dr Webb's laboratory gave

me hands-on experience, an idea of the complexity of pathophysiologic conditions, and an appreciation for the scope and application of scientific research. As a senior, I had the opportunity to train a sophomore to take over the project when I graduated. Overall, this experience confirmed my passion for scientific inquiry and gave me an appreciation of the challenge of mentorship.

I have been extremely fortunate in my career to have mentors at each step who were perfect for the stage of career I was in. During the undergraduate years, they fueled my passion for scientific discovery and began to teach me the skills needed for a career in research. In graduate school at the University of Michigan, Dr Jeffrey Martens dispensed invaluable mentoring in both writing articles and grants and delivering effective oral presentations. Importantly, Jeff went beyond this basic training, constantly challenging me to think about what I was doing and why, honing my experimental design and pushing me to get out of my comfort zone and strive for excellence. My postdoctoral mentor at Temple University, Dr Walter Koch, gave me the space to let me drive my research and develop independent pathways, challenged me with mentoring opportunities, and exposed me to the broader aspects of what a Principal Investigator (PI) does besides supervising a laboratory. Looking back, I can see how each mentor has stretched and molded me into a confident researcher and influenced the development of my personal mentoring style. Through my experience, I have gained some perspective on the difficulty of selecting a mentor and of being a mentee worthy of their continued investment and hope my experience will encourage the next generation of scientists in their career pursuits.

When beginning graduate school, I think it is extremely important to acknowledge one's strengths and weaknesses and to choose a mentor who will work to iron out those weaknesses. Trainees should also pay close attention to mentoring style, the attitude of the mentor and their laboratory, and the environment they foster when considering whether this environment is one in which they would struggle or thrive. When I began graduate school, the PI nicknamed my 2 laboratory members Statler and Waldorf, the pair of cranky old Muppets that heckled everyone from the balcony. The heckling was never ill-spirited and provided a constant push to grow as a scientist and respond appropriately to the inevitable criticism and challenge of scientific peers, reviewers, and grant



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committees. In addition, trainees can become too focused on working in a particular field of research (HIV or Alzheimer). Although it is important to enjoy and be passionate about the science, trainees need to understand that the important thing is to learn to think critically and manage research projects under someone who expects progress. It is important to find a mentor who does not view graduate students as mere employees but as future scientists who should be challenged to grow in all areas crucial for the career path being pursued. A graduate student needs to be equipped with the tools and confidence necessary to become independent.

At the postdoctoral stage, it is important to consider the scientific field that one wants to contribute to. Building relationships with a mentor's collaborators and colleagues and networking within the field both locally and at national meetings will expand one's own network of fellow scientists and mentors. This will provide invaluable insight into the career and opportunities for collaborations in the future. It is also important to have a mentor who exposes you to the broader responsibilities of a PI, including meetings about intellectual property and patent protection, collaborations with industry, and grant design and execution that will aid the preparation for an independent career. Before pursuing a faculty position, it is critical to have many opportunities to train graduate students and technicians and work with project teams to learn how to

manage people in the laboratory. It is also invaluable to have mentors beyond one's PI that can provide a new perspective, objective advice, and additional counsel for any life or career decisions. Having such inclusive mentors who were honest with me about what it takes to become an independent scientist and were stewards of my passion for research has established the platform on which to build my independent career.

Finally, it does not matter how good a mentor is if the mentee does not listen. It is the job of the mentee to appreciate the wisdom and perspective their mentors have gained from experience and use that as a guide when making one's own decisions. More importantly, although a lack of knowledge on a particular subject can be easily overcome by study, the personality traits crucial for a life in research cannot be taught. A passion for science and a strong work ethic are necessary for success. Scientific research involves creativity, resilience, adaptability, perseverance, and an open and observant mind to follow the science. An independent scientist is both student and master, balancing a teachable spirit with the confidence to push their research beyond exploration and advance the field. These are the goals I have and will continue to strive for as I pursue my independent career and hope to instill in my future trainees.

### Disclosures

None.

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