Research Topics and Research Supervisors

Introduction

The young student embarking on research towards a Master or PhD degree faces a number of problems and choices that can be vital to his/her future career. All too rarely does the student get adequate counselling in this important area. These notes reflect my experiences, both as a student and as a research supervisor and undoubtedly my prejudices. As such, they are only guidelines to help you make your choices.

There are three important choices to be made:-

1. Where shall I study?
2. What area of research interests me?
3. Who will supervise my research programme?

Let us consider each in turn though the three choices are usually not independent of each other.

1. Where shall I study?

This choice cannot really be made separately from (2) and (3). There are pros and cons in choosing one's home institution. The Master's degree is usually seen as a prerequisite for undertaking PhD studies and would usually be done in the home institution. The question of home or away is more relevant to the PhD degree. My prejudice is to first thoroughly investigate the possibilities in your home institution. If you wish to study or work abroad you should consider if this is something you might take up after PhD studies in a Post-Doctoral position. If you have completed a good PhD you are likely to find opportunities to undertake research elsewhere and unlike being a PhD student you will be treated as a fellow researcher on your own merits. If you do decide to do your PhD elsewhere you need to consider carefully several points:-

What are the prerequisites for the PhD degree? North American universities usually expect you to take the Graduate Record Exam (GRE) and the TOEFL English language test. You will normally be expected to take one or two years of graduate courses prior to embarking upon your research. Financial support requires special care. Unless you enjoy an especially prosperous financial situation you will need substantial support. As a foreign student you can face expensive fees (US$20,000/year is not uncommon) as well as living costs. In many cases it is possibly to obtain competitive Research and Teaching Fellowships. Be warned - a TF position involves teaching and/or grading work and may significantly lengthen your period of study. If you are looking abroad you need to seek advice about the university - not all universities are equal. Does the university have the facilities and staff appropriate for the type of research and study you want to undertake? Talk to people in your home institution with experience of other institutions. Better still, if you can, talk to people who have studied abroad.

What area of research interests me?

One of the difficulties facing the potential research student is deciding upon the area of research to enter. Often the student has little idea of the diversity of research topics available. You need to get as much information as possible before making your decision and to think "What special abilities do I bring to research?". If you have done brilliantly at theoretical aspects of your subject but are hopeless at practical things then experimental research is probably not your forte and you should be considering a theoretical topic. Conversely, if you enjoy practical aspects of your subject and feel reasonably competent in the theory of your subject then perhaps an experimental topic is to be your choice. Investigate the abilities required in the various areas of research. Some will require abilities in data processing, computing, field work etc. Probably the most important thing to ask yourself about any area of research is "Does the area of research excite and challenge me?". Success in research depends strongly on self-motivation. If you are only mildly interested in the research area then you are unlikely to succeed. Expect to have to work harder than you have at any earlier time in your career. Expect to be confronted with your ignorance and the need to fill large gaps in your education. All your previous study should have taught you how to teach yourself and now you must!

Before making a definitive decision as to your research area make sure you consult other research students and talk to potential research supervisors to see what areas of research they are interested in supervising. Read any descriptive literature available that describes the various research groups in your institution. See what papers are being published within these areas by persons in your institution. Remember the choice is yours and no one elses - it is your future that is at stake. At UMK you might consult "Physics at Nicholas Copernicus University" and "Recent Papers of the Institute of Physics and Department of Computer Methods". Remember though it is not the number of papers that is important but rather their quality and significance.

Think also about how your research area choice will affect later career choice options. Don't expect to spend the rest of your life working in the area of your PhD thesis - things change and so must you. Relatively few persons can expect to have a career in academia and will have to look elsewhere for employment, and hopefully enjoyment, in areas such as industry, education, business etc.

Who will supervise my research programme?

The choice of a research supervisor is critically important to one's present and future prospects and is all too often overlooked. Is your supervisor excited by his/her research and sees research as an enjoyable occupation? Is your supervisor active in research? What is the assessment of other students who have worked under your supervisor? Does your supervisor have contacts that could be useful in the later development of your career? These are all difficult judgements.

Your best lecturer may make your worst supervisor and vice versa. I have met Nobel Prize winners who were dreadful as lecturers but excellent as supervisors. I have also met brilliant lecturers who seemed to be incapable of doing research. Some supervisors will over supervise making it difficult for you to develop - others will never be around when you need them. Ultimately you have to reach the stage when you can work independently. In one case I know of a student went to a top US university and did his PhD under a very distinguished physicist. He interacted with his supervisor for a total of one hour in three years. That student is now himself a distinguished professor of physics! The preceding remarks are intended to show you something of the vagaries of choosing supervisors - never an easy task.

What is a good PhD?

So you have selected your topic and supervisor and finally presented a thesis. Is it a good PhD? What will an examining committee or potential employer be looking for? I would hope that in the area of your thesis you now know more about the topic then your supervisor; you have shown yourself to be capable of independent research and in developing your own ideas for research; your thesis work has a high degree of originality and even before presentation of your thesis you have been able to publish in top international journals the results of your research. In doing your PhD expect to work hard, harder than you ever have, but with enjoyment and enthusiasm. At times things will be tough, possibly not enjoyable but persevere. Try to keep your period of PhD research to a reasonable time - take too long and your future employers are going to have doubts as to how long they will have to employ you before there are results.