# Looking Beyond the Ph.D.

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Editorial

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# Looking Beyond the Ph.D.

You just defended your thesis successfully and completed all the requirements to obtain a Ph.D. degree. What will be your next career move? How will you secure the position that could lead you to establish a successful career? The excitement of completing a major professional degree quickly transitions into a concern of practical reality. This type of quandary is now being encountered by the majority of the graduate students worldwide. It is even more challenging if you have not thought deeply about your next move as it puts you in a group of thousands of other Ph.D.s who are actively seeking appointments in academia, as research scientists, industrial scientists, or in consulting positions. There is a general feeling that we have a glut of Ph.D.s (http://www.npr.org/blogs/ed/2015/02/27/388443923/a-glut-of-ph-d-s-means-long-odds-of-getting-jobs). Hence, the challenge for all new Ph.D.s is to make your skills and experience stand out so that potential employers give serious consideration to your application.

Given the tremendous increase in funding in countries like China and India, more students than ever are entering graduate school and, thus, adding to the increasing number of Ph.D.s graduating in developing countries. Leading research groups in physical chemistry and material science receive dozens of requests every week from new graduates who are keen to join their research groups for postdoctoral studies. The increased number of Ph.D. students graduating each year coupled with the limited number of available postdoctoral openings or industrial positions is making the competition tougher for new graduates. How can you make your application stand out among a large pool of applicants? Here are some thoughts to build the necessary skills during your early years of graduate school.

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*Explore New Opportunities to Build Skills.* Graduate school offers an excellent opportunity to gain the experience needed to succeed and capture the job to which you aspire. Simply carrying out experiments in the laboratory and publishing papers in peer-reviewed journals is not sufficient. Because it takes 4−6 years to complete all the requirements for a doctoral degree, students have enough time to build their skills for the type of job they are aiming for. Many universities in the U.S. and elsewhere have introduced career centers to guide the students and postdoctoral researchers, regular workshops for proposal writing, training for academic jobs, and so forth. Researchers should actively explore various opportunities and develop an overall portfolio to thrive in the competing job market. In addition, it is also important to get involved in leadership activities by leading a literature discussion group, graduate student symposia, and student committees within the department or graduate school.

*Engage in Research Collaboration and Scientific Interactions.* National and international scientific meetings are a good venue to interact with scientists working in your area. Do not feel shy about engaging in scientific discussions with leading scientists in the field. Similarly, within your own university, explore the possibility of collaborating with another research group that could complement your ongoing work. Expanding your horizons remains an important aspect to attain broader research appeal.

*Writing Skill Matters.* Good writing skills are an integral part of a successful research career. Despite the diversity of culture and language, English remains the preferred medium for scientific communication. So, it becomes harder for people who lack English language proficiency to communicate their latest findings effectively. Indeed, the biggest impediment to obtaining a science job in the U.S.A. or Europe is poor writing. If one practices writing every day, it is easy to develop the necessary writing skills during their graduate work. (One can, for example, consider writing one page per day on an experiment that was conducted or about a paper that was just read.) A disciplined writing exercise on a daily basis will allow you to express scientific findings and visionary ideas in effective ways.

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*It Is Not the Quantity but the Quality of the Published Work That Matters.* Because research training and course requirements vary among universities in different countries, published research papers serve as a gauge to judge the research expertise and skills acquired during Ph.D. studies. Hence, the nature of published work is an important factor for all graduating students. However, this fact has translated into the publishing of a large number of scientific papers in a short period of time, often through collaborative or joint research efforts. It is common to see applicants boasting a large number of published papers on their CVs. Many of these papers are coauthored with several other collaborators. (Imagine, if you are the tenth author in a list of 15 coauthors, what does it say about your contribution?) A paper with detailed scientific insights addressing a key research problem clearly stands out.

*Focus on the Impact of the Paper and Not the Journal.* Another aspect candidates often point out in their CVs is the impact factor of the journals in which they publish. It is important to note that the journal impact factor does not represent the impact of the individual papers. (See a recently published

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editorial, http://dx.doi.org/10.1021/acs.jpclett.5b01527. More than 60% of the published papers have a lower impact than the journal impact factor. In many instances the journal impact factor is driven by high citations of review articles and a few breakthrough research articles.) For new Ph.D.s, one would like to see three or four first author papers with well-rounded scientific content for assessing the merit of the applicant. An increased number of publications beyond that merely reflects a dilution effect. Many of the applicants fail to demonstrate their individual skills in generating new research ideas or their unique expertise that they have acquired during their graduate work. Hence, it becomes important to separate out the contributions that exclusively represent your expertise when seeking a postdoctoral position.

*Develop Leadership and Mentorship Skills.* In the discipline of chemistry, the postdoctoral position provides a bridge between graduate school and a permanent position. It is a springboard to establish oneself as an independent researcher. Leadership roles within the group, such as mentoring undergraduate students, volunteering to teach smaller classes or conducting tutorials and writing proposals for fellowships, are a few ways a postdoctoral researcher can set him- or herself apart from the others.

*Identify Your Strengths and Explore Career Choices Early.* Although academic jobs are the preferred choice for many researchers, openings in academia are limited and remain highly competitive. Alternate career choices to consider include becoming scientists in national laboratories and industry, consultants, science journalists, and entrepreneurs. Hence, it is important for researchers to decide what they would like to do early on and start preparing themselves during the course of their graduate work and postdoctoral research. The only way to succeed is to be ahead of the competition. The "You and Your Research" lecture given by Dr. Richard W. Hamming at Bell Laboratories, which was transcribed by J. F. Frasier, a Bell Laboratory Scientist (http://www.cse.nd.edu/resources/hamming.html), provides some key aspects to succeeding in your research career. Good work ethics, research skills, and expertise and preparedness for the job will definitely help you achieve your career goal.

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### Notes

Views expressed in this Editorial are those of the author and not necessarily the views of the ACS.



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