

# **The Benefits of an Engineering Post-doctoral Position**

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## **Abstract**

Post-doctoral positions are not as common in engineering as they are in the sciences, so some may view as post-doctoral positions as “fallback” options for engineering PhD’s who are not immediately hired into tenure-track positions. While seeking one’s first position, it is easy to lose focus on the long-term goals of tenure and promotion. Engineering faculty are expected to teach effectively at the beginning undergraduate, advanced undergraduate, and graduate levels; develop and maintain a funded research program; and perform service both internal and external to the university. Assistant Professors must demonstrate these skills, particularly the first two, to receive tenure and be promoted. Increasingly, faculty searches are looking for candidates who have begun to meet these requirements. A post-doctoral position is one way to do this before the tenure clock starts. Two first-hand accounts illustrate how post-doctoral positions were used by the authors to develop a broad base of knowledge of the research conducted by others, establish contact with a broad network of researchers, acquire important research-management skills, and develop teaching expertise.

## **Prior Research on Post-doctoral Participation**

As an early entrant in the cross-disciplinary engineering education research field, Ohland was a recipient of NSF’s Post-doctoral Fellowship for Science, Math, Engineering, and Technology Education.<sup>1</sup> A previous study by Finkelstein and Libarkin investigated the benefits of this particular fellowship program. That work documented an increase in both the mentor’s and the post-doc’s level of interaction with the education community as a result of the program. Of particular interest is that the post-docs who participated in that program were recognized in their academic appointments for their educational expertise—at the time of the study, about half of the Fellows served on university or national level education committees in addition to teaching or conducting education research. Fellows were overwhelmingly positive about the program.<sup>2</sup>

Finkelstein and Libarkin summarize other research on the quantity and quality of post-doctoral experience in technical fields. There are a few messages that echo through the literature studying the post-doctoral experience:

- post-doctoral scholars add significant value to critical research areas
- supporting post-doctoral scholars is particularly important in developing areas of research in which they are not likely to find other mentors
- the conditions of post-doctoral employment should improve to make such positions more attractive to doctoral graduates

Research reported by Fields in an NSF brief indicates that PhDs who work as post-doctoral associates are not likely to be hired into tenure-track positions.<sup>3</sup> What the work of Fields does not address is how many of those post-docs sought tenure-track positions. Some may have realized during their post-doc that they were not interested in an academic career, or were more interested in administration without assuming the responsibilities and pressures of a tenure-track position. Others may have used to post-doctoral position to gain an advantage in obtaining industrial employment.

Rather than add to the research base studying the behaviors of large numbers of post-doctoral students, this paper is intended to examine the experience of two post-doctoral fellows to illustrate the role of post-doctoral work in the early development of faculty. The lessons of these case studies are intended to be applicable to doctoral students conducting research in emergent technical fields as well as engineering education, and may be particularly relevant to doctoral students conducting research in areas served by NSF-sponsored Engineering Research Centers and other positions that have combined research and education missions.

### **Developing a Knowledge Base**

It must be reemphasized that the goal of an aspiring faculty member is to earn tenure, not simply attain a position. Differentiating one's self from one's advisor and establishing one's own research identity is critical to earning tenure. The examples below illustrate how the authors used their time as a post-doc to begin the establishment of their research identity.

Most people will build on the results of their Ph.D. thesis and it is possible to arrange the thesis so that papers are easily written from the chapters. As most thesis-related papers will be submitted for publication after the thesis is defended, the post-doctoral time period is a good time to submit these papers. However, it is recognized that the work completed for the Ph.D. was performed under the supervision of the thesis advisor. In all likelihood the advisor solicited the funding to support the project, and it was part of the advisor's larger research program. This means that if one plans to focus only on the area of their thesis, they will be competing with their advisor, who already has established a research program for funding and recognition. Further collaboration with the advisor may be one way to do this, but the research community may not recognize this as the individual effort of the recently graduated Ph.D.

Palmer chose to pursue a different area of research and took a post-doctoral position in RPI's Center for Integrated Electronics and Electronics Manufacturing. His Ph.D. thesis focused on grain growth of thin films and was not related to the focus of the post-doctoral position. As a post-doc, he was able to establish his own program focusing on environmentally conscious electronics manufacturing. This has served as the basis of his research as a professor. As a post-doc he was able to begin writing proposals, interact with researchers from industry, national labs, and other universities. He began making presentations at conferences based on this and his prior work.

When Ohland first started in a post-doctoral position at the University of Florida, he was the Assistant Director of SUCCEED, and the NSF PFSMETE program had not been established. When Ohland was hired, there were few who had enough perspective to understand the greater scope of what the Coalition had accomplished in the first five years of operation, so he spent a significant portion of his first year with the Coalition reading reports and proposals from that period. This base of knowledge both enhanced his awareness of the state of educational research in engineering education, but it also made him a valuable resource to the Coalition.

As Ohland continued in the position, he further developed his knowledge base through the dissemination efforts of the Coalition. Even as SUCCEED Coalition representatives were sharing the best of what the Coalition had accomplished with non-SUCCEED partner schools, there was always something interesting going on in engineering education at every institution visited. Attending conferences and other national meetings continued to expand his awareness of the research and researchers in the field of engineering education.

### **Establishing a Network of Collaborators**

At the same time as Ohland was developing a knowledge base in the national workings of the SUCCEED Coalition, he also developed professional relationships with a large number of engineering educators who were interested in educational research. The standard NSF-format of 2-page biography that is submitted with NSF proposals requires that collaborators, including any colleagues with whom a researcher has authored a paper or a proposal, be listed for the last 48 months. In Ohland's case, that list includes 49 collaborators.

Service is also critical. When being considered for tenure having served a professional society in a leadership role is important. Many professional societies do not allow students to assume leadership roles. However, as a post-doc one can be a professional member. It was as a post-doc that Palmer, first became involved in ASEE and TMS. He volunteered to organize sessions and joined various committees. By the time he was reviewed for tenure he had chaired an ASEE division and several TMS Committees. Receiving a leadership role and successfully completing the term of office takes time. One must be involved for several years, and the post-doc allows one to start the involvement earlier in the tenure and promotion process. Ohland has had more minor roles in ASEE leadership, but is the President of Tau Beta Pi, the national engineering honor society. The flexibility of his post-doctoral position allowed Ohland to become involved as a seminar facilitator for Tau Beta Pi, the start of his national involvement in the organization.

### **Acquiring Research-Management Skills**

Professors are managers of a research program and frequently supervise students in that role. A post-doctoral position can provide this kind of experience as well. The center in which Palmer worked was funded by industry. It was possible to use undergraduates and masters students to do some of the lab work associated with the research. While it is true that undergraduates and masters students are not as experienced as Ph.D. students, they can make meaningful contribution to a research program. As a post-doc, Palmer supervised 15 undergraduates and 2

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graduate students, and was even a co-advisor on a master's thesis. Recruiting students, training students, setting up a realistic work schedule, and reviewing their work are all critical management skills required of an engineering professor.

During his years in the administration of the SUCCEED Coalition, Ohland learned how large research projects are funded and managed, gaining a special understanding of how the NSF operates. Observing how a large, multi-institution research project is managed at various partner campuses yielded valuable perspective that a single-institution project cannot provide.

Thus the post-doctoral experience enabled Palmer and Ohland to develop skills in project planning, budgeting, personnel management, and multi-institutional collaboration—again, all without the tenure clock “ticking.”

## **Teaching**

One cannot forget that a professor must be an effective teacher. While developing their own research identity, a formidable task requiring publishing the results of their thesis and working on new projects, one has the opportunity to teach as a post-doc. By doing this one will learn how to balance the loads associated with the different required tasks of a faculty member. While serving as a post-doc, Palmer was also appointed as an Adjunct Faculty Member in the Materials Science and Engineering Department at Rensselaer. This allowed for him to not only teach, but to learn about the internal structure of an academic department. He worked with a senior faculty member to redesign a course for freshman, and this experience laid the ground work for the courses he later developed. This work was also presented and published and has been funded by NSF through the CCLI program.

Ohland's engineering education research overlaps his classroom teaching, making both stronger. He has directed curriculum revision, coordinated a course with multiple instructors, and has had contact with the entire freshman engineering class of Clemson University for the last three years. His awareness of so many positive education interventions leaves him with more ideas for improving the education of Clemson's General Engineering program than can be implemented. In that respect, Ohland also benefited from his experience with the Coalition and how to manage change in engineering academia.

## **Conclusions**

The authors have undertaken a different set of activities since earning their PhD, but both have been afforded advantages in their tenure-track careers as a result of their post-doctoral experiences. These two cases are offered to corroborate the other evidence supporting the value of post-doctoral positions. The experiences of the authors are expected to be particularly relevant to doctoral students conducting research in areas served by NSF-sponsored Engineering Research Centers and other positions that have combined research and education missions, where it is possible to develop expertise at the two most important areas assessed in the tenure and promotion process—research and teaching.

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is Associate Professor of Manufacturing Engineering at Kettering University. His research interests include electronics manufacturing particularly the development and characterization of new joining materials, and teaching activities focus on incorporating active learning in courses.

## References

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<sup>1</sup> National Science Foundation, Post-doctoral Fellowships in Mathematics, Science and Technology Education, document number: NSF 97-42. Available online at <<http://www.nsf.gov/pubs/stis1997/nsf9742/nsf9742.txt>>, last accessed January 8, 2004.

<sup>2</sup> Finkelstein, Noah, and Julie Libarkin, "Who Cares About Post-docs Anyway? Evaluating the National Science Foundation's Post-doctoral Fellowships in Science, Mathematics, Engineering and Technology Education," available online at <[http://lhc.ucsd.edu/nfinkels/higher\\_ed\\_post-doc.pdf](http://lhc.ucsd.edu/nfinkels/higher_ed_post-doc.pdf)>, last accessed January 7, 2004.

<sup>3</sup> Regets, Mark C., "What Follows the Post-doctorate Experience? Employment Patterns of 1993 Post-docs in 1995," Issue Brief, Directorate for Social, Behavioral, and Economic Sciences Division of Science Resources Studies, National Science Foundation, November 27, 1998, <<http://www.nsf.gov/sbe/srs/issuebrf/sib99307.pdf>> last accessed January 4, 2005.