Mapping out a Research Agenda

Barbara G. Ryder
Rutgers University
ryder@cs.rutgers.edu
http://www.cs.rutgers.edu/~ryder
http://prolang.rutgers.edu/
Why do research?

• To satisfy intellectual curiosity
• To better understand things
• To be at the forefront of an exciting, technical field
• To always be learning new things
• Because that’s what professors do!
Helpful Personal Qualities in Pursuing Research

- Creativity
- Curiosity
- Independence of thought
- Good communication skills
- Perseverance
- Self-discipline
- Interaction skills
Choosing a Research Problem

- Problem should be important
- Problem should hold your personal interest
- Problem should have depth, in terms of aspects possibly available for investigation
- Problem might come from questioning existing literature
Choosing a Research Problem

- Problem may be amenable to some technique you already have devised
- Problem may lead you into new technology
- Problem may be in a ‘hot’ area
  - Pros and cons
How to proceed?

• Set aside **uninterruptible** blocks of ‘research thinking time’ in your weekly schedule
• Familiarize yourself with previous work from the literature
• Critically examine previous approaches, questioning generality, practicality, validation
How to proceed?

• Frame long-term questions to be answered
• Use short-term objectives to subdivide research into manageable pieces
  - Divide work into investigations that ‘fit’ into a coherent whole
  - Make progress one paper at a time
How to proceed?

• Know what it means to ‘solve a problem’ or validate a technique

• Write papers and give talks about your work
  - Intuition, intuition, intuition
  - Exercise: do an in-the-elevator summary

• Develop a personal style
  - One at a time vs juggling several projects
How to proceed?

• Allow your graduate students to suggest explorations
• Re-examine your research achievements at regular intervals, to ensure progress towards answering long-term questions
SE Research

• What practical SW problems are you addressing?
• How will you validate your approach?
• How can you ‘keep up’ with this broad area of CS&E?
  - Attend conferences and network
  - Pick favorite journals and other research groups and periodically visit their websites
Specific Techniques

• Establish a reading group with your students

• Summarize attended conferences to others, to discuss key research issues encountered
  - 2-3 sentence summaries of each presentation

• Keep a research notebook where you can jot down ideas for later consideration
  - Go back and look at your entries!
Specific Techniques

• Teach a graduate seminar in your area of interest
  - Teaching is a learning experience
• Attend workshops, especially those with work-in-progress presentations
• Participate in grant evaluation panels and program committees
Specific Techniques

- Leverage your efforts with graduate students
- Use senior faculty mentor(s)
  - e.g., Obtain examples of funded proposals
Possible Pitfalls

- Switch of research areas during junior faculty years
  - Requires large time investment up front
- Controversial/risky research areas
- Obtaining negative results
- Interdisciplinary work
Collaboration

- **Con:** Need for junior faculty to establish a personal research identity
- **Con:** May be time-consuming
- **Pro:** Projects can be more complex and more realistic
- **Pro:** Allows groups to tap into personal strengths of participants
Biggest Challenge

How to develop a coherent research agenda with limited time to do so, while juggling the responsibilities of a junior faculty?