How to be a Winner in Research?

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(Some parts abridged from http://www.cs.caltech.edu/~weixl/research/experience/winner.htm)
What is research?

- RESEARCH = Re + Search
  = Search again, Search once more

- Research INTO .... (something)!

- How to be a winner in research???
- Who will be a loser in research???
Advices

- Don’t get hung up trying to understand *everything* at the outset
- Communicate and *Synchronize* Often
- Decompose
- Be Organized
- Prioritize
- Realize that your supervisor is *busy*
- Deliver
- Demonstrate *progress*
- Target Stable *Intermediates*
- Don’t turn problems (*subtasks*) into research problems unnecessarily
- Learn to *solve* your own problems
- Don’t stray away too much from what your supervisor *knows*
Advice (1)

- Don’t get hung up trying to understand everything at the outset
  - Prioritize (what do I need to know most?)
  - Read (but not months before starting!)
  - Multithread (productivity!)
  - Pursue multiple solutions (easy, hard)
  - Wishful thinking (assume subproblem solved)
  - Pester people for information (pointers, follow up on resources, …)
  - Propose working models (concrete, compare)
Losers vs. Winners

- Losers will **stop** the first time
  - Run into something unknown
  - Cannot solve a problem
  - Trouble out of “their part” of the problem

- Winners consider the **whole** problem theirs and **look for paths around** every hangup.
Losers vs. Winners

- Losers make sure there is someone or something to blame for their lack of progress.
- Winners find ways to make progress despite complications.
- Losers know all the reasons it cannot be done.
- Winners find a way to do it.
Advice (2)

- Communicate and Synchronize Often
  - With your fellow researchers
  - Different models?
  - Learn from others’ models, assumptions
  - Let them know
    - What you’re thinking
    - Where you’re stuck
    - How you’re trying to get around the problem
Advice (3)

- **Decompose**
  - Whole problem often seems overwhelming
  - **Decompose** it into manageable parts (stable intermediate)
  - **Tackle** the pieces one at a time
  - **Divide and conquer**
  - E.g.: 1~2 day tasks
Advice (4)

- Be Organized
  - Complexity!
  - **Structure** the problem
  - **Understand** the problem
  - Keep track of what you **have done**
  - Keep track of what you **need to do**
  - Make **lists**, write it down, don’t rely on your memory (or worse, yet, your supervisor’s memory!)
Advice (5)

- Prioritize
  - Make priorities in your efforts
  - Check your priorities with your supervisor
  - Typical situation
    - Supervisor asks you to do A
    - Forgets about A and asks you to do B
    - If uncertain on B over A, ask!
Advise (6)

- **Realize that your supervisor is busy**
  - You are here to help him get more accomplished than he could have on his own
  - Biggest benefit to him is when you can be
    - **Self moving and motivating**
  - Do not expect your supervisor to solve all your problems!
    - Found out what he has thought about and suggestions for a starting point & work from there!
    - Supervisor gives you the **seed + some directions**, and goes off to think about other problems
Deliver

- Once you’ve signed up, you have to deliver!
  - But, not the final solution to everything at once!
- Losers keep promising a great thing in the future but have nothing to show now
- Winners can show workable/usable results along the way to the solution
  - Solutions to simplified models
  - Pieces of a flow
  - Intermediate output/data
  - Measurements of problem characteristics
  - Stable intermediates
Advice (8)

- Demonstrate progress
  - Allows supervisor to feedback earlier
  - Helps you prioritize your attention
  - Helps you make mid-course corrections
  - Increase likelihood of successful interesting end results
  - Requirements and understanding invariably EVOLVE!!!
  - Incrementally grow your solutions
Advice (9)

- Target Stable Intermediates
  - Points where some clear pieces of your problem has been solved
  - Things you can build upon
  - Things you can spin-out
  - Things you can share with team members (allow them to help)
  - Points of accomplishment
Advice (10)

- Don’t turn problems (subtasks) into research problems unnecessarily
  - A subtask with no single, obviously right solution
  - Keep focused on the overall goals of the project
    - Adequate solution to the said problem
  - Weak link? Revisit! Explore again!
Advice (11)

- Learn to solve your own problems
  - Use your supervisor as a crutch or scaffolding only to get yourself started!
  - Watch them and
    - learn not just the answers they help you find, but
    - How they find the answers you were unable to find
  - Strive for independence!
  - Learn techniques and gain confidence in your own ability to solve problems now.
Advice (12)

- Don’t stray away too much from what your supervisor knows
  - Otherwise, then just change your supervisor
  - Or, change your research topic