



寄書

Don't Imitate Me! A Few Considerations before Becoming a PhD Student

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Don't imitate me ;
it's as boring
as the two halves of a melon.[†]
(Matsuo Basho, Translated by Robert Hass)

When you plan a career in R&D you have to decide whether you want to do research or if you want to work with development. Research, when it is most rewarding, will give you the opportunity to find explanations of facts that you did not know before or to connect previously unrelated phenomena. Research, when it is most depressing, also means that there are frustrating periods where no progress is made ; most of the easy problems are already solved. Development, on the other side, is much more organized. Also here problems have to be solved but the goal and main strategy to reach it are clear. An example of these differences is the following : You can write a project plan to write a program package for your computer. It might be a very complex and difficult project with many problems to be solved on the way but the goal and the main steps to reach it are clear when you start working. On the other hand if you don't know it, it is impossible to write a project plan to find the Pythagorean theorem.

A personal example illustrating the value of pure curiosity is the following : As a student I attended a course on topological groups. We were the only two students and the course was given by a well-known professor who retired after the course. The course was interesting but not really related to other courses. A

major part was the construction of the Haar integral. At the time this was not very efficient : only two students and a professor, weak connections to the rest of the studies and the construction of an integral you only need to know that it exists. Personally this course had no real consequences for decades. Then I became interested in the application of groups in perception and recognition. It became clear that groups are important and that the Haar integral can be used to construct invariants. An unpredictable result of a useless course taken long time ago. That this connection is already mentioned in Wiener's book on Cybernetics from 1948 which is another story.

After the decision to go on to a PhD education you have to find a way to finance it. Even if there are no fees you need money for food and housing. If you are a Swedish PhD student you are in a good position. Most (in some departments all) PhD students are employees. The time you have to do work not related to your PhD studies is limited. Furthermore you have full social security : if you increase the size of the family with a child during that time you have the right to stay home 10 days when the child is born and 240 days afterwards. For 195 days you get 80% of your salary for the remaining days somewhat less. You can also choose to work part-time in which case these days "last longer". Furthermore you can stay at home when your child is sick and receive 80% of your salary.

After you have solved all these problems and you are accepted as a PhD student you have to organize your

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work. Here I recommend to you to consider the idea of 'reproducible research' (http://lcavwww.epfl.ch/reproducible_research). In many branches of science, like physics or chemistry, it is required that others can reproduce your results before they are accepted. In engineering this is not yet the case. The purpose of reproducible research is to introduce the same standards in engineering research and to organize your work accordingly.

When you start producing results you have the sell them. There is no doubt that English is The language of science. If you want to let the world know what you have done you have to communicate in English. Here Swedish students have the big advantage that they usually have very little problems communicating in English. Since Swedish is only spoken by a few million people it is too expensive to translate TV-programs, movies, books etc.. Also travel is an important part of the life-style of many students and many courses at the university are given in English. As a result most students are relatively good in reading, writing and speaking English. Another cultural difference is that the social gap between student and teacher is much smaller in Sweden (titles are almost never used and everybody almost always uses the first name in conversations) and that students are generally less afraid to make mistakes. This means that the threshold of actually communicating in English is much lower and they have more training doing so from early age. The conclusion is thus that it pays in the long run to speak English as often as you can to get as much training as possible.

After you have worked hard and produced results you have to describe them and you have to explain them to others. Today this is an important part of your work and conditions have changed in recent years and are still changing. There are many conferences and journals but there is a real difference in the chance that the

contribution is read by others. Funding agencies have also noticed that and now more and more of them are taking into account where a certain contribution was published. A paper with an important scientific contribution published in the wrong place will count nothing while a weak paper in an important journal is ranked very high. There is a lively debate about the merits and the drawbacks of the system but that is how it works and you have to take it into account and the conclusion is that you should try to publish in the best journals and conferences.

Finally one should not forget that the relation between a PhD student and the advisor is also a relation between two persons. The student will always be dependent on the advisor and it is the duty of the advisor to handle this situation responsibly. For me this means that in the beginning the student will learn by studying what others have done and this will to a large extend be an imitation of others and especially of the advisor. At the end of the studies this should have changed. Now the student should be the expert and the student should no longer imitate me but be an critical, independent researcher himself with own ideas and insights.

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