

A Conversation with Helen G. Grundman, AMS Director of Education and Diversity

Stephen Kennedy and Helen G. Grundman



Helen G. Grundman is the Director of Education and Diversity of the American Mathematical Society and Professor Emeritus of Mathematics at Bryn Mawr College. Her email address is hgg@ams.org.

As part of its strategic initiative on diversity and inclusion, the AMS has created the new Education and Diversity Department, appointing Helen G. Grundman as its director. The AMS's Strategic Plan describes the new department as seeking to promote diversity and inclusion at all stages of the mathematics pipeline.

Grundman is a number theorist with a Berkeley PhD, who after two years as a Moore Instructor at MIT spent twenty-five years at Bryn Mawr College. She earned campus-wide awards from Bryn Mawr for both excellent teaching and effective mentoring. In January at the Joint Math-

ematics Meetings she will receive the AWM's M. Gwyneth Humphreys Award for Mentoring Undergraduate Women. *Notices* asked Grundman to tell us about herself and to share some of her thoughts on the new department.

Notices: Please tell us about your educational background.

Grundman: When I was seven, my family moved to Detroit so that my father could be the founding headmaster of a diverse college-prep school in the inner city. At the time, black students were being turned away from the elite

college-prep schools in the area. I attended Friends School in Detroit for eight formative years, part of a learning community with students from various races, religions, ethnicities, economic backgrounds, and physical, emotional, and intellectual abilities. I know from experience that education is enhanced by diversity.

At the University of Michigan, I double majored in mathematics and psychology and completed the work for secondary teaching credentials in mathematics and general sciences. I took an extra semester to finish because I wanted to do my student teaching in the fall, allowing me to start with the students at the beginning of their school year.

After that, I took a mid-academic year job at a large parochial high school just outside of Detroit, teaching there for three and a half years. I greatly enjoyed it, particularly teaching those students who came in the door convinced that they could not do math. I missed working on advanced mathematics, but teaching is a noble profession and going to graduate school in math seemed to me to be very self-indulgent. Then a friend of mine explained that I should get a PhD in math because the field needed more female role models. This meant that I could have fun learning and doing math and do it for a good cause!

I decided to go to UC Berkeley, where I was lucky enough to take a number theory class with Emery Thomas. A topologist who had converted to a number theorist in his later years, Emery became my dissertation advisor.

Notices: Can you tell us something about your mathematical work? What areas have you worked in, what have you been doing lately?

Grundman: I consider myself an algebraic number theorist. In my thesis, "The Arithmetic Genus of Hilbert Modular Threefolds," I used algebraic and computational number theory to derive results in algebraic geometry. Since then, my research has been varied, partly because I enjoy working collaboratively, and that often means pushing one's boundaries to find common ground with a collaborator. I have a number of publications dealing with

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Hilbert modular varieties and some related papers dealing with cubic number fields. I have a special love for elementary number theory, because it's usually easy to explain the problems to people who don't know much math and because it's an excellent area for involving undergraduates in research. Probably my most cited works are in inverse Galois theory, specifically on the realizability of groups as Galois groups. I've dabbled in some other areas of number theory, and in recent years have become involved in multiple projects concerning the solvability of families of Diophantine equations.

Notices: *I know you've been involved with the EDGE (Enhancing Diversity in Graduate Education) program. Can you tell us about that experience, the roles you played, the effects it had on your thinking, what lessons you learned?*

Grundman: EDGE is an amazing program. I taught algebra to the students the first and third years that the program existed, and had some minor roles in the following years. Several years later, Rhonda Hughes asked me to run the EDGE Mid-Atlantic Mentoring Cluster. This involved arranging gatherings of EDGE alums who were currently in the region. The most effective meetings involved a meal with a lot of socializing, followed by a more serious session in which the women shared their current situations, struggles, and victories. The feedback I received indicated that they, particularly the women in graduate school, greatly appreciated the sharing and mutual mentoring at these meetings.

The EDGE Program taught me how incredibly important it is to know that you are not alone when pursuing something like a graduate degree. These students learned ahead of time that there would be bumps in the roads to their degrees and were given tools and support that they could use to deal with difficult times. When times got rough for them, they were much less likely to get derailed, but instead became more determined. Of course, some decided on different directions, chose to change programs or final goals, but their support network helped to keep them from feeling that they had failed. These women knew that they were making choices and not letting others make their choices for them. And, of course, many of them now have PhDs and are teaching and mentoring a new generation.

Notices: *Are there other relevant life or professional experiences that will inform your work in the Education and Diversity Department?*

Grundman: Probably the most relevant life experience was my time as a math graduate student. I was coming to graduate school from being a high school teacher and was not used to being treated as a student, nor to leaving issues to others to resolve. I sincerely felt that the faculty, staff, and administrators were fellow educators and colleagues and should be wanting to improve their programs. I learned the bureaucracy and helped many graduate students navigate it—particularly when they needed

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exceptions to rules, something that women and underrepresented minority students seem less likely to know are commonly granted.

This was during a time when the Berkeley PhD program admitted a lot more students than they could support beyond the first year. Most professors didn't bother to get to know first-year students, since so many of them would not be there the next year. And then, of course, there were the exams, which caused even more students to leave. Though I am not at all opposed to graduate exams, I find it very frustrating

that so many very strong students get weeded out by them. It is the students without strong egos who leave rather than asking for a second or third try.

My second or third year, a friend of mine and I were asked by a faculty member to organize something for the women graduate students. We learned that a female graduate student had been stalked by an advanced graduate student who had originally claimed to be a beginning student in a class with her. She ended up avoiding him by entirely avoiding the math building, and she eventually left the program. Somewhere in the process, she found out that this same student had also been harassing other female students. Although that stalker had graduated and was gone, there was an awareness that the women graduate students needed to be less isolated.

We applied to the graduate dean for some funds and held a picnic for women math graduate students. We worked hard to get everyone to attend. One of our goals was for all of us to learn that there really were a lot of women in the program. Another was to make sure that every woman knew at least one other. The picnic became an annual event and later morphed into the Noetherian Ring, an organization for women math graduate students that has spawned similar organizations at other schools.

At that time, the Mathematics Opportunity Committee (MOC) was able to admit capable students from underrepresented groups, who were passed over by the regular admissions committee. Those who appeared to have a weaker background were admitted to the master's program with the understanding that they could then transfer into the PhD program. What I found during my six years at Berkeley is that very few ever transferred and many felt duped. I decided that there should be a set program for these students and, during my final year, I designed and proposed such a program with the help of two friends. The PrePhD program gave students one year (with support) during which they took advanced undergraduate courses in order to fill out their backgrounds. Students who passed the courses with an appropriate grade point average were automatically transferred to the PhD program, at which point the clock would start for them to complete their exams, etc. A number of years later, I was thrilled to meet

and be thanked by the first student to complete the program and go on to receive her PhD.

All in all, my time in graduate school taught me a lot about how and why students leave mid-program. For so many of these students, their leaving did not seem to have anything to do with whether or not they would make strong mathematicians.

I should mention that prior to coming to Bryn Mawr College, I had great doubts about single-sex education. But I have learned some very good reasons for having this option for some students. I think that it's wonderful for a young woman to be on a campus where the goal is to educate women. (I think that there are plenty of campuses that give the impression that their goal is to educate men.) Equivalently, I think that it's wonderful for a black student to be on a campus with the historical goal of educating blacks. But I think that all of these campuses are enhanced by more diversity. For example, around 1950 Hampton Institute, now Hampton University, had a program in which white college students (my mother having been one of them) would attend this otherwise black college for a semester or a year, broadening the education of all of the students. I guess that my belief is that having diversity does not imply having to lose a particular institution's special focus.

Of course, all of my experiences at programs, conferences, and workshops, and my years at MIT, Bryn Mawr College, MSRI, and the Bunting Institute of Radcliffe College inform me of what does and does not help mathematics students and mathematicians at various levels to be successful. Also my work with AWM, Project NExT, and other organizations has given me a variety of additional experiences mentoring young women both before and

after obtaining their PhDs, helping to inform me of the issues near this difficult transition point.

Notices: *Can you tell us your thoughts on graduate education more generally?*

Grundman: First of all, I want to be very clear that we, in America, have the best graduate mathematics programs in the world and we don't want to change that. Of course, we should always be working to improve our programs, if only so that they remain the best.

I think that a PhD in math should indicate a broad knowledge and understanding of mathematics along with a very deep understanding of a small area, in which one has done independent (though, perhaps, guided) research and proven new results. I would like it also to indicate an ability (though not necessarily a desire) to do more mathematics

research and I would like it to indicate an ability (though perhaps one that needs some honing and, again, not necessarily a desire) to teach mathematics.

Not everyone should get a PhD in mathematics, just as not everyone should become a symphony cellist. But, in either case, in order to produce the very best of the best, we need to make sure that everyone has the opportunity to enter pathways leading there, that they are appropriately encouraged and supported, and that the filters we use to remove students from programs achieve the desired outcomes. (And we need to agree that the desired outcomes include our having a more diverse mathematics community than we have now.) We know that orchestras are becoming more diverse and *of higher quality*, now that blind auditions are common. We need to find analogous ways to improve the filters that we use throughout our educational process. And, as anyone who has been working in graduate admissions to improve diversity can tell you, we definitely need to improve the opportunities (and encouragement) for underrepresented minorities and women to enter, and continue on, the pathways that can lead to applying to a PhD program in mathematics. Once we have admitted well-qualified, capable students into our programs, we need to ensure that we provide them with a challenging and supportive environment that does not (perhaps inadvertently) drive them out.

Notices: *What are some of the institutional or structural barriers to members of underrepresented groups in graduate education that persist? And what can we do about them?*

Grundman: I'm not sure that I'd call them barriers as much as hurdles, but they are hurdles that exist for some students, and not for others. And, as I talk with more and more people, I'm learning that they still persist at every step of the way, from undergraduate advising and mentoring, through admissions, and then each stage of the graduate-school experience.

For example, there are many issues at the point of admissions; many schools are already addressing some of them. One clear problem is the over-reliance on GRE scores. On one hand, it seems like such a clearly objective measure, independent of individual biases. But, to the

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Grundman talks to graduate student Jonah Swann at a reception in the Anna Pell Wheeler Mathematics Lounge at Bryn Mawr College.

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their current practices.

Admissions decisions that are not based on test scores usually depend a great deal on letters of recommendation. Obviously, letters from mathematicians known to members of the committee carry more weight than letters from unknowns. Thus, to improve diversity without sacrificing quality, members of admissions committees need to make an effort to get to know some of the professors who teach and write letters for applicants from underrepresented minorities. This would also allow the letter writers to learn more about what characteristics of the students are important to the committees.

Considering the problem more generally in graduate programs, one well-documented reason women and students from underrepresented minorities leave is because of isolation, because each is, at best, one of very few in their program. This reinforces the barrage of messages a student receives indicating that perhaps he or she doesn't belong there. These other messages are a combination of the small failures that almost all graduate students face, along with the (often accidental) micro-aggressions coming from both faculty and students, and, unfortunately, the blatantly racist and sexist actions and comments that we all would like to believe are not a part of our graduate programs.

A number of approaches have been tried to solve, or at least mitigate, some of these problems. Some institutions have drastically changed their admissions practices, with very positive results. To combat the problem of isolation, some campus-wide organizations have been formed to allow students from underrepresented minorities to see that they are not alone and to allow for co-mentoring. If that is not an option, then perhaps students can be connected with mentors on other campuses. Faculty in the students' departments can greatly reduce the effects of the negative messages, by delivering clear, honest, positive

contrary, we have very strong evidence (a controlled experiment run by the ETS) that this sort of standardized mathematics test yields lower scores for women (on average) than they do if a simple change in the testing procedure were made. And there are similar results for students in other groups that are underrepresented in mathematics.

Another admissions problem is the desire to admit students with trajectories typical of successful students previously admitted. Though this is, in many ways, a logical approach, it dooms us to repeat the past. Programs need more experience with students whose backgrounds are different, but they can't get that without changing



Grundman with four of her graduate students at Bryn Mawr College's graduation: Jaclyn Lang, MA '09 (PhD UCLA '16); Eva Goedhart, PhD '15; Amanda Hittson, MA '09; and Daniel Wisniewski, PhD '10.

messages to students. This is a skill that can be learned, along with the skill of avoiding micro-aggressions. Finally, departments that want to be diverse need to accept that they have a responsibility to set standards for acceptable behavior, to communicate them clearly, and to have an established procedure to be followed by people who witness racist or sexist behavior in the department or at a departmental event.

In general, I think that the biggest need is for high-quality mentoring, with at least one mentor who actually understands the student's situation. But I also think that we still have a lot to learn about success in graduate school. We need to understand what mechanisms are in place that cause talented and capable students to leave math graduate programs. If someone finds that they are not happy spending large amounts of their time working on mathematics, then it may well be that a PhD in math is not what they want. On the other hand, if they want to spend that time on math, but the real world intrudes and also demands much of their time, this should not necessitate an exit from mathematics. But few programs have easily identifiable procedures for dealing with such situations. If students enjoy math and excel at it, but circumstances make them miserable when they're physically in the math department, we should become aware of the situation and figure out what needs fixing. Again, having a good mentor in the department who can understand the problem and can help the student find ways to succeed is key.

Notices: Would you care to share some of your big-picture thinking about the mission of this office and your vision of what it can accomplish?

Grundman: The mission of the department, simply put, is to promote diversity and inclusion in the mathematical sciences and to contribute to the improvement of mathematics education. The initial focus is on diversity in graduate-level mathematics education. I'm hoping to find ways to improve the recruitment, preparation, and

success rate of students at this level, particularly members of groups that are underrepresented in the mathematical sciences, including women. Successfully increasing the number of doctoral recipients among these groups will not only diversify the population of PhD mathematicians, but will also, over time, positively affect diversity at earlier stages of the mathematics pipeline.

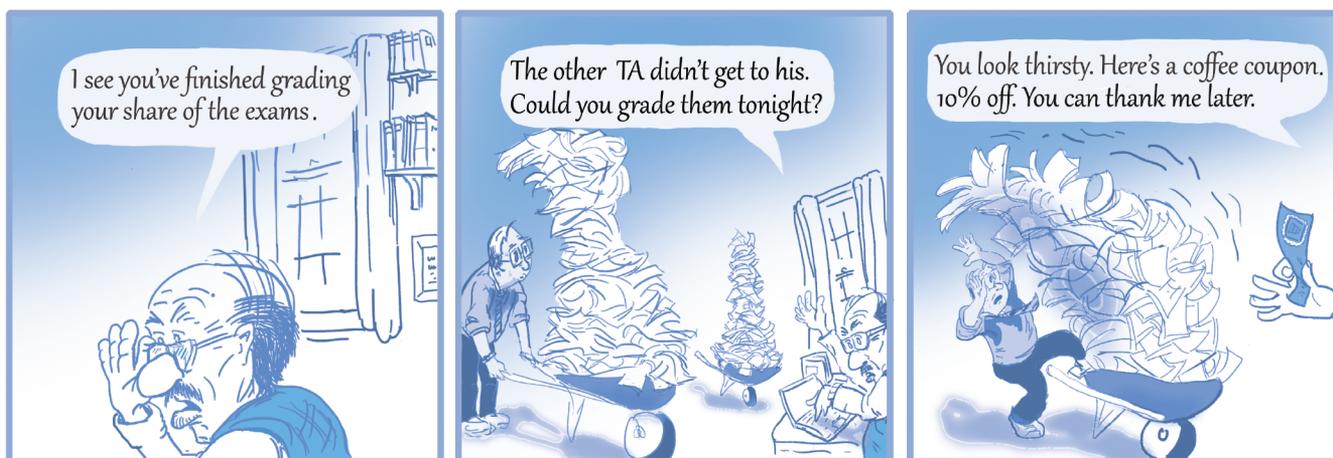
Credits

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Photo of Helen with graduate students at graduation is courtesy of Jaclyn Lang.

MY PROFESSOR



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