Graduate Supervision Award Nomination Dossier

Jeff F Dunn: Nominee Statement

I'm pleased to be given the opportunity to discuss my supervisory philosophy and accomplishments. I'm especially pleased that students of mine, both past and present, support me in this endeavor. Since joining the Faculty of Medicine in 2004, I have been the primary supervisor of 16 graduate students and over 16 undergraduates. I have been on 13 other graduate committees. After leaving, my students have obtained a variety of positions including in research labs, faculty positions, gone to medical school and worked in pharmaceuticals. My first student in Biochemistry at Oxford University, Dr. Irene Tracey (co-supervised with Dr. GK Radda), has become one of the world's leading neuro-MRI scientists and is the Director of the FMRIB lab (functional magnetic resonance imaging of the brain) in Oxford—one of the largest fMRI labs in the world. She is an example of many who, after leaving my laboratory, have gone on to have successful careers.

But what should I, as a graduate supervisor provide to the student? The central concept of my supervision is that the student is not a technician, just another warm body hired to generate data for the lab. They are a valued member of a research team. I want to instill a sense of responsibility and ethics, including the concept that research is done for our society. It is not done for the glory of the supervisor (although more and more glory is needed for our annual reports!). My job is to help them in their career. They should learn enough such that by the time they graduate, they know more about their research subject than do I. I also recognize that most graduates do not proceed to a research career. As a result, I ensure the student gains important life skills as well as research skills. These life skills include communication (oral and written), team building and management.

Let me expand on these points. The "student as a technician concept" has long dogged research labs. As grant funding gets tighter and annual reports more metric based, the pressure mounts on the supervisor to get data, get papers and get grants. There is a lot of pressure to generate data. I have worked passionately to protect my students from this type of graduate experience throughout my career. In addition, I've lobbied my colleagues and others to share my belief that a student is not a technician. In 1992, an article was published in New Scientist from a senior scientist arguing that students should seriously consider not going to graduate school because they were glorified technicians. As evidence of my longstanding defense of graduate studies as a learning experience, I wrote the following rebuttal to this concept (see page 3) that was published in New Scientist.

When a student enters my lab, I explain that this work is not easy. They are unlikely to succeed without long hours and hard work. They won't succeed working 9-5 and so I don't monitor their attendance. I monitor results. In order to achieve their goals, they need motivation. I aim to empower the student to recognize that they have the ability to achieve, to make their own decisions and to make their own discoveries. I foster an idea generation culture. We bandy ideas around like a balls in a dodgeball game. I was amused when one day, during a planning session, a custodian was listening. They later approached me and said it sounded like an episode of the TV medical show "House".

The ability to create new knowledge and feel you made that discovery is heady stuff indeed. It is what makes the long hours and sacrifice worthwhile. I want each and every one of my students to share this excitement with me. To help share this belief, I wrote about it in November 2014, on my blog site that was shared online to over 15000 followers of the scientific Twitter account @realscientists that I had the opportunity of hosting (see page 4).

As I teach that creation of new knowledge and the excitement of discovery are important motivators for students, so do I teach that we as researchers have an ethical responsibility to society. Data need to be as unbiased as possible. Interpretation should be based on data, not on a personal agenda. Knowledge should be shared. These concepts are key to maintaining honesty and integrity. They are also at odds with

another problem in science—secrecy. Many labs hide new results with the goal of using their reveal to promote the lab, to obtain the next grant or to outcompete another laboratory. I disagree with these concepts. Without rapid dissemination of new knowledge, we run a serious risk of duplication of research which is a waste of resources. By being protectionist, we fail to learn new information from perceived competitors—information that could facilitate our own research. I teach that "ideas are cheap" and need to be spread like seeds in a field, not hidden never to grow. We should collaborate with labs undertaking similar work, and not make them into competitors. As a result, all of my students gain exposure to other research groups. They learn to communicate with people who may help them. They learn to discuss new ideas at meetings and to generate stimulating brain storming sessions aimed at reaching a common goal. This is in contrast to secretive views aimed at protecting the lab. Our responsibility is not to the lab, it is to use society's resources wisely to create new information that, in turn, will improve society as a whole.

As a supervisor, my primary job is to provide the student with training. The details vary considerably between supervisors. I provide technical and academic training in the area of their research program. This is the minimum one would expect. To help with both academic and career training, I encourage a co-supervision model. I provide training in basic science while the co-supervisor trains in an application area such as medicine, kinesiology or engineering. If the student is aiming for medicine, we focus on medical problems. If the student is aiming for biomedical engineering, we focus more on math and physics.

A scientist needs to have a niche as well as a network. I encourage students to become experts. I make it clear that by the time of their defense, they need to be the expert in their research problem—and they need to teach me in that area. Aiming for this goal gives them confidence. To help them develop their network, I ensure that they have a local network of collaborators. I also ensure that all of my students present at international meetings. This is extremely important for their growth as scientists as well as individuals. I introduce students to my extended network of contacts. I facilitate collaboration with groups who may be able to help my students either with their current project or with their ongoing career paths. I have a large network of contacts who share my belief in open collaboration.

I recognize that most graduate students in our modern society will not pursue a research career. They need training in key marketable skills. These include writing, oral communication and teamwork. The students write their papers and documents. I spend considerable time working one on one with them, editing and provide writing suggestions. All my students edit work from others in the lab. They assist with grant proposals to expose them to grant techniques. My students work as a team. Each tends to be a specialist in a particular method or disease, but each will need the assistance of others to complete their studies. My student projects always include other laboratories so that the student gains experience with other methods, but also with other management and supervision styles.

I encourage discussions of race, gender, politics and culture. As you might expect with science, my lab and the labs of my associates are very multicultural. We often have people from countries that may not be overly friendly to one another. I want the students to be able to understand people from diverse backgrounds as this is key to successful management in our multicultural society.

By the time students leave my lab, I want them to have made a contribution that they can be proud of. This isn't just a high mark in a graduate course. They aim to publish a paper in a respected journal. They need to have made a new discovery, regardless of whether they are an MSc or PhD student. They need to have learned a combination of scientific and life skills that will improve their chances of having a successful career regardless of the path they choose to walk. Finally, after graduation, I want my students to look upon me as a mentor and collaborator, and not just as a boss. My students are my extended academic family. I wish them all well and will do what I can to assist them with their goals.

received: "The government believes that considerable benefits can be achieved through firms and other organisations working together under the European Community R&D programmes such as ESPRIT. UK firms can share risks with European partners; tap a wider range of expertise; and use this collaboration in research for developing their business in the single European market.

"The government has made clear to the Commission that it would expect the Fourth Framework Programme to continue to provide support for industrial R&D which is precompetitive and which covers generic technologies with potentially wide applications. The Commission has not yet published its detailed proposals for the Fourth Framework Programme but the government will study these carefully when they become available."

FOLLOWING a debate in the House of Commons on recycling, John Clubb of the British Scrap Federation drew my attention to a study by the US Environmental Protection Agency into the advantage in making steel with ferrous metal and other scraps in place of iron ore and coking coal.

The American report claims considerable savings and far less pollution: 86 per cent less air pollution, 76 per cent less water pollution, a 40 per cent saving of water, a 90 per cent reduction in the use of "virgin materials" such as iron ore and coke, 97 per cent less mining spoil and an energy saving of 74 per cent. The energy saved if we had used scrap over the past 10 years, Clubb claims, would have been equivalent to nearly 13 billion gallons of petrol. The House of Commons should take more interest in the scrap industry. □

A voyage of self-discovery

Jeff Dunn thinks that collaboration and guidance are key aspects

NOT long ago *New Scientist* published Simon Wolff's comments about why to avoid doing a PhD (Forum, 6 June). It may be that such tongue-in-cheek writing should not be taken at face value but I still think it appropriate to offer an alternate view. Unfortunately, this reply may come too late as any student who has not already committed suicide after reading the aforementioned article probably shares some of my opinions on the subject.

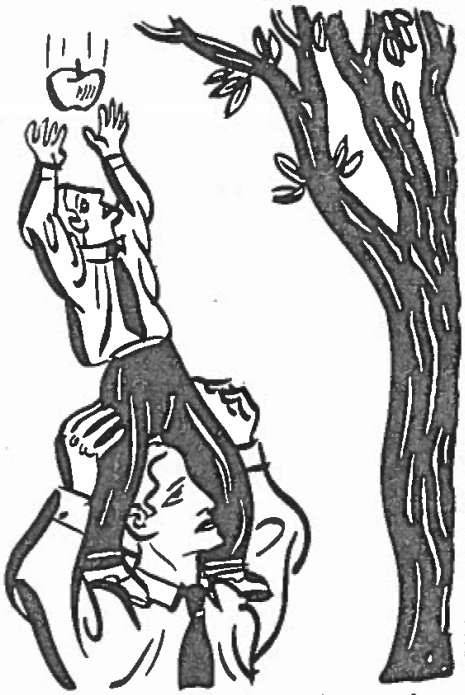
The realisation of what a studentship is really like is hard to convey. In some ways these discussions are best left to late night sessions in a student bar. At the end of the day, however, someone must try to tell potential students what they are getting into, and current students how they may best proceed.

I think it was unfortunate and irresponsible for Wolff to write that all supervisors use their students only for "slave labour" and that they do "not want to see any intellectual development". Wolff describes the prototype supervisor which every student should try to avoid. It is a product of even greater thoughtlessness to write that all PhD projects are considered useless by "anybody sane and in touch with reality". This man is not going to win a gold star for motivational skills.

British education is clearly going through a bad patch and it is important that unsatisfactory aspects of the system are reviewed and improved. So I shall attempt to consider the plight of the student in this light and to offer advice to budding Isaac Newtons about reasonable expectations and potential results of doing a higher degree.

During the first few months of a PhD the candidate's feelings are more likely to be associated with depression and misery than with academic revolution and excitement. A degree is designed to produce intellectual advancement and there is a gap as wide as the Channel between the work ethic required to get a first-class BSc and that needed to do independent research. Anyone who has not attempted to leap such a gap will find it impossible to understand fully the personal search for the self-motivation required to make that jump. Many supervisors fail in their duties during this period.

It is easy for a student to take on a project where the experiment is already designed, where the techniques are already available and where the conclusions are expected. In short, to treat the student as a glorified technician—one who will fill in the blanks of the supervisor's major projects. Let's not pull punches, this is common in Britain. But let's also realise that if the student can develop quickly enough



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through collaboration and guidance (preferable from the supervisor but also from his or her peers), the rewards will be worth the effort. At this point the student becomes a collaborator and not a technician. The time that the supervisor spends in assisting this transition will be rewarded in two areas: the lack of supervision required in the later stages of the degree and the potential for innovative ideas that a young, fresh mind can bring to a project. The student in return acquires a new set of mind-tools—logical thought, critical appraisal—and a self-confidence which he or she can bring to bear on future endeavours.

This brings me to the potential results of undertaking a higher degree. As I said, there is an enormous amount of self-discovery in obtaining a degree. At worst this kind of discovery can tell you what you do not want to do for the rest of your life.

It is no surprise that many professional associations will hire PhD students because these students often have a special level of emotional maturity. They have certainly developed their capacity for self-motivation.

At best, the project that the student works on will actually lead to an exciting development in their field. It is true that this is the nirvana, the Holy Grail of the PhD. It is also true it is often not achieved—for reasons which include choosing too predictable a project, poor experimental design, simple bad luck or poor supervision. This is the fish that keeps the fisherman waiting. The point to keep in mind is that fishermen can still have a wonderful time even if they do not catch anything. The same is true for the PhD student. The process of undertaking the project is as important to a student's development and self-satisfaction as is the result.

At the end of it all, what then? There are few jobs, the pay is not what you will get in business and the job security is being eaten away. If the supervisor has not given the student some insight into the rewards of academic toil then the only path available will be into business. On the other hand, there *will* be a few who are motivated by the academic challenge and, in addition, want to improve the system from within. One would like to think that these people are recognised and encouraged to enter the academic world—if only to replace the supervisors Wolff describes. □

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Dr. Dunn

Graduate students savour your excitement

Publish, get data, do statistics, give talks, go to lectures, communicate, innovate, produce, write a thesis, get grants, find a post-doc, find a job.....and do it all within the time limits set by your university and your lab. Sound stressful? You bet.

Few outside the field know how difficult being a graduate student can be. Some will judge you based on your salary. Graduate school isn't paid as a job. I know you get paid less than minimum wage. You know that. Others may or may not know it. It's hard to pay for food and accommodation. Some will judge you as a permanent student. A graduate student position is cross between student training and an apprenticeship. It's hard for many to understand the position because it has a bit of both "job" and "student" mixed together.

But in the "upside", do you remember the first time you discovered something? The first time you can look back and say—"Nobody knew that! I'm the first to know that." Even now I have a sense of wonder when a student comes to me with new knowledge. What a rush. Do you get that sense of excitement when you have an idea and explore the literature to learn if that idea has a leg to stand on. That exploration leads to other bits of knowledge. Your idea morphs and grows into something stronger. You discover, you explore.

The world has been traveled from top to bottom, from east to west. Mountains have been climbed. We have explored the world we live in. Yet we live in a physical and biological wonderland that we are just beginning to explore. You are the adventurers of this generation. You are the modern explorers. Business and society may not recognize your contribution. Remember these times, and when you become faculty try to give back to your own students. If you move into medicine, business, law, government, engineering or where-ever your path takes you, remember the young academics that are striving for new knowledge, knowledge needed to fuel continued innovation and growth in our society.

But for now, to help you get through, remember to savour your sense of wonder. Explore the universe from your mind and hold onto your excitement.