Nurturing New Mathematicians

Some Advice on Advising

Jonathan Borwein, FRSC
jborwein@cecm.sfu.ca

http://www.cecm.sfu.ca/~jborwein/talks.html
“Good scientists study the most important problems they think they can solve.”
“Moreover a mathematical problem should be difficult in order to entice us, yet not completely inaccessible, lest it mock our efforts. It should be to us a guidepost on the mazy path to hidden truths, and ultimately a reminder of our pleasure in the successful solution. …

Besides it is an error to believe that rigor in the proof is the enemy of simplicity.”
Some General Observations

- Set an example for yourself and for your students
  - Be realistic for yourself and for your students
- One size does not fit all
  - some need to left alone/some need regular meetings/some need bullying
- Learn about your discipline’s history
  - learn about your discipline’s ecology
- Meet the neighbours---and have them visit
  - be friendly but not intimate
  - you will often be *in loco parentis*
Learning to Lecture

"But this is the simplified version for the general public."
Career Preparation, Honours Projects and UGRA's

- Examples of good (and bad) projects

- technology helps --- in moderation
- boredom does not
- being alone does not
- they may be your future graduate students
Examples of good projects and bad
- not research but research enabling
  - Computation of Pi, Brouwer's Fixed Point Theorem
  - Minimax Theorems, Image Fidelity Measures

Terminal or transitional?
Make sure other skills are developed
- presentation, IT, writing
Our future selves --- our PhD’s

- Ask if Tom can get a job with a thesis:
  * On fuzzy pseudo-multigrid methods for non-standard micro-ontologies of type IIb?

- Ask why Anne wants a PhD?
  - obtain and transmit a realistic picture
  - sometimes the best reply is ‘No’

- Start them publishing; in appropriate vehicles
  - not all in the one you or a friend edits

- Be interested but not addicted to the topic
“Caution, skepticism, scorn, distrust and entitlement seem to be intrinsic to many of us because of our training as scientists ... These qualities hinder your job search and career change.”

Hardy and Littlewood's

4 Axioms for Collaboration

```
The first [axiom] said that when one wrote to the other (they often preferred to exchange thoughts in writing instead of orally), it was completely indifferent whether what they said was right or wrong. As Hardy put it, otherwise they could not write completely as they pleased, but would have to feel a certain responsibility thereby.
```
Axiom Two

The second axiom was to the effect that, when one received a letter from the other, he was under no obligation whatsoever to read it, let alone answer it, - because, as they said, it might be that the recipient of the letter would prefer not to work at that particular time, or perhaps that he was just then interested in other problems....
The third axiom was to the effect that, although it did not really matter if they both thought about the same detail, still, it was preferable that they should not do so.
Littlewood's Miscellany
... in Bella Bollobas' 1988 edition

- And, finally, the fourth, and perhaps most important axiom, stated that it was quite indifferent if one of them had not contributed the least bit to the contents of a paper under their common name; otherwise there would constantly arise quarrels and difficulties in that now one, and now the other, would oppose being named co-author."
The final step

Post Doctoral Fellows

- Becoming independent
  - don’t take a PDF on before *you* are!

- Growing a dossier
  - writing, speaking, publishing
  - authors, referees, editors and publishers

- Prioritize and learn time management
  - do research all year, on appropriate projects

- Don’t be a perfectionist
  - publishing often, but not too often
References: a sample