

PhD: The First Chapter in an Exciting (mostly) Journey

Saurabh Bagchi

Dependable Computing Systems Lab (DCSL)
School of Electrical and Computer Engineering
Purdue University



1

PURDUE
UNIVERSITY

You are Special

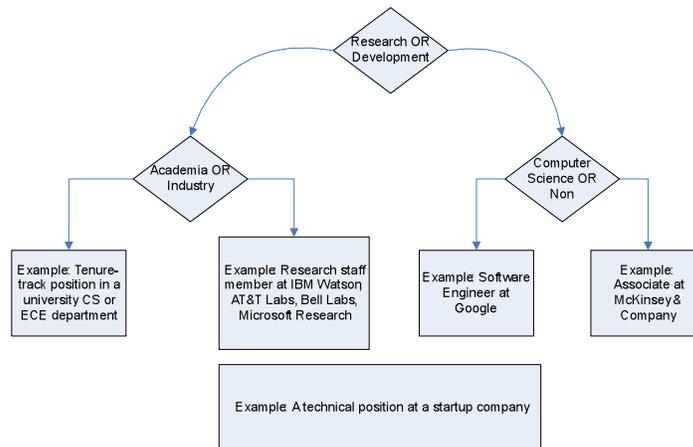
- Once you get your PhD, you will be in elite company
- Now stop gloating over it and show me what you can do
- With a PhD tassel, you will not automatically:
 - Get respect from your peers
 - Be considered the unquestioned expert in your organization
 - Know the most about the project you have been asked to tackle
- But you have the necessary skills and smarts to earn each of the above, with effort



2

PURDUE
UNIVERSITY

Options After a PhD



Observations on Research Success - I

1. Challenge your abilities as you seek to raise your own bar
 - Work on challenging problems that give you butterflies in the stomach – be daring
 - Leave room for mid-course correction and occasional failures
 - Strive to improve yourself even though it may not seem related to your current tasks
 - Be courageous in the face of hard technical problems
2. Refuse to let the urgent crowd out the important
 - Urgent emails to respond to have their place, but not to the exclusion of thinking deep on your hard problem
 - Urgent problem brought on by environmental or political climate does not necessarily need your attention



Observations on Research Success - II

3. **Be agile in adjusting the magnification level of your microscope**
 - As you look at a solution, you sometime need to delve into the details – the exact algorithm, the system under study, the code
 - Many times you will need to abstract out details and consider black boxes and see how they fit in an overall solution
5. **Work on important problems divided into manageable portions**
 - Ask yourself in quiet solitude if the problem is scientifically challenging and important
 - We do not get big-bang results for the important problem in the first year
 - Have things to show for at time granularities of at most one year



Observations on Research Success - III

5. **Be committed to the problem you are trying to solve; don't dabble in it**
 - This is not a day job
 - Quantity A: Achievements of person with limited ability, completely committed to his problem
 - Quantity B: Achievement of person with great skill dabbling in his problem
 - $A > B$, in almost all cases
7. **Do your job such that others can build on top of it**
 - The essence of science is cumulative
 - Release details of your experimental procedure so that others can replicate it – Tech Reports are great for this
 - Release input and result data set
 - Release source code with detailed instructions for reuse



Observations on Teaching Success: Personal Account

- Walking in to teach my first class of 125 juniors for a course called “Data Structures and Algorithms”
- As a teacher, I want to enable the students to be
 - Innovative in designing algorithms
 - Interpret imprecise requirements
 - Responsible in collaborating with other team mates
- So I set challenging open-ended programming projects.
- Result: Student evaluations that make me cringe today



Observations on Teaching Success: Personal Account

- Today: Happy story – multiple teaching awards from department, college, and university
- What lessons I learned (and wish somebody had told me)
 - Teach so that most of the class gets it, but leave something in to challenge the top students
 - Hand-holding with many students is necessary
 - Be responsive to student needs – respond to questions on mailing list quickly, return graded homeworks and exams quickly, hold extra office hours before exam
 - Treat the students as responsible individuals – know their names, expect professionalism and exhibit professionalism
 - Use electronic means to keep the students in the loop – RSS feeds, video recorded lectures



Summary

- Multiple career options available after a PhD
- A PhD is neither a necessary nor a sufficient condition for future career success
 - You have to earn the success through continual efforts
 - The PhD does provide you with a rich array of tools to help you achieve such success
- **Success in research:** Challenge yourself; Pick important problems and manageable portions; Magnify details at the appropriate level; Be engrossed in the problem you are solving; Work in a way others can build on it
- **Success in teaching:** Be responsive to the student needs; Pay close attention to what the students are not getting

