

# Tips for Science Research

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# Challenges in doing Research

- ▶ Increasingly difficult to explore in the enormous published research literature
- ▶ Tendency towards over specialization
- ▶ Excess specialization has decreased the range of science
- ▶ Consequently, in many science areas, further growth as a means, to an increased rate of major discoveries is no more true.

# How to do it?

- ▶ Read widely and deeply
- ▶ Develop judgment about great papers
- ▶ Build general knowledge
- ▶ Look for issues and questions
- ▶ Capture opportunities
- ▶ Keep a [Research Notebook](#)
- ▶ Follow [references and use citation index](#)

# How the Research is Judged?

- ▶ **Impact ?**
  - ▶ Does it has wide potential?
  - ▶ Does it lead to new directions?
  - ▶ Does it effect teaching?
- ▶ Standards differ in nature of publications
  - ▶ **Conference:** timely, interesting, simple, share
  - ▶ **Journals:** correct, relevant, well-written

- ▶ **Theoretical Research**  
Evaluation of proof, elegance, clarity
- ▶ **Experimental or System Research**  
Evaluation by experiment, simplicity, utility
- ▶ **Multidisciplinary Research**

- ▶ Stay “light on your feet”
  - ▶ Seek new approaches or simplifications
  - ▶ Do not work on same area forever
  - ▶ Have short-time goals
- ▶ Learn from writings
- ▶ Read **Selectively** and **Critically**

# Finding ideas ?

- ▶ Look for problems ...
  - ▶ in reading, teaching
  - ▶ by using your own tools / systems
- ▶ Have lots of ideas, pursue one that:
  - you are uniquely qualified to handle
- ▶ Tackle important problems that:
  - excites you, that on which you make progress



# How to improve?

- ▶ Ask lot questions (why?)
- ▶ Read a lot ([from where?](#))
- ▶ Development judgment about:
  - ▶ [problems](#)
  - ▶ [solution techniques](#)
  - ▶ [explanations, evaluations](#)

# Process of Research in Science

- ▶ Be stubborn and at the same time flexible. In mathematical research, solving a problem takes long
- ▶ Be knowledge-seeking.
- ▶ (Mathematical) Research is an intrinsically social activity.
- ▶ Split the problem into small, bite-size steps
- ▶ Consider examples that capture the phenomenon.
- ▶ Have several questions to think about
- ▶ Use the Internet (Also Mathoverflow: <http://mathoverflow.net/>) MathOverflow is a question and answer site for professional mathematicians. It's 100% free, no registration required.
- ▶ Use analogies

- ▶ Do computer tests to find patterns in data
- ▶ Confirm your results and proofs by computer calculations
- ▶ Keep good notes of what you are doing (preferably in LaTeX)
- ▶ Try to write clearly and concisely, in logical sequence.
- ▶ Try to understand statements and proofs of the results
- ▶ Be motivated and guided by beauty and harmony
- ▶ Listen to your heart