Careers in Industry

for Mathematicians

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PIMS Graduate Summit – Jasper

Outline

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Academia vs Industry?

How do I decide whether to
aim for a job in academia or industry?

Is Academia Really For Me?

1. How much do you love research and teaching, in equal measures?
2. Do you find writing enjoyable and easy?
3. How important is it for you to maximize your salary and/or earning potential? How willing/able are you and your family to (temporarily) sacrifice earnings and job security?
4. How well do you handle rejection/criticism? How thick is your skin?
5. Do you feel the need to receive regular feedback on performance?
6. Do you want freedom to "chart your own course" without needing someone to guide you? Do you like being your own boss?
7. How much do you value long-term job security?
8. Do you mind working long hours?
9. Can you identify interesting and novel research questions?

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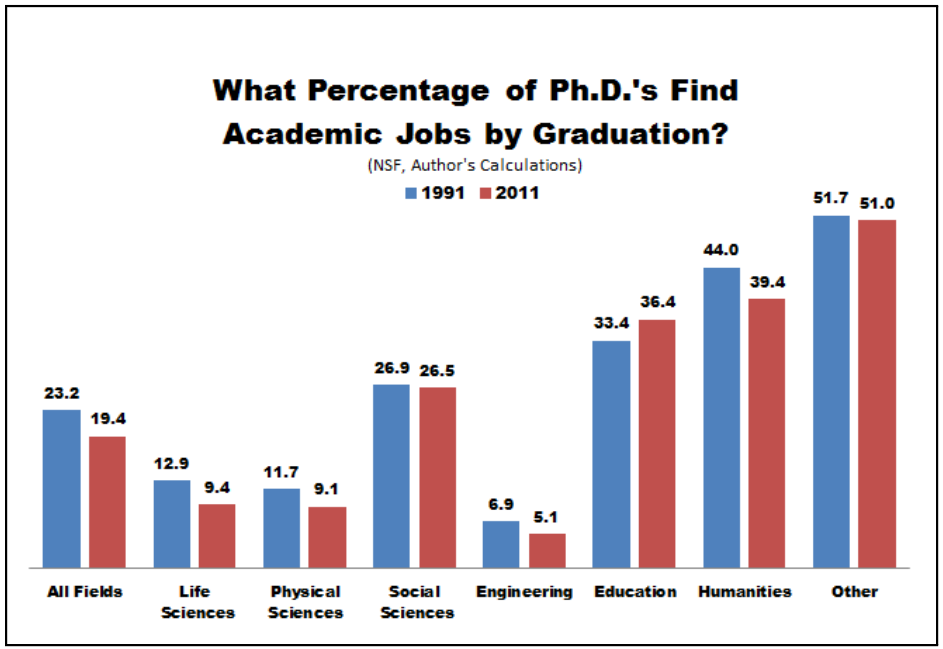
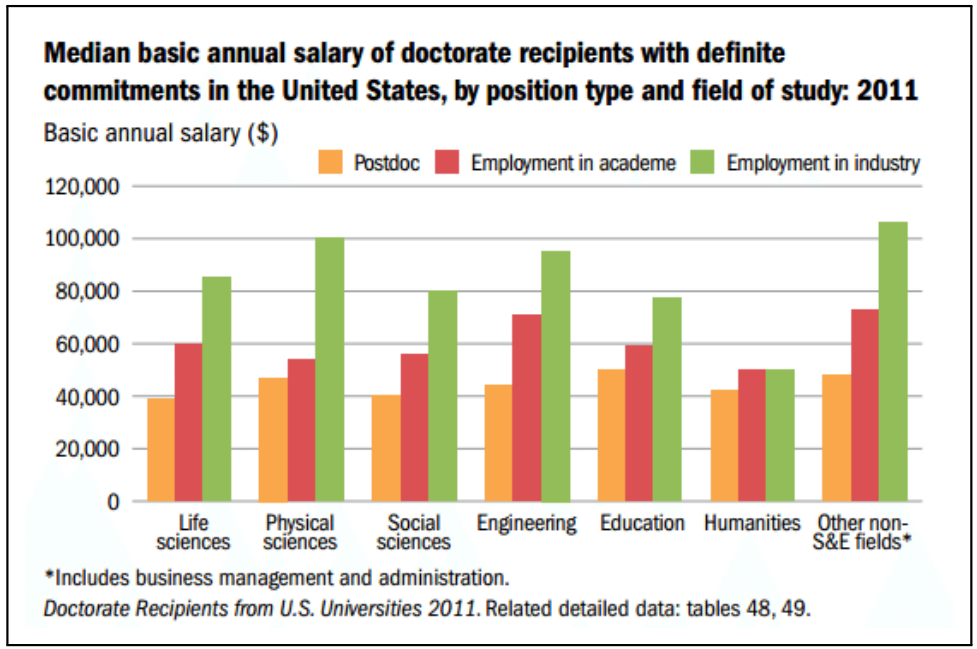
Why Industry?

Two BIG REASONS to consider a career in industry:





But I really want to be a research mathematician. Why should I even bother thinking about non-academic jobs or the needs of industry?

Myths About Academia vs. Industry

- If you are interested in research, your only option is an academic job.
- Industry is the "easy road" and advanced skills aren't needed/valued.
- An industry job is much more stressful.
- Tenure is the greatest hurdle to overcome in academia.
- You can't publish/present your work in industry.
- Intellectual freedom and creativity are lacking in industry.
- Results of experiments and research done in companies are mostly biased and untrustworthy.

Key Differences

There are still a few fundamental differences between academia and industry:

- Timelines: industry deadlines tend to be much tighter.
- Mechanisms of financial support: grants versus goal-oriented budgets.
- Infrastructure: typically not a problem in industry.
- Working hours: in academia, work is unstructured and can easily get out of control.

Outline

Top 10 Jobs in 2016

CareerCast ranks 200 jobs according to work environment, income, outlook and stress.

1. Data scientist
2. Statistician
3. Information security analyst
4. Audiologist
5. Diagnostic medical sonographer
6. Mathematician
7. Software engineer
8. Computer systems analyst
9. Speech pathologist
10. Actuary

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Many are highly mathematical!

"Math Jobs" in Vancouver

Some BC companies that hire applied math MSc / PhD students and have some emphasis on research:

- Bioinformatician: BC Cancer Agency, BC Genome Sciences Centre
- Engineer / Consultant: MDA, AMEC, Stantec
- Video Game Developer: Electronic Arts, Next Level, Radical, Relic
- Quant / Financial Analyst: Fincad, Quic
- Other: Ballard Power Systems, Slac, Hootsuite, ...

Otherwise, Vancouver lacks "big industry" that supports large research divisions like in:

Bombardier, Lockheed, IBM, GM, Blackberry, CSE,
StatsCan, Banks (in Toronto, Montréal, Waterloo, Ottawa)

OR Google, Facebook, Microsoft, Boeing, AT&T (in USA)

Canada's Top R&D Spenders

November 17, 2016

Canada's TOP 100 CORPORATE R&D SPENDERS 2016

Rank 2015	Rank 2014	Company	R&D Spending FY2015 $000	R&D Spending FY2014 $000	R&D Spending % Change 2014-2015	Revenue FY2015 $000	Research Intensity R&D as % of Revenue**	Industry
1	1	Bombardier Inc.*	$2,293,988	$2,022,340	13.4	$23,236,536	9.9	Aerospace
2	3	Magna International Inc.*	$639,350	$585,385	9.2	$41,089,746	1.6	Automotive
3	2	BlackBerry Limited* ++	$599,710	$785,300	-23.6	$2,761,992	21.7	Comm/Telecom Equipment
4	4	BCE Inc.	$530,300	$546,000	-2.9	$21,514,000	2.5	Telecommunications Services
5	7	Canadian Natural Resources Limited	$527,000	$450,000	17.1	$12,795,000	4.1	Energy/Oil & Gas
6	5	Pratt & Whitney Canada Corp. (fs)	$518,000	$542,000	-4.4	nd		Aerospace
7	6	IBM Canada Ltd. (fs)	$477,000	$466,000	2.4	nd		Software & Computer Services
8	13	Valeant Pharmaceuticals International, Inc.*	$427,597	$271,707	57.4	$13,357,940	3.2	Pharmaceuticals/Biotechnology
9	8	Rogers Communications Inc.	$425,287	$418,000	1.7	$13,414,000	3.2	Telecommunications Services
10	12	Constellation Software Inc.*	$349,325	$287,518	21.5	$2,350,646	14.9	Software & Computer Services
11	10	Ericsson Canada Inc. (fs)	$316,000	$315,000	0.3	nd		Comm/Telecom Equipment
12	11	Apotex Inc.	$274,505	$311,105	-11.8	$1,875,891	14.6	Pharmaceuticals/Biotechnology
13	14	CGI Group Inc.	$257,177	$262,492	-2.0	$10,287,096	2.5	Software & Computer Services
14	16	Open Text Corporation*	$251,253	$195,313	28.6	$2,368,046	10.6	Software & Computer Services
15	17	TELUS Corporation	$206,000	$194,000	6.2	$12,502,000	1.6	Telecommunications Services
16	21	Suncor Energy Inc.	$200,000	$150,000	33.3	$29,589,000	0.7	Energy/Oil & Gas
17	19	Imperial Oil Limited	$195,000	$175,000	11.4	$26,756,000	0.7	Energy/Oil & Gas
18	18	General Motors of Canada Limited (fs)	$190,000	$190,000	0.0	nd		Automotive
19	15	AMD Canada (fs)	$185,422	$206,000	-10.0	$372,497	49.8	Electronic Systems & Parts
20	24	Mitel Networks Corporation*	$168,021	$130,662	28.6	$1,480,351	11.4	Comm/Telecom Equipment
21	20	BRP Inc.++	$164,400	$158,200	3.9	$3,829,200	4.3	Transportation
22	22	CAE Inc.	$138,900	$149,000	-6.8	$2,246,300	6.2	Aerospace
23	25	Sanofi (fs) (a)	$133,300	$130,471	2.2	$694,930	19.2	Pharmaceuticals/Biotechnology
24	29	Hydro-Québec	$130,000	$106,000	22.6	$13,754,000	0.9	Electrical Power & Utilities
25	23	MDA	$129,266	$138,951	-7.0	$2,117,363	6.1	Software & Computer Services

Source: http://www.researchinfosource.com

Outline

Skills

What skills / courses / programs are important for a career in industry?

What Companies Want

"High-Tech" industry leaders advocate the importance of combining technical skills **and** soft skills:

- communication (spoken and written)
- networking (professional contacts and interpersonal skills)
- leadership and project management
- problem-solving
- computing experience and software development with relevant languages: Java(script), Python C/C#/C++, Ruby, SQL
- domain-specific knowledge (depends on the job)

Survey of Past Applied Math Students

From an informal survey of past SFU Applied Math MSc / PhD students currently working in industry:

1. Useful Math Skills

- problem-solving
- numerical algorithms behind commercial software

2. Important Courses

- applied statistics
- machine learning
- distributed computing
- data mining / data science
- bioinformatics

3. Essential Soft Skills

- perseverence
- networking (get over shyness)
- technical writing

4. Other Advice or Experiences

- attend an industrial problem-solving workshop
- `http://chemicalstatistician.wordpress.com`

If your ultimate goal is an industry job,
is it important to specialize in something?

Outline

Job Search

How do I start my search for
a non-academic job?

Outline

Pros and Cons of a Math MSc / PhD

Advantages:

- **generic** problem-solving skills!!
- broad mathematical toolkit
- computing experience

Disdvantages:

- few job ads specifically ask for "mathematicians"
- extra effort needed to sell yourself and your unusual skill-set
- lack of specific domain knowledge (unless you work at it)
- no certifications (unless you go out to obtain them)

. . . most of these disadvantages are "easily" overcome!

Advice

BE PRO-ACTIVE!

- Take a relevant course outside your department, OR ...
- Enrol in a short course or summer school that provides you with a certified skill, for example:
  - Data science: bcdata Workshop (UBC, Aug 14–25)
  - Software or HPC: Software Carpentry, Compute Canada
  - Machine Learning: Brains–Minds–Machines (Woods Hole, Aug), MLSS (Max-Planck, `http://mlss.cc`)

  ... many, many opportunities, often with travel support!
- IMHO these short courses are a much better use of your time/money than professional programs like:
  - UBC Master of Data Science (10 months, $31,000)
  - UW MS in Computational Finance (12 months, US$41,000)

Advice (cont'd)

- Attend an industrial problem-solving workshop (IPSW):
  - Canadian IPSWs organized by CRM, Fields, PIMS
    Next one: Aug. 7–11 in Montréal
  - Grad Student Math Modeling Camp (GSMMC, Rensselaer)
  - European Study Group with Industry (ESGI)
- Consider a co-op semester or Mitacs internship – `http://www.mitacs.ca/accelerate`
- Visit university careers office, career fair or industry "meet & greet".
- Prepare a resumé $\neq$ CV!
- Build up a professional on-line presence: web page, LinkedIn, ...
- Take a Mitacs "soft skills" workshop – `http://www.mitacs.ca/step`

Mitacs Step Workshops (Free)

- Build Your Scientific and Technical Writing Skills
- Business Writing for Today's Professional
- Career Professionalism
- Communicating Your Research (online)
- Discovering the Entrepreneur Within
- Essentials of Productive Teams
- Foundations of Project Management I
- Foundations of Project Management II
- Networking Skills
- Practical Tips for Growing Your Network (online)
- Practice Your Presentation Skills I
- Practice Your Presentation Skills II
- Skills of Communication
- Time Management
- Time Management (online)
- Writing Effective Emails (online)
- Writing Strategic Business Reports (online)