FORMULATING GOOD SCIENTIFIC QUESTIONS
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- What is a good scientific question?
- How do you choose a question?
- How do you answer the question (solve the problem)?
- How do you evaluate your success?
FORMULATING GOOD SCIENTIFIC QUESTIONS

- Interesting!!!/Important
- Substantial, with original dimensions
- Relevant
- Clear and simple
- Manageable
- Consistent with requirements
FORMULATING GOOD SCIENTIFIC QUESTIONS

Interesting!!!/Important

- Pursue with goal of getting at the truth
- Be certain the question intrigues you!
- Do you have a passion for the subject?
- Avoid fads (especially methodological ones)
- Be able to back-up with academic debate
- Use your imagination!
FORMULATING GOOD SCIENTIFIC QUESTIONS

- Substantial, with original dimensions
  - Sufficient in scope?
  - Use your imagination!
FORMULATING GOOD SCIENTIFIC QUESTIONS

**Relevant**

- *Raised in literature (don’t neglect older literature)?*
- *Fills gap in knowledge*
  
  ✦ Do I know the field and its literature well?
  ✦ What are important research questions in my field?
  ✦ What areas need further exploration?
  ✦ Has much research been conducted on this topic already?
  ✦ How will my study impact the field?
  ✦ Is the timing right to ask the question?
  ✦ *(Would funding agencies be interested?)*
  ✦ Use your imagination!

[http://www.theresearchassistant.com/tutorial](http://www.theresearchassistant.com/tutorial)
FORMULATING GOOD SCIENTIFIC QUESTIONS

- Clear and simple
  - Avoid vague questions
  - Consider a question that is divided into a number of parts (consecutive talks at meetings, etc.)
  - It will become more complicated!
  - Use your imagination!
FORMULATING GOOD SCIENTIFIC QUESTIONS

Manageable

- Be realistic (time? resources?)

Feasible

- Start small(ish) and expand
- Be honest about problems you are experiencing; write them down; think about cause

Use your imagination!
Alon (2009)

Problems can be ranked in terms of ease and interest

Feasibility

Interest

Large gain in knowledge

Small gain in knowledge

Hard

Easy

"low hanging fruit"

Figure 1. The Feasibility-Interest Diagram for Choosing a Project
Two axes for choosing scientific problems: feasibility and interest.
Alon (2009)

Choice of problems along the Pareto front moves with life stages of scientist

- Large gain in knowledge
  - Long term plan for lab
  - Good problem for postdoc
  - First problem for beginning student

Interest vs. Feasibility
FORMULATING GOOD SCIENTIFIC QUESTIONS

Consistent with requirements

- Masters thesis
- Dissertation
- Grant solicitation guidelines!!!
- Use your imagination!
FORMULATING GOOD SCIENTIFIC QUESTIONS

Suggested reading:


- Alon, U. 2009. How to Choose a Good Scientific Problem. *Molecular Cell* 35:
FORMULATING GOOD SCIENTIFIC QUESTIONS

“A good project draws upon your skills to achieve self-expression”

Alon (2009)

“To be highly successful the scientist must be confident enough to steer for blue water, abandoning sight of land for a while. ”

Wilson (1998)
Use your imagination!