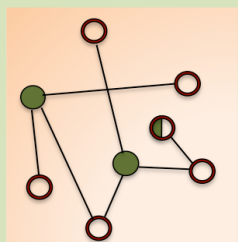


E-MENTORING NETWORK IN THE MATHEMATICAL SCIENCES



Creating Mentoring Networks

Providing Mentoring to underrepresented groups in the Mathematical Sciences

Undergraduate * Graduate * Postdoctoral * Faculty

January 2012

Why apply to summer research programs for Undergraduates?

The benefits of a professional society for Grad students

If I could do over my Postdoc, this is what I would do differently.

Junior faculty: balancing all responsibilities

Why apply to summer research programs for Undergraduates? *Emille Davie Lawrence and Dagan Karp offer their advice.*

EDL: If you are thinking about going to graduate school to study mathematics, you may want to strongly consider applying for a summer research program. These are commonly referred to as research experiences for undergraduates, or REU, for short. An REU exposes you to mathematical research similar to that which you may be doing as a graduate student. Just as a future law student might intern at a big law firm during the summer, an REU gives you extra training and preparation for your future as a mathematician. These programs are usually for students after their sophomore or junior year in college and are held on the campus of some university. Most have deadlines between January and March. There are many REUs to choose from, and finding a program that is a good fit for you could be a little daunting. Here are a few tips to help you sift through the many choices.

Do your homework: Before applying to any REU, find out as much about the program as you can. You should undoubtedly be aware of the eligibility requirements, starting and ending dates of the program, the institution at which the program will be held, and the research topic. However, you should also ask some deeper questions. For example, *does the REU have a particularly good track record for preparing students for graduate research? Do you know anyone else who has participated in the program?* If so, seek out their thoughts on their experience. *How competitive is the program?* Also, if you are an underrepresented student in mathematics (women, African Americans, Latinos, and Native-Americans are some examples of underrepresented minority groups in mathematics), *would you like to participate in a program specifically for your minority group or not?* All of these questions should be explored when choosing the right REU for you.

Are you curious about the topic? Not everyone likes strawberry ice cream. Some people prefer chocolate or vanilla or one of many other flavors out there. Mathematics is the same as ice cream in this regard. There are many different types of mathematical questions out there, and you may gravitate more toward some rather than others. Find out as much as you can about the focus of the program from one of your professors, and gauge your own curiosity about that topic. Chances are if you are chosen for the program, you will be spending 6-8 weeks thinking about this topic, therefore, you want to make sure that it is something you will enjoy sinking your teeth into.

Get the opinion of a mentor. It is always a good idea to seek the opinion of a trusted mentor or one of your professors when selecting an REU for which to apply. Your mentor or professor is likely aware of your specific needs, interests, and goals as a rising mathematician. Thus, he or she will be able to help you choose the right program to meet those requirements. You will also certainly need a recommendation letter from a faculty member for any program that you apply. So, before you ask for that letter, pick their brain and get their opinion!

Choosing the REU or summer program for you is not always easy, but with the proper guidance and preparation, you will find the experience enriching and the effects long-lasting. Not to mention, you will forever be a part of a network of students and professors that will add to your support system (and who doesn't need more allies?). A lengthy list of REUs can be found at the web address below. Good luck and happy applying!

<http://www.ams.org/programs/students/undergrad/emp-reu>

DK: Summer research programs are now a fundamental component of undergraduate education for PhD bound students. Students with no summer research experience may be at a significant competitive disadvantage for competitive PhD programs. In addition, and just as importantly, a student's education is simply incomplete without research experience. At its core, research consists of teaching oneself. By engaging in research, students are exposed to ways of thinking simply not available in the classroom.

I recommend applying for summer research programs *every summer*, including after your first year of College. Of course, the less experience you have, the more difficult it will be to gain admission. But there is no harm in trying. Indeed, the experience of searching for programs, requesting letters of support, and preparing your personal statement will help you create a stronger application the next time you apply. The more summers of research you have, the better.

It's also important to know that summer programs should *pay for your travel and provide a stipend.* It's the best summer job: you get paid to do math, meet people from around the world, possibly travel, and it helps your future employment.

Once you've decided to pursue summer research, it's time to select a program. By far the most common summer research programs are Research Experiences for Undergraduates, funded by the National Science Foundation. They are all listed here: http://www.nsf.gov/crssprgm/reu/list_result.cfm?unitid=5044. After you've looked through the list for REU's that look interesting to you, ask for advice from people you know and like, including friends and professors.

To name just a few, below are links to four programs specifically working to broaden participation in the mathematical sciences. These include MTBI at Arizona State, MSRI Up in Berkeley, the REU at Cal State Channel Islands, and the PURE Math program at Hawaii. It is important to note that US citizenship is often required, but that you should definitely inquire in any case, because creative solutions may sometimes be found.

<http://mtbi.asu.edu/>

<http://www.msri.org/up/>

<http://faculty.csuci.edu/cynthia.wyels/REU/>

http://www2.hawaii.edu/~pure/PURE_Math/Welcome.html

Note that REU application deadlines begin as early as February, so apply now! Prepare to work hard and have fun.

Editor's note: There are also excellent research programs at National Laboratories, such as Lawrence Berkeley, Oak Ridge, Argonne, and others where important research takes place. One popular program is the Science Undergraduate Laboratory Internship (SULI), which requires a single application to be considered at many of the national labs (see <http://science.energy.gov/wdts/suli/>). Even if one of the laboratories is not part of the SULI program, they do have other internship opportunities. For example, Lawrence Livermore had the Scholars programs for students (<https://scholars.llnl.gov/>). Importantly, these opportunities are not only for summer research, some are available year round. Visit the Department of Energy (<http://energy.gov/offices>) to see the full list of National Labs.

The benefits of a professional society for Graduate students. *By Ricardo Cortez*

Becoming a member of mathematics professional societies can have several benefits to graduate students. In this note I will make a distinction between national mathematics societies, such as the AMS, SIAM and MAA, and professional societies that focus on specific groups, such as SACNAS, NAM, AWM and AISES.

Professional societies organize conferences and smaller meetings that graduate students can attend to gain insight into mathematics outside their own institutions. Graduate student may also present at those meetings. This is a great opportunity for students to highlight their dissertation research before they look for jobs. Professional societies also have publications (newsletters, journals, etc.) that are a good source of information regarding the discipline. The conferences often include outreach activities such as employment centers, travel scholarships, etc., that students should take advantage of. Most importantly, the networking that takes place at the meetings has tremendous value. Typically, student membership is free or very cheap.

Annette Emerson (Public Awareness Officer) and Diane Boumenot (Manager of Membership & Programs), from the American Mathematical Society, say: "Graduate Student membership in the AMS is a free membership given by an institution to full-time graduate students in the mathematical sciences whom the math department "nominates" to the AMS. (It's free to the student if the institution has paid for institutional membership.) Grad students then become part of the broader math community, opening the doors to networking -and working- with peers and more senior mathematicians. They can learn about opportunities such as travel grants, fellowships, employment and career services, research conferences, authoring help, and more, through Notices of the AMS, Headlines & Deadlines news service, and special communications to students from the AMS; receive discounts on publications and meeting registrations. The AMS's newest program for graduate students is the Graduate Student Travel Grants: <http://www.ams.org/programs/travel-grants/grad-students/emp-student-JMM>. The AMS Graduate Student Blog (<http://mathgradblog.williams.edu/>) is a great way for graduate students to communicate with each other, share experiences, questions, and advise. Professional society membership, and in particular the free periodicals that are

a benefit of membership, are the best ways to stay informed about trends in the professional community, job outlooks, and opportunities for speaking or networking. Meetings are a great way to keep up to date with colleagues and research, and to explore new ideas and research areas. All AMS membership benefits as described at <http://www.ams.org/membership/individual/mem-nominees>."

The Society for Industrial and Applied Mathematics (SIAM) offers its student members free membership in two of their Activity Groups (subgroups of members by area of mathematics), access to SIAM News and SIAM Review, discounts on SIAM journals and books. "All students, regardless of SIAM membership status, are eligible for greatly reduced registration rates (up to 85% discount off non-member fee) to attend SIAM conferences, and can join or start a student chapter of SIAM on their campus." (<http://www.siam.org/students/memberships.php>).

The mission of the Mathematical Association of America (MAA) includes education, research, professional development, public policy and appreciation of mathematics. It also provides its members discounts on MAA books and national meeting registration fees, access to employment services, publications and to professional enhancement programs. See more at <http://www.maa.org/membership/benefits.html>.

Professional societies that focus on minority groups in the mathematical sciences include the Association for Women in Mathematics (AWM), the National Association of Mathematicians (NAM), the Society for Advancement of Chicanos and Native Americans in Science (SACNAS), and the American Indian Science and Engineering Society (AISES). As a whole, these societies offer important research, networking and professional development opportunities in environments that are supportive to its members. The purpose of the AWM is to encourage women and girls to study and to have active careers in the mathematical sciences, and to promote equal opportunity and the equal treatment of women and girls in the mathematical sciences. The AWM sponsors a large number of activities and programs, including Travel Grants, Workshops for women graduate students and recent PhD's, student chapters, prizes and conferences. Their resources include job ads, career advice, education and advocacy. See <https://sites.google.com/site/awmmath/> for more information. NAM's objective is the promotion of excellence in the mathematical sciences and the promotion and mathematical development of underrepresented minority mathematicians and mathematics students. Among NAM's activities are the undergraduate MATHFest and the Faculty Research Conference. A great place to learn more about NAM is its newsletter (<http://nam-newsletter.org/>). SACNAS is an all-science organization that has an active mathematics membership. SACNAS is devoted to advancing Hispanics, Chicanos and Native Americans in science. They do this by promoting advanced degrees, careers and positions of leadership. It sponsors national and regional meetings, student chapters, a leadership institute, a large number of professional development opportunities and an effective network of support. See: <http://sacnas.org/>. The mission of AISES (<http://www.aises.org/>) is to substantially increase the representation of American Indians and Alaskan Natives in engineering, science, and other related technology disciplines. AISES sponsors pre-college and college programs, chapters, summer internships, and a resume database. Their events include an annual conference, regional meetings, a science and engineering fair, and more.

If I could do over my Postdoc, this is what I would do differently. *By Dagan Karp, Ariel Cintron-Arias, and Estela Gavosto*

A Postdoc is a time of transition for all of us. We are leaving the secure environment of our graduate mentor and entering a new chapter where we are supposed to become independent researchers. The dissertation we just finished contains most of what we know and we have a couple of ideas of how to extend some of that work during the Postdoc years. This is a good way to get going; however, the Postdoc years are a time when one should get involved quickly in new projects independently and with new collaborators. It is also a time to establish a research plan that can carry you for a few years in research directions that are your own, independent from the work done with your advisors. Having a Postdoc mentor that can facilitate this process is ideal but one cannot wait for this to happen in the way we are used to (whatever that may be). The Postdoc must seek out other faculty that are receptive to collaborations and who are supportive. Most of us try to mature as much as possible during the Postdoc years but, in hindsight, it is easy to see things we should have done to make sure that at the end of the Postdoc we are in a great position to embark on a long-term research career. Here are our contributors' comments:

DK: To give a brief answer, perhaps the two most important activities to pursue during a postdoc are the publishing of your work and establishing research collaborations, in that order.

The single most important goal is to publish your work. This includes your thesis and its natural extensions. When I was a postdoc I pursued two large and ambitious projects, which did not come to full fruition. These were the kind of projects that should take several collaborators a few years to complete. Of course this was fun and exciting, and the possible rewards were large. But the pursuit of these projects was to the detriment of several smaller projects. Given the short timeframe of the postdoc, it's crucial to have at least some projects come to completion. You don't need to

conquer the world during your first year as a postdoc; your brilliance will be expressed naturally. Make sure you publish your thesis and its extensions, and keep your ears open for problems that sound interesting, fun, and that your tools can attack.

On the other hand, one needs to grow as a scholar, and forming collaborative relationships is key. Through collaboration a postdoc can reach into new areas and begin projects, which are portable to a tenure track position. Indeed, as I look around at scholars in my field, many professors continue to collaborate with colleagues they met as postdocs.

AC-A: If I were to do over my Postdoc, I would become more proficient in numerical methods, with emphasis in large-scale computation and parallel computing. For this purpose, I would learn C++ and Python. I would also get involved with numerical solutions to partial differential equations.

I would also spend some time putting together literature and ideas for at least two research proposals. In fact, I would write a "white paper" (2-to-4 pages) for each proposal. If I get far enough with one of them I would submit it as grant proposal, but my main objective in assembling these white papers would be to devise ideas that can seed into large-scale projects with potential to be funded in the near future.

EG: I would think more about the long-term impact on my career of what I was working in. At the time, I only cared about working in interesting problems (that was OK) but I did not think about tenure or developing my own research program. I do not mean writing a proposal for a grant because I did it, but I never thought of developing a long-term vision and the existing professional opportunities for that vision.

Junior faculty: balancing all responsibilities. *By Ricardo Cortez*

When you are hired on a tenure-track position at a university, it is not easy to figure out the boundaries of all the new responsibilities placed on you. All combined, teaching duties, grading, research projects, student advising, thesis supervision, committee work, proposal writing, mentoring, organizing seminars, figuring out the school's proper channels, writing papers, referee reports, and everything else, can leave you overwhelmed. It is also likely that it will take several months (years?) to find a way to manage your time. Here are some suggestions for those of you starting your careers.

It is crucial to make yourself a weekly schedule that includes all the obvious commitments (like class times) as well as time for research and administrative work (such as refereeing papers). This is easy enough to do; however, the key is to treat every part of your schedule as sacred. Otherwise, the research time is the first one to suffer because it seems like the most flexible. You can't not go to class, but it is easy to take part of your research hour to take care of other things. This is a mistake. Treat your scheduled research time as if it is an appointment with the Provost that you simply cannot change.

Making a schedule will also let you see all your commitments in one place and it will be easier to identify when you have too many things going on. Learn to say "no" and to prioritize the commitments you have. You might feel that becoming the faculty advisor for the math Olympics team is a good thing to have in your CV, but this is true only if it does not come at the expense of writing another paper. Focus on the most important aspects of the tenure review.

My best advice is to identify a senior person in your department as a mentor and run things by that person before accepting another chore. They will tell you if you are overcommitting and when they do, follow their advice. Your mentor will also help you work out awkward situations. Let's say that several faculty members in the math department have approached you to help write departmental proposals to acquire computer equipment. As a junior member of the department, you want to be helpful and collegial, but you feel that this will take a substantial amount of time that you would rather use for other activities. One way to deal with this situation is to let your mentor know how you feel and let her (or him) suggest to your colleagues that they should reduce your contribution to the proposal. The main point is that having someone that looks after you is truly valuable.

Reader Resources

E-Mentoring Network in the Mathematical Sciences is designed to address relevant questions that students, postdoctoral researchers and junior faculty may have regarding their own advancement in mathematics. Its goal is to reach as many readers as possible, especially those who may not have sufficient mentoring at their current institution. We publish mentors' opinions as provided in order to stimulate discussion. We hope you will be active in this process.

The topics addressed in this publication are kept relevant by requesting suggestions from readers. Please send

mentoring topics to mathmentoringnetwork@gmail.com and look for responses in future issues.

Visit <https://sites.google.com/site/mathmentoringnetwork/> for more information, resources, older issues and more.

Follow us on [Facebook](#) for additional conversation and in-between-issues mentoring.

Do you find this publication useful?

Send your feedback to mathmentoringnetwork@gmail.com to help us improve this publication. If you are a mentor and would like to contribute to a future issue, we would like to hear from you.

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