

Guest Editorial

A note to PhD students

A young scientist needs a PhD to begin a career in Science. This applies in both developed and developing countries. However, first we need to put to bed the idea that all the brains are in developed countries. There is an element of truth in this, which lies in the ability of the Western world, and the USA in particular, to attract bright scientists from elsewhere because of the need for scientists and the available funding for science. As a result, many US Nobel prize winners were immigrants. However, we all come from the same gene pool, so there are just as many potential Nobel Prize winners per capita in every population. It is the scientific environment that allows excellence to prevail that wins in the end.

But even in the West, it's up to the best post-graduate students to select the best supervisors and the best projects for PhD research. An extreme test of the value of a research project, if successful, is could it ever be worth a Nobel Prize? Of course, most of us have to settle for something rather less important and more mundane, which is a better match for our talents. However, we still need to convince ourselves that the project has real value. If it is difficult in the developed countries to select a good research project, how much more so is it in the developing countries?

Science runs with the fashion of the times. The free thinkers create a field, the rest of us follow, perhaps long after the field has become fallow. That's why it's important for Post-Grads to critique the projects they may be given. Three to six years is a long time and the student must complete this first R&D task to ensure that the project is going to be worthwhile. As such, the student must take the initiative in selecting the supervisor and accepting the project. The supervisor should have a national or international reputation and the project should offer new horizons to explore, not just dotting I's and crossing t's. But especially, the project should appeal to the student's most important objective; the desire to contribute to the good of humanity.

In the modern era, most R&D projects are multidisciplinary. This means that the student could never do the whole project alone (nor could the supervisor). Collaborative research is an essential process that trains the student for the real world. The pace of such research can be really amazing in a well-oiled laboratory. Usually there are students at various stages in their PhDs who can mentor the new students in a way that most supervisors cannot. In such a progressive, intellectual environment with established facilities and techniques, a 3 year PhD could be achieved. The existing technologies, protocols, quality assurance and collective enthusiasm of the Post-Grads and supervisors allow for the blooming of new ideas and achievements. As such, students will always remember those halcyon days of their PhD experience.

Publications are the currency of research. Over-publication of papers on a given topic can lead to their devaluation, but no publication means that nothing has been achieved for all the hard work. So how to get that first research paper published? This is where the supervisor is indispensable. It all begins by weekly progress reports to the group and monthly reviews, all subject to critique by the research group. Over time, the first paper develops as results come in (or don't) and directions change as hypotheses evolve. Methods and protocols should be written up as they are developed and the thesis begins to take shape.

Conference presentations may open up your research for critique, but still they help develop confidence in your research directions. Especially if you make contact with senior researchers who

can help mentor you and provide a depth of critique that perhaps your supervisor may not have. Such contacts may be the most important aspect of attending a conference. After 2-3 years of intense effort, there is every chance that the student could have become more expert in a specific research field than the supervisor. In fact, this should be the supervisor's objective.

In the current era, almost every student now has instant access to the world's cumulative knowledge by the Internet. Rather than making life a lot easier, this ability actually accelerates the pace of R&D so there are more lines of research to follow and more papers to write. So it's still 24/7, as it always has been, but your productivity is so much greater and publication expectations are so much higher.

Research funds do not grow on trees in the West nor anywhere else. So research grant applications become an important activity for the student who, by year three, should be feeling the harsh realities of not winning research grants. Just remember that negative experiences can be more useful than positive ones in developing character and achieving your goals.

Finally, thesis objectives must be re-tuned to match the available funding, resources and available time. Time is of the essence and few universities now allow too many extensions.

My final comment regards Integrity. We may be good or poor researchers but above all, we must prize our scientific integrity. This must never be compromised. Always reference other people's ideas and results and do not hide your mistakes but rather admit to them. Hopefully, you can publish a correction before others find your error. Science is essentially a self-correcting profession where the truth will always emerge. Just remember to ensure that you are always on the right side of the truth.

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