

# **Business, Industry, and Government Careers in the Mathematical Sciences**

by Philippe Tondeur

Career preparation for graduate students in the mathematical sciences ideally provides superb research and education development for aspiring mathematical scientists. An aspect of career development not yet routinely part of graduate studies in the mathematical sciences are research experiences related to business, industry and government (BIG). For the purposes of this discussion, you can think of this acronym as standing in for mathematically oriented research in a non-academic setting. It is not yet a standard term used outside the mathematical sciences.

BIG career opportunities have substantially expanded over the last decades, as has the number of graduating PhD's in the mathematical sciences. This is not the case for the number of academic tenure track and tenured positions to be filled. For a discussion of this discrepancy in a larger context, see [4]. Yet in the mathematical sciences context personally and financially rewarding BIG careers are continually opening up in well-established as well as unexpected fields, appearing under a bewildering number of labels, attesting to the forever spreading of mathematical tools across an equally bewildering number of fields. All this is an expression of the fantastic expansion of the impact of the mathematical sciences. Vital skills looked for in these positions are mathematical thinking and problem solving skills.

There are many approaches to prepare graduate students for BIG careers. In the BIG Jobs Guide [2], the authors give practical and compelling advice how to navigate that territory, based on their deep and very successful experiences in advisory roles. They concentrate on students trained in Mathematics, Statistics and Operations Research. Mathematical Physics students will equally benefit from the fantastic career advice outlined by the authors. The main transitions considered are undergraduates envisioning BIG Jobs, and graduate students as well as postdocs contemplating BIG Jobs. But the job seeking principles provided will be helpful for other transitions.

This Job Guide was developed by the BIG Math Network [1], which is dedicated to the development of partnerships between academia, business, industry, and government. It was launched in 2016, and is supported by most of the professional societies focused on the mathematical sciences. Such partnerships have developed over time in manifold ways, and the network [1] seeks to spread and amplify these developments.

To achieve its goals, activity plans for the BIG Math Network are described in [3] as follows:

- Communicate the career value of mathematical science training to students, faculty, and BIG employers (case studies, interviews with BIG career scientists)
- Facilitate and create interactions between students, faculty, and BIG employers

- Share knowledge on how to prepare for BIG internships and jobs (webinars, panels, presentations by previous BIG interns and BIG job holders)
- Collect and create best practices and training material for preparing students for BIG jobs
- Promote BIG job opportunities via professional societies and at society meetings (career fairs, panels)

It is a pleasure to report that such activities have increasingly gained active support by mathematically implicated professional societies, in particular the American Mathematical Society, the Society for Industrial and Applied Mathematics, and the Mathematical Association of America.

#### References:

- [1] BIG Math Network (<https://bigmathnetwork.org>) is an organization to foster networking between academia, business, industry, and government.
- [2] BIG Jobs Guide, by Rachel Levy, Richard Laugesen, and Fadil Santosa, Society for Industrial and Applied Mathematics, Philadelphia, 2018, xii + 141pages. Invaluable advice for aspiring mathematical scientists thinking about careers in BIG.
- [3] BIG Career Developments for Mathematics Graduate Students, by Richard Laugesen, Rachel Levy, and Fadil Santosa, Notices of the American Mathematical Society, April 2019, 523-524.
- [4] Private sector nears rank of top PhD employer, Science March 15, 2019, Vol. 363 Issue 6432, p. 1135.

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