Who am I?

Russ Joseph
From: St. Thomas, USVI
Education:
- BS Carnegie Mellon
- PhD Princeton
Now: Associate Professor, Northwestern
Research:
- Computer Architecture
  (Power/Reliability Aware Systems)
Fun:
- Running (Eight Marathons)
- Golf
Revisiting Choices

Nearing the end of your first year of graduate school, you have some questions to ask:

- Am I in the best program for me?
- You’ve had a year under your belt, ask yourself:
  - What do I want from the graduate school experience?
    - Likes?
    - Dislikes?
  - What do I want as a future career path?
- If not, then how do I get to my preferred track?
  - An opportunity to course correct
Exercise: Turn And Talk To Your Neighbor

A. What is your plan? MS or PhD?

B. What do you want from the graduate school experience?
   - Likes?
   - Dislikes?

C. What do you want as your future career path?
Who’s in the audience?

How many currently in master’s programs?
- Course masters?
- Thesis masters?

How many in PhD programs?
Grad School Paths

Job: Industry/Startup

First Year

Re-apply

Job: Industry/Startup/Lab/Academia

Choose Advisor

Qualifying Exams

Thesis Proposal

Submit Papers

Write Dissertation

Job Hunt

MS Course

MS Thesis Project

PhD

Coursework

Switch

To Dissertation

Research is production of new knowledge

At end of PhD you are the expert in your dissertation topic area!

To Dissertation

Job: Industry/Startup/Lab/Academia
# Program Comparison

<table>
<thead>
<tr>
<th></th>
<th>Course Based MS</th>
<th>Research MS</th>
<th>PhD</th>
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</thead>
<tbody>
<tr>
<td><strong>Educational Goals</strong></td>
<td>• Acquire knowledge via coursework</td>
<td>• Acquire depth &amp; project skills (thesis) • Get taste of research</td>
<td>• Do original high-impact research • Learn skills for more research • Expert-level knowledge</td>
</tr>
<tr>
<td><strong>Program</strong></td>
<td>• Courses are more deep • Short time (job hunt) • Networking opportunities</td>
<td>• Research is not as deep as PhD • Shorter commitment • Less publications/impact</td>
<td>• Long process</td>
</tr>
</tbody>
</table>
Paying For Your Degree

**PhD: Generally fully funded by university**
- Support for students in “good academic standing”
  - Maintain GPA, Find advisor, Pass quals, Make research progress
- Mixture of fellowship (internal/external), research assistantship (grants), teaching assistantship (departmental)

**MS: Generally student supported**
- Most programs: student finances studies
- Other options:
  - Fellowships (internal/external), student loans
  - Employer sponsorship (full/partial)
Financial support mechanisms

Research Assistantship: Work on research project (hopefully contributes to your thesis) funded by external agency…need to show results!

Teaching Assistantship: Work as teaching staff (grade, help students, occasionally lecture) funded by department/university…need to juggle teaching with your own work.

Fellowship (Internal/External): Focus on your academics (research/courses)…no other commitments.
Fellowships

• Even if your advisor has plenty of research funding…
• Apply for fellowships whenever you can:
  – Gives you more freedom
  – Upgrades your CV
  – May come with other perks (e.g. internship)
• Where to apply? Look high and low:
  – Government: National Science Foundation (NSF), Department of Energy (DOE), …
  – Major corporations: Google, Facebook, IBM, Intel, Microsoft, …
  – Other: Ford Foundation, GEM, Hertz
MS: Course vs. Research

**Course Masters**
- Breadth of knowledge may qualify you for marketing, project management roles
- If that’s what you want, take some business classes!
- Lack of major project may be handicap for development roles

**Research Masters**
- Deep project may qualify you for more interesting development roles
- Much more attractive for a research lab position
- Thesis will help with publications
**MS Career Opportunities**

- **Types of Jobs**
  - Operations and IT type jobs (non-tech industry)
  - Product or application development
  - Research support (Contribute to prototyping and publications)

- **Employers**
  - Information Technology (IT) companies
  - Companies in other industries
  - Universities (Typically in support roles)
PhD Career Opportunities

• Research or advanced development in industrial research labs
• Development leadership roles in industry
• Technical project management/leadership
• Academic research and teaching in a university as a professor
Experience of the PhD

Pick Advisor & Move from coursework to research

Hold on!

First paper submission

Ups and Downs
- Thesis research
- Submit papers
- Write dissertation
- Job hunt

Quals
Lessons from the Roller Coaster

• The ride is similar for most people
  – You are qualified for the ride. It’s scary for everyone!
  – You aren’t alone. Share your experiences!

• It takes externally applied energy for the uphills
  – Your advisor will be a key person (later session on this)
  – Seek support from many sources (technical, emotional)

• There are a lot of downhill sections
  – Frustration and doubt are guaranteed…
  – Things can/will go wrong!

• Momentum is important
  – Keep moving forward!
  – No side trips to distract!
## Technical Ladder Example

<table>
<thead>
<tr>
<th>Example Title</th>
<th>Contribution and Impact</th>
<th>Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fellow/Senior Fellow</td>
<td>Multiple product lines or technologies</td>
<td>Top tech leadership impacts the industry</td>
</tr>
<tr>
<td>Principal Engineer/Senior PE</td>
<td>Group product line or technology</td>
<td>Technical authority, impacts a business</td>
</tr>
<tr>
<td>Senior Staff Engineer</td>
<td>Multiple products</td>
<td>Project-wise expert, Impacts a product</td>
</tr>
<tr>
<td>Research Scientist</td>
<td>Product, Project Methods</td>
<td>Expert in area of contribution</td>
</tr>
<tr>
<td>Senior Engineer</td>
<td>Portion of a Product/Project</td>
<td>Working knowledge in one area of contribution</td>
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</tbody>
</table>
Industry Career: Research and Industry Impact

• Research
  – Engage in scientific discovery, collaborate with peers, fund research (but typically later in career, possibly internal funding)
  – May involve university faculty and students
  – Develop creative thinking about technical solutions to problems

• Technology Transfer
  – Contribute to company’s products, client engagement, open source, intellectual property…
  – Demonstrate strong problem-solving skills
  – Publish work and engage with academia

• Service
  – Departmental (hiring committee)
  – Company-wide (promotion review board)
  – Professional
Academic Career: Research, Teaching, and Service

• Research
  – Engage in scientific discovery, involve graduate and undergraduate students, fund research

• Teaching
  – Active teaching, mentoring, advising

• Service
  – Departmental, University, Professional (External)

Expected to do all three well!
Different Types of Colleges

- **Research Universities**: PhD program – emphasize research, but teaching and service important

- **Colleges/Universities**: MS program – emphasize teaching, research and service also important

- **Selective Liberal Arts Colleges**: BS program -- emphasize teaching with research a close second, but service important

- **Teaching-Oriented Colleges**: BS program – emphasize teaching and service but research can be expected
Academic Career Ladder

- **Professorial Ranks**
  - Assistant: Tenure-track, 5-7 years
  - Associate: Usually with tenure (life-time appointment)
  - Full: University-level service expected
  - Chaired Professor: Endowed

- **Administrative Ranks**
  - Department Chair, Dean, Provost, President

- **Instructor** – teaching and service

- **Postdoctoral/Research Associate** – research
What can I do now to prepare for a job in industry?

- **Complete a project(s)**
  - Industry has shifted considerably to applied research

- **Get an internship(s)**
  - Try out a corporate culture, job type, industry
  - Find mentors/supporters of your career
  - Publish your work with co-authors

- **Acquire key skills**
  - Build your professional network, communications, negotiation, making yourself visible

- **Check your competition**
  - Who is graduating soon in your field from other (top) schools?
  - Who works at this company?
What can I do now to prepare for an academic job?

- **Research**
  - Apprenticeship: learn from advisor, doing it, and others
  - Grant writing
  - Corporate connections for funding, student job placement

- **Teaching**
  - Teaching experience, teaching assistantship, teach some even if you don’t have to
  - Professor-in-training programs, course

- **Service**
  - Organizing student organization/support groups
  - Working on department committees
  - Volunteering at conferences
Moving Between Research Lab and Academia

From University to Industry

• Must build real systems

• Establish visibility and knowledge in industry

From Industry to University

• Must continue publishing

• Establish visibility in research community
The B. Algorithm!

```java
if (I.LoveLoveLoveProgramming)
    PursueMasters(); // industry, entrepreneurship
else if (I.LikeProgramming && I.WantMoneyBefore30) {
    if (rand(0, 1.0) < 0.6)
        FinishBachelors();
    else
        PursueMasters();
}
else if (I.LikeProgramming && I.BelieveTheTruthIsOutThere)
    PursuePhD(); /* research, tenure track, teaching, industry, labs, entrepreneurship */
else if (I.DontLikeProgramming) {
    FinishBachelors();
    BecomeASurfer();
}
```
All Choices Are Valid

• People move in all sorts of directions

• Start PhD program – exit after Masters
• Masters – continue to PhD

• Figure out what you want and then get it!