

# Mentoring Philosophy and Practices

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There are two ways one might go about writing a dissertation in philosophy of science. One way is first to figure out one's overall philosophical approach to science by asking such questions as these: Are you a realist or an anti-realist about unobservable entities such as dark matter? Does all science reduce to fundamental physics or are there genuinely emergent phenomena? Put another way, are you a reductionist or anti-reductionist about scientific theories? Having done this, one then focuses on a particular science or phenomenon of interest and tries to figure out how that science or phenomenon supports your overall view. In effect, this approach puts "philosophy" first and uses the scientific exemplar as a means for supporting some overall philosophical position.

A second way to approach writing a philosophy of science dissertation is to do what I've been doing my entire career. On this approach, one first gets interested in a branch of science because what it has to say about the world is interesting and challenging. Only then does one investigate the consequences for a sophisticated understanding of scientific methodology. For example, how do scientists in field  $X$  think about understanding and explanation? How do they think about the relations between the theories and models with which they work. What do they take to be the relationships between their theories and others? For instance, classical mechanics is used today by engineers, material scientists, and by the space program. But theoreticians have told us that quantum mechanics is the true theory of the small and that general relativity is the true theory of the large. By what right are

these scientists and engineers allowed to continue to employ a theory that they have been told is false?

I actively encourage my graduate students to approach their projects in this second way. To my mind, this approach is intellectually more honest and more truth conducive. It is the harder approach because it forces students to think much more deeply about the philosophical implications of differing approaches to science taken by practitioners in different fields. It also enables them to develop a deeper familiarity with the science. I believe that this approach has enabled my students to write original, field-changing dissertations. It certainly has helped them stand out in a very competitive job market. Furthermore, I simply do not believe it is the job of a philosophy supervisor to assign a thesis topic to a student who has asked to work with you. (Of course, this can definitely be the norm in other disciplines.) If a student is not completely invested in their project, they will have difficulty writing and finishing the dissertation.

I encourage my students to meet with me to discuss readings of their choice concerning the particular scientific phenomena upon which they've settled. This is the absolutely best part of supervising students, as I really do get to learn new material. For instance, I've learned about error analysis in numerical methods, about the chemical manufacture of nanoparticles, about divergent series in quantum field theory, and about how one can adequately model hurricanes and cloud systems in the study of climate science. Over the years, I believe I've developed an effective ability to make philosophical connections between a particular student's new project and other philosophical projects that may very well be of interest and relevance to that new project. For example, there are indeed connections between modeling strategies for understanding the behavior of nano-materials and the modeling of hurricanes as meso-scale structures in the atmosphere. Such connections have allowed my students to make genuine progress in the philosophical understanding of how models represent systems in these different fields.

Depending upon how the student works (and I've discovered that there are a lot of different ways to approach writing a dissertation), I adjust my meeting schedules and agendas to maximally benefit the student. Some prefer to work more or less independently, showing me work when it is near completion. With others I meet more frequently and give comments on multiple drafts. In all cases, while students are deep into the details, I keep my eye on the big picture to help ensure that when they finish they have the right kind of publications and overall profile to make them competitive on the job market.

Thus, I approach mentoring with a pretty light touch—one that is designed to let the students do their work in a fashion that maximizes their potential and supports their natural abilities.

I also spend quite a bit of time helping them become professionalized. I provide feedback and comments on papers to be submitted for publication. I assist in the construction of research and teaching portfolios and CVs for their job searches. This is a difficult exercise as it is quite different from the actual doing of philosophy. But, it is extremely important. I act as a sounding board and help students deal with various stressful situations such as panicking before mock job interviews, rehearsing their spiels, and just generally helping them deal with difficulties they are bound to experience in the profession at large.

I have also found that as students transition from graduate school to tenure track positions, there are often a number of bumps and even crises along the way. One student, for example, discovered immediately that the department that hired her was an unfriendly, unsupportive, and a generally exploitative place. I worked hard to help her deal with the stresses of that situation and to secure a new tenure track position in another, much friendlier, department. The institutional and interpersonal difficulties that one can find in academic departments are, by and large, not something experienced in graduate school. I try to bring my own experiences to bear and strive to help my students deal with these issues. I have also had a couple of students who have successfully transitioned out of academia and I've assisted them to the best of my ability in making that transition.

I am always available to talk and to help my students make the major change in lifestyle that comes with finishing graduate school as smoothly as possible. In addition, I do not see the mentoring relation as something that stops when a student receives her degree. In this way, too, my students become my colleagues. I ask them for feedback and comments on my work at least as often, if not more, than they ask that of me. In fact, this is typically the case even before they get their degrees.