From Rosie the Riveter
To Rosie the Researcher

Dana Vantrease
Computer Science Grad Student
Overview

• How did I get here?
• What is grad school like?
• What do I spend all of my time doing?
• Lessons I’ve learned
Destined to be an Engineer
From Engineering to Computer Science (Engineering)

**Mechanical Engineering**
(I like to read “How Things Work”)

**Chemical Engineering**
(I like AP Chem)

**Computer Science Engineering**
(I like C++ more than AutoCad)

**Computer Science – Theory**
(I like studying the complexity of problems)

**Computer Science – Architecture**
(Complexity is too hard, I’d like to try Architecture)

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Last Year of High School

College

First Year of Graduate School
My First Career Choice

Red Vest? Blue Vest?
My Second Career Choice

Industry?

More College?
Why Go To Grad School?

- Money
  - Economy is Bad
- Your Parent Has a PhD
  - Economy is Bad
- Uncertainty (my reason)
- More Interesting Starting Job

- Professor
- Scientist
- Expert
"Academic" Salaries
Actual average and median salaries at U.S. Doctoral-granting Universities

Notes: Administrator figures are medians salaries, the rest are averages. All figures in 2008 dollars. Sources: College and University Professional Association for Human Resources 2005 Survey; American Association of University Professors 2007 Survey; The Chronicle of Higher Education 2001 Survey of Graduate Assistants; USA Today Survey of Div. I-A College Football Coaches Compensation 2007.
## Deciding Between Masters & PhD

<table>
<thead>
<tr>
<th>Degree</th>
<th>Years</th>
<th>Success Measure</th>
<th>Paid For</th>
<th>Job</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters of Science (MS)</td>
<td>~ 2</td>
<td>Class Grades</td>
<td>Sometimes</td>
<td>More Advanced Industry Job</td>
</tr>
<tr>
<td>Doctorate of Philosophy (PhD)</td>
<td>4-8</td>
<td>Research Papers</td>
<td>Usually*</td>
<td>Research Lab, Start-Up Company, University</td>
</tr>
</tbody>
</table>

*Teaching Assistantship (TA)  
  Research Assistantship (RA)  
  Fellowship (Fellow)
Really Getting Wet

Interested

Committed

Fully Committed
What I Did Know About Grad School

• Carry-overs from Undergraduate Experience
  – Application Process
    • Christmas-time deadlines
    • GRE
    • Essays
    • Recommendations
  – How to find “good” schools
• “Research”
• “Academic Inbreeding”
Not Knowing What I Was Getting Into

• Not just a matter of being smart and putting in your time
• Publications, publications, publications

The Anatomy of a Large-Scale Hypertextual Web Search Engine

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Abstract

In this paper, we present Google, a prototype of a large-scale search engine which makes heavy use of the structure present in hypertext. Google is designed to crawl and index the Web efficiently and produce much more satisfying search results than existing systems. The prototype with a full text and hyperlink database of at least 24 million pages is available at http://google.stanford.edu/ To engineer a search engine is a challenging task. Search engines index tens to hundreds of millions of web pages involving a comparable number of distinct terms. They answer tens of millions of queries every day. Despite the importance of large-scale search engines on the web, current search engines still lack in efficiency and accuracy.
Steps Towards a PhD

~ Year 2: Qualifying Exam
  – Test Knowledge of Area

~ Year 3: Finish Classes

~ Year 4: Preliminary Exam
  – Propose Thesis Topic

~ Year 1-6: Papers (unofficial measure)
  – Publish Results in Conferences, Journals, etc

~ Year 6: Dissertation
  – Written: 200+ page summary of research
  – Oral: Defense in front of faculty committee
My Steps to a PhD

"Satisfaction Level" vs Time

- Qualifier
- Prelim
- Dissertation?
Day in my shoes

• Wake up
• Drink Coffee
• Do Any Combination of the Following:

Read New Research
Write About My Research
Discuss ideas
Design Experiments

+
Keeping Perspective

Smart people are everywhere!

Egos

Easy to feel inferior, lose self-esteem/confidence.

Stay in touch with activities outside of the university (volunteering, etc)

Real World

Academia
Intellectual Balance

• Study something besides your thesis topic!
• Go to talks in other areas
• UW PhD Minor Requirement
  – (Folklore was my minor)
  – (I studied “foodways”)
PhD in Computer Architecture

• Making computers (especially their processors) “better”
  – Faster
  – Lower Power
  – New Functionality
My Job: Find a Use for New Optical Widgets

• 3 widgets:

1. Laser
2. Optical Wire
3. Ring Resonator

X 16 = 1 Human Hair
How Ring Resonators Work
How Ring Resonators Work
How Ring Resonators Work
Now What?
Multi-Core Processor

IBM Cell Chip
(Sony's PlayStation 3)

8 Cores that-
Read/Write Data
Crunch Data
Communicate Data
Idea -- Communicate!

• Today:

• Tomorrow (2017?):
  - High bandwidth
  - Lower power
  - Speed of Light
How to Communicate

- OFF
- ON
- OFF
- ON
How Ring Resonators Work
How Ring Resonators Work
Dreaming up uses for our widgets

• *Communicating Data (yes!)*

• Other possibilities (?) – Research In Progress
  – Synchronization
  – Arbitration
  – Enforcing Coherency/Consistency
  – Optical Computing
  – ...!!!...???...!!!...
Thinking About Grad School?

• Talk to your professors
• Intern in industry
• Perform undergraduate research
• Applying:
  – If uncertain about your area-choice, attend a school that is strong in many areas
  – Choosing an advisor is very important
Thinking About a Major?

• Choosing A Major:
  – Browse the Registrar’s Course Guide
  – Talk to people in the Major
  – Don’t give up if you don’t like XX101

• Don’t make your hobby your job
THANKS