

Report of the AMS Employment Prospects Task Force - 2009

The Task Force

Early in the fall of 2008, it became apparent that we were entering a period of economic instability that was likely to have a strong impact on publicly supported colleges and universities and be prolonged. First, state budgets reported unanticipated deficits for their current fiscal year and then investment vehicles plummeted, spreading the impact to academic institutions reliant on spendable income from endowment. It was clear that the recent good times for higher education would not continue.

In November, the ECBT discussed the prospect of a deteriorating employment market and recommended the formation of a task force to consider and make recommendations to the community to address the situation. The task force was appointed in January by AMS President James Glimm with the charge:

...to survey the extent of anticipated employment problems for young mathematicians, as may be exacerbated by recent problems in the US and world economy.

The Task Force should recommend actions that can be taken constructively by the various parties with an ability to effect changes, including recommendations to:

- *institutions traditionally employing young mathematicians,*
- *departments producing new PhDs in mathematical sciences,*
- *individuals seeking employment or soon to be seeking employment, and*
- *the AMS and other professional societies (e.g., MAA, SIAM and YMN) sharing concern for young mathematicians.*

The members appointed to the AMS Task Force on Employment were:

- Linda Keen (Chair), CUNY Lehman College and Graduate Center
- Douglas Costa, Susquehanna International Group
- Annalisa Crannell, Franklin & Marshall College
- Eli Donkar, Social Security Administration
- Moon Duchin, University of Michigan
- Melvin Hochster, University of Michigan
- Susan Loepp, Williams College, Member of AMS Committee on the Profession
- Bernd Sturmfels, University of California-Berkeley, AMS Vice President and Council Member
- James Tattersall, Providence College, Member of the AMS-MAA-SIAM Joint Committee on Employment Opportunities
- Carol Wood, Wesleyan University, Member of AMS Committee on Publications and AMS Board of Trustees

with AMS staff support from:

- Ellen Maycock, Associate Executive Director of Meetings and Professional Services
- Diane Boumenot, Professional Services Department
- Donald McClure, Executive Director

Report to Council and ECBT

There is little doubt that mathematicians are susceptible to the recent disruptions in the economy, nor that recent PhDs will face severe challenges finding jobs in the near future. As the projections below show, the number of students completing PhDs in mathematics is unlikely to change significantly from last year (if anything, the numbers will rise), while the number of academic job openings will decrease dramatically (by nearly 40%), leaving a gap between the number of academic positions available and the number of new mathematicians this year. Because new PhDs apply predominantly for academic positions, there will be many people disappointed this year.

This report addresses employment issues in mathematics in five sections. The first of these is informational:

- 1) What we know (preliminary data and resulting projections about the near-term job market in mathematics).

The remainder of the sections provide recommendations on how the AMS can address the effects of this (and future) economic downturns on the mathematics profession.

- 2) Recommendations for the short term from the AMS to academic departments that are hiring;
- 3) Recommendations from the AMS on broadening employment prospects for graduate students and recent graduates;
- 4) Recommendations regarding NSF and the stimulus package; and
- 5) Recommendations for the longer term.

1) Preliminary data and resulting projections about the near-term job market in mathematics.

The latest Annual Survey data are not yet available, but it seems that the number of people receiving doctoral degrees will be close to last year's number, 1378. Excluding doctoral degrees from statistics departments, there were 1061 new Ph.D.s in 2007-08. Data from the quick survey of representative departments just completed by the AMS¹ project that the total number of academic positions available for these new doctoral candidates is 918, down about 39% from last year. The responses also indicate that these students are applying primarily for academic positions. Typically (based on Annual Survey reports) more than 10% of the total population of new doctoral recipients take positions outside the U.S. and about 75% of those employed in the U.S. take academic positions.

It is important to note that there are young mathematicians exiting postdoctoral and instructorship positions who are also candidates for the estimated 918 positions being recruited. To put the count of 918 in perspective, the 2007 Annual Survey reported 1543 academic positions open to new mathematics doctoral recipients in 2006-07.

¹ The recent task force survey contacted 68 mathematics departments in late February 2009 and collected data on recruitment, retirements and graduate students completing their doctoral degree in 2008-09. All 68 departments responded to the survey.

2) Suggested recommendations from the AMS to academic departments that are hiring.

It is clear from the data above that not all current students completing PhDs and recent PhD recipients will be able to get academic jobs, and that this economic downturn will be hardest on our most vulnerable (that is, most junior) colleagues. At the date of this writing there may be little that can be done to influence individual outcomes in the current hiring season. Still, academic departments can mitigate the near-term effects of a bad job market in several ways.

First, and perhaps most important, is to maintain ethical employment practices. The mathematical community has a history of high ethical standards; the AMS should reinforce endeavors to live up to these standards so that this economic downturn does not create permanent damage to the way we hire. We should continue to encourage departments along these lines:

- Whenever possible, hire tenure-track instead of multiple, revolving-door visitors.
- Whenever possible, hire multi-year visitors instead of multiple one-year visitors.
- Whenever possible, hire a full-time visiting instructor instead of multiple adjuncts and part-time instructors.

As part of this effort, the AMS should publicize our “Policy Statement on Supportive Practices and Ethics in the Employment of Young People in the Mathematical Sciences” (see appendix A) on the employment web pages, in the *AMS Notices*, and elsewhere. (<http://www.ams.org/secretary/supportivepractices.html>)

Second, given the current economic climate, all departments should strongly consider extending the length of existing postdoctoral fellowships and visiting positions. When this is done, the institution and the individual are urged to explore a wider range of possibilities for the following year’s job search, including more serious consideration of non-academic employment and/or employment in academic settings other than four-year colleges and universities.

Each department should be alert to the possibility of unexpected additional ‘stimulus’ funding within its own institution, and be prepared to argue forcefully for its allocation in support of mathematics.

Third, departments should proactively begin to advise current doctoral students of the degree of dislocation in the market for new PhDs, and that this level of dislocation is likely to continue for the next few years. At the same time, departments should assist current doctoral students in researching and contacting non-academic employers in industry and government

Indeed, the topic of non-academic employment of mathematicians was repeatedly a central focus of the task force’s discussions. It is reasonable to expect the elasticity of the supply of academic jobs for mathematicians to be relatively low and the elasticity of non-academic jobs to be relatively higher. Under that expectation, the ‘solution,’ if there is one at all, to the undersupply of academic jobs is most likely to come from the exploitation of non-academic ones, both in the near term and the longer term. We shall have more to say about this below.

3) Recommendations from the AMS on broadening employment prospects for graduate students and recent graduates.

As several employment task forces over the past three or four decades have noted, graduate programs tend to prepare their students for (and overwhelmingly direct students toward) academic careers in universities and four-year colleges. This narrow focus leaves mathematicians especially vulnerable to unemployment and under-employment in times of economic instability – as noted above, this year will see substantially more new PhD mathematicians graduating than there are academic jobs available in colleges and universities. Even within the framework of academic careers there are additional options, including positions at community colleges, whose hiring timetables and practices are unfamiliar to members of most graduate programs.

The AMS should assist graduate departments to be more aware and to take advantage of broader notions of mathematical careers. In particular, graduate departments need to know how to help their graduate students who might pursue non-academic or government employment. Help from the AMS might take the form of:

- flyers to advisors and graduate students, pointing them to existing resources on the web; see <http://www.ams.org/employment/job-articles.html>, for example;
- information sessions at the Joint Meetings, or even at regional and sectional meetings, led by mathematicians from industry;
- including non-academic advising issues in Chairs sessions;
- helping departments to link to industrial internships their students might pursue;
- making available on the web more profiles of mathematicians (and especially recent PhDs) in non-academic careers;
- helping mathematicians set up “industrial post docs;” and
- finding funding for "industrial sabbaticals" that could place academic mathematicians who advise graduate students in an industrial setting for one year.

Doctoral students and post-docs should be encouraged to take action along the following lines:

- include some applicable mathematics in their course of study. (Examples include probability, statistics, numerical methods, optimization, etc.)
- learn, in depth, a programming language widely used in industry, along with good software development practices.
- make a concerted effort to develop good communication skills: listening, oral presentation, written presentation, and good presentation of data and technical results.
- do an internship in industry or government. Observe what is used in practice and use the experience to help guide their professional development.

Academic departments should be encouraged to make it as easy as possible for students to follow the recommendations above while pursuing their degree programs. Toward this end, departments should consider:

- becoming knowledgeable about industrial and governmental career alternatives, and setting up a faculty advisor specialist, as discussed below, who would help students prepare for employment, starting in their first year.
- creating and maintaining a network of alumni, and other, contacts in industry and government.
- encouraging and facilitating programming proficiency, for example by allowing programming credits to count toward the degree.
- encouraging and facilitating internships, for example by allowing them to count for credit toward the degree.

We discuss some of these ideas in other contexts in both of the sections below.

4) Recommendations regarding NSF and the stimulus package

According to a report from Peter March to the Committee on Science Policy in early March, there is some encouraging news: the NSF has doubled its number of new postdoctoral positions from approximately 30 to approximately 60. In late March, the DMS created 30 new postdoctoral positions for recent PhD recipients who have not found employment for the coming year. These positions will be housed by and shared among the seven NSF-funded institutes. The DMS expects up to \$100 million of new money from the stimulus package; that funding is designated for “new” projects (meaning “not funded by the NSF before”) and needs to be obligated by October 2009. In the longer term, future funding should also triple the number of Graduate Research Fellowships. (We note that these new students entering the pipeline will need jobs when they graduate.)

This is obviously a time when the new administration wants to support technology and science. We need to make sure that the AMS (as an institution) and AMS members (as researchers at the frontiers of knowledge) keep the importance of mathematical research and the professional development of mathematicians in the minds of our legislators, the decision-makers at the NSF, and the general public.

Given the new monies available to the NSF, the AMS and its members can be instrumental in suggesting constructive uses for it. For example, the NSF-funded institutes could play a role in retraining PhD mathematicians in non-academic areas where there are numerous employment opportunities. For instance, MBI and SAMSI could provide new and welcome leadership by offering training opportunities in biology and statistics, respectively. Such opportunities can be a winning situation for everyone, raising the general mathematical community’s awareness and appreciation of the institutes, and benefiting all participants, including those that later return to a regular mathematics job in a regular mathematics department. The AMS should foster and nurture such programs.

The AMS should encourage institutions to direct stimulus money that they receive toward people in the formative stages of their careers. In addition, as described above, the AMS should pursue funding, or encourage departments to pursue funding, for initiatives that help graduate departments to link to industrial internships for graduate students and industrial sabbaticals for academic mathematicians, to create programs for employment advising, and to extend post-doctoral and visiting positions.

5) Suggestions for the longer term.

In every recent economic downturn, a task force has encouraged the AMS to assist academic mathematicians to pursue non-academic careers. Clearly, such an endeavor requires a more systematic, sustained effort on behalf of the AMS than our periodic distress calls have mustered. When jobs become more plentiful, the flow of information about alternative career tracks to degree-seekers is impeded by negative attitudes, as well as (in many cases) by faculty ignorance on the nuts and bolts of non-university job placement.

The AMS should undertake a sustained, ongoing discussion on how to make non-academic employment more of an option for mathematicians, even during times of hiring plenty: it should support systemic initiatives to train faculty advisors and to pair mathematics students with industrial pre- and post-doctoral support, perhaps with NSF encouragement and funding. The AMS might consider ways to help people apply for non-academic jobs online (for example, investigate an industrial analog of the AMS Cover Sheet or of MathJobs).

The AMS should facilitate the creation within individual mathematics departments of a faculty advising role (possibly an Associate Chair in large departments) for professional placement. As one of our task force members wrote,

“It could be extremely useful to create a program through the AMS (perhaps funded by NSF) to train faculty members to be job placement resources for students in their departments. This program could assemble a packet of information about community college, government, and industry employment to send out to each department. (For instance: application procedures and deadlines; job security; pay; coursework or teaching experience that makes an applicant more attractive; contact information for people willing to field questions - including alumni - in each type of job.) In addition, the program could run a training weekend that a representative from each department would attend to get up to speed.

A more long-term, but nonetheless real, concern regards public cries for more “accountability” and regulation of academic institutions. The AMS should continue to train the mathematical community to be sensitive to these concerns: how do mathematicians address (or even forefend) charges that professors are not doing enough teaching because they spend too much time on esoteric research? Even in the academic community, there is widespread ignorance of the richness of mathematical research and the stunning contributions it continually makes to our society. Since crises tend to be especially hard on the vulnerable (not so much “survival of the fittest” as “extermination of the slowest”), it is especially important for departments to extol their virtues to their administrations and the public, in order that they have a continuing appreciation of mathematics as fundamental to the infrastructure of our civilization. The AMS will continue to play a vital role in helping mathematicians communicate our worth to the larger society.

Appendix A

AMS Policy Statement on Supportive Practices and Ethics in the Employment of Young People in the Mathematical Sciences

as found at <http://www.ams.org/secretary/supportivepractices.html>

1. Mathematics departments should make their students aware of the realities of the job market and should provide them the opportunity to prepare for a broad range of jobs in the mathematical sciences.
2. Employers have a responsibility to support the development of recent graduates, whether in temporary or potentially permanent positions, through mentoring and training in all aspects of professional life, and by integrating them into the scholarly life of the department.
3. Mathematics departments that offer temporary positions are urged to offer such positions for at least two years' duration whenever possible. When a recent graduate is hired for only one year (e.g., to replace a permanent faculty member on sabbatical), it is especially important to attend to the professional development of the person hired. Colleges and Universities have a responsibility to permanently staff departments at sufficient levels, rather than continually relying on temporary non-tenure track faculty.
4. Recent graduates should be hired at salaries commensurate with national norms. In particular, the practice of hiring recent graduates by the course at sub-standard salaries is reprehensible and exploitative.

Adopted by the Council in March 2007 so as to speak in the name of the Society