

BIG Career Developments for Mathematics Graduate Students

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Graduate training in mathematics prepares excellent teachers and researchers. Students and postdocs thus may infer from their training that they are qualified only for jobs at colleges and universities, when their career opportunities actually are much broader. Options are a good thing, because while academic life has its attractions, it does not suit everyone. In addition, vastly increased PhD production nationwide means that the majority of new graduates in the mathematical sciences will spend their careers working in business, industry, or government (BIG).¹

The lack of exposure during graduate school to careers outside of academia leads many PhD graduates to take multiple short-term academic jobs, whereas a purposeful leap into BIG could be more rewarding both financially and personally. Graduate training in mathematics provides a solid foundation for that career move, once students and departments take some modest steps in advance. This article provides resources to help students prepare for BIG careers, and outlines steps faculty members and departments can take to open up career opportunities for graduates.

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¹PhD production is about 1900; see Figure A.2 in "Report on the 2015–2016 new doctoral recipients," Notices of the American Mathematical Society 65(3) (2018), 350–364. The number of tenure track and tenured positions filled is around 750–800; see Figure F.2 in "Report on 2015–2016 academic recruitment, hiring, and attrition," Notices of the American Mathematical Society 64(6) (2017), 584–588.

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So what are BIG careers? Business and industry roles for a mathematics graduate might range from business-oriented analytical and data science problem solving to industry-oriented technical R&D problems, with a vast range in between including policy analysis work at consulting firms and think tanks. By government careers, we mean jobs at local, state, and federal agencies such as national laboratories, the defense department, and medical research organizations.

How can students prepare for BIG careers? Inspirational stories and practical advice can be found at the BIG Math Network website (<https://bigmathnetwork.org>). The Network is an independent partnership that launched at the 2016 Joint Mathematics Meetings and is supported by the American Mathematical Society, the American Statistical Association, the Institute for Operations Research and the Management Sciences, the Mathematical Association of America, the MathWorks Math Modeling Challenge, and the Society for Industrial and Applied Mathematics.

The BIG Math Network website includes:

- Career transition stories by mathematical scientists who went on to BIG careers
- Links to resources for students and faculty
- Practical advice about seeking jobs

For further in-depth advice and career preparation strategies we recommend our recent book, the *BIG Jobs Guide: Business, Industry, and Government Careers for Mathematical Scientists, Statisticians, and Operations Researchers*, available from the online SIAM and AMS bookstores. The *BIG Jobs Guide* offers students and postdocs a practical how-to guide on topics such as:

- What skills can I offer employers?
- How do I write a high-impact résumé?
- Where can I find a rewarding internship?
- What kinds of jobs are out there for me?

The *Guide* helps students plan ahead for career pathways, right from the undergraduate years, through the early years in graduate school, to the final years and the job search, while being useful also for postdocs wanting to make a career transition.

Faculty members and department administrators are another audience for the *Guide*, with a chapter on low-cost activities by which departments can help students learn about and prepare for BIG jobs, and ways faculty members can build institutional relationships with internship mentors.

What comes next? Inspired by the vision of Philippe Tondeur, former director of mathematical sciences at NSF, the BIG Math Network aims to bring together the broad mathematical sciences community to:

- Communicate the value of mathematical sciences training to students, faculty members, and employers in BIG
- Facilitate connections between students, faculty members, and BIG employers
- Share knowledge on how to prepare for BIG internships and jobs
- Curate and create best practices and training material for preparing students for BIG jobs
- Collaborate with professional societies and BIG in connecting job opportunities with talent

Phillippe and Claire-Lise Tondeur have generously given over \$300,000 to further these goals. The AMS, MAA, and SIAM will use these funds in collaboration with the BIG Math Network to create new activities and programming over the coming three years. Please keep your eyes open for activities at MAA section meetings and at MAA MathFest, AMS sectional meetings, SIAM conferences, and the annual Joint Mathematics Meetings. Other efforts will take the form of products, services, and studies to help departments connect effectively with BIG employers and help students navigate the BIG job market.

If you are a faculty member, graduate director, or department chair, we hope you will actively encourage students to pursue careers in industry and government. The *BIG Jobs Guide* provides ideas for how to do it. If you are a student or postdoc, we hope you will explore **all** the career opportunities open to you. The BIG Math Network and *BIG Jobs Guide* explain how to prepare yourself, get an internship, and choose a career you find challenging and rewarding. Good luck on the journey.



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Credits

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