

## The Culture of Research and Scholarship in Mathematics: The Structure of Graduate Programs

Although mathematics is very closely associated with the natural sciences, the structure of mathematics graduate programs differs from those of other scientific disciplines in several fundamental ways. These include the transition from coursework to research, the advisor's role, and funding sources.

Due to the richness and maturity of the mathematical sciences, graduate students typically require two to three years of post-baccalaureate course work before reaching the frontiers of the discipline, choosing an advisor, and beginning dissertation research. During the years of coursework, beginning graduate students typically are advised via departmental structures – such as a committee, a vice chair, or a nominal faculty advisor - rather than a dissertation advisor or major professor.

The role of the dissertation advisor of a mathematics graduate student differs from that of an advisor in the natural sciences, especially laboratory sciences. It is often the case that the student's dissertation work is independent work, which broadly supports the advisor's research direction but may not contribute directly to the advisor's current research project. Accordingly, dissertation advisors are sometimes coauthors of publications arising from doctoral theses, but not always. Advising a graduate student in mathematics may not contribute to the advisor's research output to the same degree as it does in other sciences.

Degree program requirements for undergraduate majors in science and engineering create high demand for mathematics instruction taught in lecture/recitation format, and therefore a high demand for graduate teaching assistants. On the other hand, federal agencies support a smaller fraction of active researchers in the mathematical sciences compared to the physical and biological sciences<sup>1</sup>; the awards support a smaller proportion of graduate students<sup>2</sup> and rarely provide more than partial support<sup>3</sup>. Consequently, mathematics students are typically supported as teaching assistants by the department rather than as research assistants by the major professor<sup>4</sup>.

---

<sup>1</sup> See <http://www.nsf.gov/statistics/seind12/append/c5/at05-22.pdf>  
<http://www.nsf.gov/statistics/seind12/append/c5/at05-24.pdf>

<sup>2</sup> See <http://www.nsf.gov/statistics/seind12/append/c2/at02-06.pdf>

<sup>3</sup> Based on average award size, see <http://dellweb.bfa.nsf.gov/awdf3/default.asp>

<sup>4</sup> Data from the [National Center for Science and Engineering Statistics \(NCSES\)](#). See table <http://www.nsf.gov/statistics/seind12/append/c2/at02-05.pdf>