About Careers in Math

Richard Braun
UD Math 268
11 September 2015
This talk will ....

• Be partial answers to important questions that you should be asking
• Give a picture of recent job markets for PhDs
• Include information that many students wish they were told early in their studies
• Include skills and traits that a number of industrial mathematicians, scientists and engineers said they wanted.
Professional orgs

• Society for Industrial and Applied Mathematics (SIAM, www.siam.org)
• Association for Women in Mathematics (AWM website)
• American Mathematical Society (AMS, www.ams.org)
• Mathematical Association of America (MAA, www.maa.org)
Comparing PhDs awarded this year with those awarded in 2003–2004:

- PhDs awarded have increased more than 78% over the last 10 years.
- Degrees awarded by Doctoral Mathematics combined and by Statistics & Biostatistics Combined have increased 72% and 96%, respectively. Some of this latter increase is due to the increase in response rate among the Statistics & Biostatistics departments and an increase in the number of biostatistics programs included in the Annual Survey over the last 3 years.
Where do those Drs go?

- These are *new* PhDs
- Most go to academia
- There are several categories there
- Note that there are many non-US people hired: your competition is from around the world, even if not PhD!
Recent job market data

• Based on AMS data and other sources (AMS annual survey)
• SIAM Report on Mathematics in Industry 2012 (www.siam.org/reports/) link
• Slides on job data from Bill Kolata’s talk at a workshop I helped organize (www.ima.umn.edu/2013-2014/SW4.7-9.14/)
Phd job data

New Math Sci. PhDs

- Stat
- Math
- Total

Years: 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12

Numbers: 0, 200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800

Graph showing trends in new Math Sci. PhDs from 1986 to 2012.
PhD job data

New Math. PhDs --> Ind. & Gov.

Graph showing the number of new Math PhDs going to industry and government from 1986 to 2012.
PhD job data

New Stat. PhDs → Ind. & Gov.

Graph showing the number of new Statistics PhDs moving into industry and government from 1986 to 2012. The graph indicates a trend where the number of PhDs moving to industry has generally increased over the years, with peaks in 2005 and 2011. The number moving to government has been more variable, with a noticeable increase around 2005 and then a gradual decrease by 2012.
TT job data

Tenure Track Positions Filled in Math Departments by Highest Degree Offered

- Bachelors Degree
- Masters Degree
- Doctoral Degree
Why Industry?

Rationale for Taking a Job in Industry

- Had an industrial mentor: 6%
- Worked w. faculty with ind. connections: 12%
- Experience w. ind. Internship: 24%
- Had a job in industry: 32%
- Intellectual challenge: 36%
- Expected better opp. for career adv.: 52%
- Expected higher compensation: 66%

“PhDs tend to underestimate the quality of science done in industry. You will get to solve challenging problems.”
UD activities

• SIAM, AWM chapters
• IMA, MSRI membership (institutes): many activities
• REU projects associated with NSF grants
• Math Modeling in Industry workshop (not every year)
• SIAM and AWM speakers
• Organizing workshops, such as COIMS at IMA
From the COIMS workshop at the IMA, what students said:

• “I wish someone told me this early in my studies”
• “I never knew we had these options”
What Industrial reps said:

• “Programming in a real language is a must, e.g., C or C++, a scripting language, etc
• “I wouldn’t hire anyone who didn’t know optimization”
• “Get an internship”
• “Know something about the business”
The Industry job search now

• Network, network, network, repeat
• Electronic applications are it
• The time scale for industry job changes is weeks.
• Electronic ad appears, and after a wk or two (& 100s of apps), interviews may start
• Within a week of interviewing, offer(s) may be made
Getting a job in a Natl Lab

• Resource rich and sometimes political missions
• Postdoc programs are a main mechanism for hiring for permanent positions
• Identify potential mentors, develop proposals in cooperation with them
• Often, computing important for labs
Getting a job in Academia

- Write papers
- Finish thesis
- Get out and talk about your work, a lot
- Postdoc – more years for higher ranking school, generally
- Get out and talk about your work, a lot
- Network, network, network, repeat
- Did I mention publishing?
Industry vs Academia or Labs

• Picking one or the other because it seems safe “would be a mistake”
• “Pick something you really want to do and make a career out of it”
• Communication with non-math people critical
• Ability to work in teams is critical
• Seeing how to contribute to company and industry is vital
Industry vs Academia or Labs

- Summaries: Grandine and Kolata videos
- Workshop videos on these environments: Calderbank and Saltzman
- Entrepreneurship is possible (panel video excellent with diverse views)
- Data driven industry case studies: Codenotti, Sharp, Lurati
- more
What do the Orgs say? Reports etc

- SIAM 2012 Math in Industry (www.siam.org/reports)
- Mathematics Sciences in 2025 (search for it, www.nrc.org, free pdf)
- INGenI0uS report (www.maa.org, may be hard to find, I can send it to you)
- “Do Babies Matter?” by Mason, Wolfinger and Goulden
NSF Math Institutes

• Eight of them
• www.mathinstitutes.org
• UD is member of IMA and MSRI
• All have many resources: video, talk, materials
The Career Center

• Use it for help with resume writing for industry or vita for academia/labs
• Interviewing practice and filming
• Help arrange interviews etc
• Resources about companies
• Advice