The Academic Job Search in Mathematics

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First Step: The Curriculum Vitae

Before you begin the job search you will need a vita, sometimes called a "c.v.", a "curriculum vitae", or, if it's in compressed form, a "résumé". Entire books have been written on how to put together a c.v. and what should go into it. Without trying to upstage any of those volumes, I will now list some of the categories of information you, a mathematician looking for a job, might want to use for your résumé.

Basic Information

Include your name, address, phone, e-mail, and Social Security information. Make sure especially that your name occurs on each page of the c.v. and that you have included page numbers.

Work Experience

Include those jobs which are relevant to the position. The fact that you delivered papers in Girard, Ohio, in 1973, while it may show initiative, is not really germane to the question of whether you deserve a postdoc at MSRI.

Education

List degrees, dates of attendance and/or receipt of degree, honors, and possibly minor subjects.

Publications

Of course anything published in the Annals of Math should be included in this category, but you might also be able to list your senior thesis, a bibliography or seminar report you have prepared and published semiformally prior to completing your thesis, or a research experience for undergraduates (REU) paper from the summer before your senior year. As you develop more of the formal, refereed papers, you may want to consider eliminating these latter publications. If you have no papers submitted yet, you may want to skip this section.

Research Interests

A school or an industrial employer will want to hear about your research interests. Describe here, briefly and generally, the results of your thesis as well as further questions that arise from it. If you wish to go into greater detail, you may want to write - and some employers may request - a one- or two-page "research statement", a discussion of more technical details of your previous research and future plans.

Talks

Of course you should include talks at national meetings, but you can also include here Math Club talks; REU reports; talks to sectional meetings of the Math Association, to other schools, to your department seminars, and the like.

If you have not yet given such talks, you should seriously consider doing so. Prospective employers will want to know, for instance, how well you perform before various faculty and student audiences. At the same time, you need to get your research ideas into circulation. Further, you will want to convince schools and industries that you are comfortable explaining technical concepts before mixed groups.

Courses

What have you taught? tutored? graded? Make sure that you indicate your level of involvement in each of the courses listed. If you are just recently finishing your graduate career, schools will place great emphasis on such questions as whether you have actually lectured (rather than "just TA'ing") in the classroom, made up exams, participated in curricular discussions and decisions, and the like. How were student evaluations and course comments? On a separate page or two you may be asked to write a "teaching statement", sometimes called a "teaching philosophy". We will have more to say about this document later.

Training

Have you had TA training? This is a good place to say so. Also, what about those computer workshops? Did you take any education courses? How about other workshops - relevant to the job, of course.

Grants, Honors, Memberships

Don't forget that your assistantships and fellowships are "honors". So is summer support, as well as that semester you spent on your advisor's NSF grant.

Undergraduate honors fit in this category, too.

Teaching awards are very important to employers. Make sure that they are prominently displayed here.

Membership in the AMS shows a research interest. Membership in the MAA indicates some awareness of teaching issues. Membership in other honorary societies, like Phi Beta Kappa or Sigma Xi, shows potential.

Conferences Attended

When you are young, such attendance shows interest. Later you will probably drop this category.

Committees

For younger mathematicians, participation on committees - for instance, the speaker committee for the graduate student seminar - seems "silly". To an institution, however, it indicates that you are willing to be a "good colleague".

Additional Information

Sometimes this section is called "Personal Information". Here you can list such relevant information as the fact that you speak a foreign language or that you spent three years teaching in Chicago or working for the Peace Corps in Kazakhstan.

The Additional Information section is a place where you can list computer skills, significant coursework in areas outside your specialty, or any administrative experience you may have.

If you are an international student, you can also use this section to discuss visa questions.

References

Make sure to get at least one reference letter that concentrates on your teaching skills. You can help make this reference specific to your skills by giving the letter writer copies of your evaluations, lesson plans if you have them, and a copy of your résumé with the items pertaining to teaching highlighted for emphasis. You should also suggest that the letter writer visit your class to make the recommendation more immediate.

Also, try to get your advisor's letter of reference to say more about teaching than "She must be a good teacher; students don't complain, and she talks well in the graduate seminar."

Some applicants list full names and addresses; others eliminate all of these. Use your own judgment.

Learning from Your Vita: A Timeline

Now that you have filled in as many of the categories of your sample c.v. as you can, you will want to give yourself a thorough evaluation.

If you are a first-year graduate student, you may well find that you have not been able to put down much information. Don't be too bothered yet, however, for this is why you went to graduate school. Your goal should be to start to fill in as many of the blank spaces as possible. How do you do this? Well, to start with, you will want to give some talks. Do you have a math club or graduate seminar? See if you can speak there. It need not be on a current research topic; you can give a general discussion of an open problem, or maybe you can tell the group about your REU experience as an undergraduate. A joint talk with another student or a discussion of a topic you're learning in a course is another possibility.

Some universities have begun to have programs called Professors for the Future (PFF) or the like. Such programs often provide the opportunity for you to go to an undergraduate institution in the area to speak on a topic of interest to students at the host institution. This opportunity is one you should not miss. You will be able to speak to undergraduates, thus finding out how far you have come in the short period of time since you left your undergraduate college, and at the same time you will have a chance to see how faculty at those schools conduct business during the day. If your institution does not have a PFF program, you might still arrange to speak to the math club at your undergraduate

institution the next time you are visiting.

Another vita category that you, as a first-year student, can fill in is that of "Training". If your department does not have TA training (Shame on them!), then your university probably will, and you should definitely take it. After all, teaching is going to be part of your life for the next few years, if not forever, and it is logical to spend some time getting more proficient at it. The people who train you and assign you TA jobs are good candidates for letters of recommendation, by the way.

By your third year you will want to be attending, and possibly speaking at, MAA sectional meetings. By now you should be able to tell people about your proposed research program. You will also have some student evaluations and comments to show to prospective employers.

If there is a PFF program at your school, you should now get very involved in it. Such a program will give you an idea of what teaching is like at a variety of institutions.

Try to take TA assignments that will strengthen your qualifications. For instance, have you spent almost all your time on a grant? If so, try to get some teaching experience. On the other hand, if you have spent most of your graduate career teaching, ask for a grading assignment in a course related to your potential thesis problem. This will offer you two advantages: a chance to learn more about the field itself and a line on your résumé attesting to your knowledge of a more advanced topic of mathematics. Also, join the MAA and the AMS.

If you do all of the above, when you reach your final year, you should have a fine c.v. You will want to refine it by writing about your research. You may also have some papers "in the pipeline" to list. You will also want to look for those areas in which you are relatively strong and weak; those will be indicators to you of what your interests are, what kinds of schools or industries you should or should not apply to, and what potential employers are apt to ask you about.

Research and Teaching Statements

More and more institutions are asking for research and teaching statements. Even if these are not being requested now, you will probably have to write them on that happy day when you go up for tenure. Thus there are a number of reasons to get into the habit of writing these today; it is never too early to start.

It may feel strange to say that the research statement is the easier one for you to write. However, when you think about how graduate school is constructed - how it aims you toward research - that strangeness disappears.

In a research statement, talk about your thesis first: What is its history? Not from the beginning of time, of course, but where did the problem come from? Who else is working on it or a similar topic? What is your result, and how does it fit into the general direction of the field? What are the next questions that will be addressed in the area?

Further, are there other problems that you hope to explore in the near future? How about other problems you have considered - in a master's thesis, say, or before you went to graduate school?

The teaching statement is often more difficult for a student to write. This seems to be true for a number of reasons: one is that we are often told that we are to write a teaching philosophy rather than

a teaching statement. Another reason is that when we begin teaching, we often feel that we are just picking up a book and working problems. A third related point is that the motivation we have for teaching is not always well thought out: "I'm here mainly to be a graduate student. I'm doing recitations because I need the fellowship."

In light of the above, let's try to construct a teaching statement. First, because it's easier to write a statement than a philosophy, let's start with "I began teaching in 1993" rather than "Teaching is love and caring."

Second, by starting with "I began teaching in 1993" we can more easily find ourselves discussing a specific classroom situation that taught us about how we approach the topic of teaching. And this last is what a prospective employer is more likely to be interested in hearing than obviously true, not especially revelatory generalities.

Of course, each of us will have a different teaching statement. I don't want to pretend that I can tell you exactly what you will write - but, having said that, let me now do so anyway.

Start with concrete details of your teaching experience. What courses have you TA'd or taught and at what levels? How do you conduct a typical class? Do you have a particular assignment or class that pleased you and that you wish to describe? Was there a classroom situation that taught you something meaningful about the way you teach and the way students react to your methods?

You might also want to or need to discuss your experience with "reform" methodologies. For instance, have you been involved in cooperative learning situations, or have you been using lots of computer or calculator assignments? Are you using reform-style texts? Indicating familiarity with newer techniques of teaching can be a plus in the job market.

You may have strong feelings about using reform methods and/or texts. You may wish to say so, but the teaching statement is probably not a good venue for doing so. Save your editorializing for later interviews where you can back up your opinions with specifics.

As soon as you have drafted teaching and research statements, share them with others. The input of those people can be immensely helpful in shaping your documents. Remember too, most schools will emphasize teaching more than research, so they will read the teaching statement more carefully. If you can show them that you enjoy teaching and are good at it, you will have a much better chance at the job.

The Cover Letter

You will need a cover letter to introduce yourself to a prospective employer. Such a letter is much more important than you may think, so you should show a draft to colleagues before sending it out to schools. Since it is the first document from you that the school or company will see, you will want to make sure that it expresses your interest in the position in the most positive light. In fact, this last indicates a way to start your cover letter: "I saw in the AMS Notices that (your institution) has an opening for a statistician."

Make the first paragraph as specific to the position as possible. If you can't make a case for being the statistician (or topologist, or mathematics educator) that the school needs, are you sure you should be applying for this job? On the other hand, if there is some "outside" reason for your making the application - for instance, you have been in communication about your thesis with a faculty member at

that institution - you should say so. Recall after all that you are the one trying to sell yourself. How can you best do this?

A second paragraph can set out your research to date in compressed form. You need not discuss your entire research career in this one paragraph; just give a short synopsis. Leave details to the vita ("As you will see from my curriculum vitae,...") or to the research statement ("I have provided more details in my research statement, which is included").

In the next paragraph talk about your teaching. Again, be brief, setting out the bare-bones description of what you have taught and how students have responded. Lead the search committee to details in the c.v. and teaching statement. Mention any PFF-type activities in this paragraph.

Of course it may be more appropriate in some cases to reverse the order of the middle paragraphs, so that teaching precedes research. Use your own judgment on this for each particular application.

A final paragraph can explain how the employer can get further information from or about you. Sentences starting with "I will be at the meetings in January" and "I can provide references" belong here.

A good rule of thumb is to try to keep the cover letter to no more than one and a quarter pages; search committees will not want any more than that. Word processors should ensure that you individualize the letter for each institution. You may feel that this takes too much time, but how much is an acceptance worth?

Finding Job Advertisements

Below are a few frequently used sources of academic position listings in mathematics.

Employment Information in the Mathematical Sciences. This publication contains numerous position listings in math departments, government, and industry, and is available free online at http://www.ams.org/eims/. Paper subscriptions may be purchased by calling the AMS at 800-321-4267.

Mathematical publications. The publications of the mathematical societies which accept advertising - for instance, the Notices of the American Mathematical Society, the Mathematical Association of America's Focus, SIAM News, and AWM Newsletter - are excellent sources of open position listings.

The Chronicle of Higher Education. This weekly newspaper is available in college libraries and contains a substantial number of position announcements in academia.

The AMS Standard Cover Sheet

Some job ads will specify that the AMS cover sheet be included with your application. You can find a copy in each issue of the Notices of the AMS, or you can download a macro template or Word form electronically from http://www.ams.org/employment/coversheet-info.html. The forms are used by department staff to aid in tracking and responding to applications.

Teaching questions will occur: What have you/could you/are you willing to teach? How well do you teach? What is your teaching philosophy? What strategies have you used that you or others might consider innovative?

You may be asked how you feel about committee work. A newly minted Ph.D. is typically bemused by such questions, but older candidates and interviewers alike know how important it is to hire someone who will share the burden of academic duties.

Curricular questions will come up. How do you feel about "reform" (a loaded question)? Have you any experience with computers, cooperative learning, "alternative" courses, and innovative strategies?

You may be asked about grants and funding. Are you thinking of applying for any? Have you been on a grant - through your advisor, say? Would you be willing to cooperate with another faculty member on a summer REU, for instance?

Some more amorphous questions you might be asked: Why do you want to come to our school/business? Why do you, with your Ph.D. from Name University, feel that you'd be happy at Our Small College in the Middle of Nowhere? (No, "I need a job" is not the answer.) Think about what you can offer their school that other candidates cannot and why you would like to teach there.

Many schools will ask you what questions you have for them. It is definitely uncool to say you have none. You should want to know, for instance, how many majors they graduated last year and whether any went to graduate school. You might also ask the grant questions yourself: "Do you have an REU program in the summer? Is there some other means for me to get some summer support?" Another topic of interest to you would be "How often will I get to teach a relatively advanced course or one in my area?" Or "How many people do you have in my area?" Ask questions about usage of computers in the classroom and about the existence of math labs and computer facilities on campus. You can also find out about average teaching assignments and class sizes. How much are you willing to teach the basic courses, and what ideas might you have for making them innovative? Are you willing to make them the center of your professional life?

At this point you can begin to think of your own questions. For instance, you can now ask about the health of the institution: How does the future look?

In closing, let me say that the Employment Register can be a hassle, but it is also what you make of it. If you go in with the attitude that your time will be wasted by a group of schools beneath your dignity, then you probably will waste your time as well as that of the schools and industrial employers. Similarly, the schools and industrial employers will probably see you as aloof and not worth their energies. On the other hand, if you look at the experience as a learning process - one in which you and the school find out if you actually fit together - you will often find out that you don't, but once in a while you may both be pleasantly surprised.

A Final Comment about the Register

We have all gone through the selection process many times and probably will do so again. It is never easy to be evaluated; it is almost as hard to be the one doing the evaluating. When we have no offers, it is easy to tell ourselves that we will take "anything, anything!" However, that's not the way you should think. You have worked hard to achieve what you have, and you should see yourself as now having a valuable skill which you need the opportunity to hone over the next thirty years or so.

Your goal then is to find a job that suits you - one that fits. Such a job, when you find it, can be extremely surprising. I have known differential geometers who ended up running computer labs, algebraists who moved to linguistics, and in at least one case a topologist who became a university president. So it would not surprise me at all if you sat down this year to another interview with No Name College, only to find yourself coming back to the Joint Meetings ten years later as the interviewer who's excitedly telling another new Ph.D. about your interesting job as chair at the same institution.

Now, here's a homework assignment: Go back and look at your résumé again. What does it seem to be telling you about your real interests? Are you an honest-to-goodness researcher, or is your advisor trying to convince you that you are? Do you really like to spend extra time with students, or is teaching just a chore? Would you be happy in industry? Can you and your significant other, a sociologist by training, find nirvana in Frozen Tundra, Montana?

When you finish this homework assignment - and today's answers may change by next week - you still might not have a job, but you will know quite a bit more about yourself and what you want from the job market. At this point, that may be all you can ask.

The Campus Interview

Now you have made it to the campus interview. At this point a school is obviously serious: they are shelling out a large amount of money to bring you there. That fact alone should make you happy. At the same time, it should prompt you to do "a really good job". What does this "really good job" consist of?

The range of events involved in an on-campus interview is quite broad. You will most likely give a research colloquium, but you may also speak to an undergraduate math club or in a class. You will surely meet with members of the department, either individually or in groups. It is highly likely that the dean will want to meet you, and some schools, usually small ones, will ask you to meet the provost or president. Occasionally schools will ask you to meet with some of the students. There may be lunches and/or dinners to attend; other social events, like receptions or walks around campus, might be planned. All in all, you are likely to be quite busy.

Before the Campus Interview

Some of the most important things you can do to make the campus interview go smoothly actually occur before you reach campus. Ask the person who contacts you for a rough schedule of events. It often turns out that the school cannot spell out this schedule in detail. Maybe you are the first candidate, or perhaps the school is unsure of the schedules of some of the people you will be meeting, but your asking about the schedule will give the school some idea of what you need to know before you reach campus.

You will also find it easier to make proposals about the schedule before you reach campus. For instance, if the school is primarily a teaching institution, you might ask to meet with a group of undergraduates to get their impression of the institution. You could try to arrange for such a meeting at the student union so as to make it less "academic". On the other hand, if there is a particular faculty

those who have not will suddenly realize the value of this program.

Of course speaking in front of an unfamiliar group can be difficult, but you should try to adopt as relaxed a tone as possible. It sometimes helps to ask at the start how many of the audience are faculty and how many are undergraduates. You can say that the talk is for the undergraduates ("I hope you faculty won't mind, but...") and then tell everyone how you would prefer to entertain questions: either "when they occur" or "saved till the end." You can follow that by asking if the audience has learned about the basic underpinnings of your general topic ("Does everyone know what a group is?"), thus assuring that you don't give a lecture completely over everyone's head. The alternative of asking if everyone has heard today's topic can be fraught with peril: what do you do if they say yes?

If you are asked a question whose answer you don't know, don't be afraid to say, "I don't know" or "Can someone help me with the answer?" You are not supposed to know everything.

Teaching talks can take forms other than the one just mentioned. Some schools ask the candidate to take over a calculus class for a day. Other schools want to hear a discussion of pedagogical issues; for instance, they may ask you to discuss your approach to calculus reform. A third possibility is a talk to a general audience about a popular topic like Fermat's Last Theorem or the Euler characteristic.

After the Seminar

Now your talk is done. You feel somewhat drained and either exhilarated or slightly depressed. In either case, try to hold your mood in check, because you are now going to be meeting lots of people. You will hear the same questions over and over ("I couldn't come to your talk. What was it about?"). It is important that you answer, over and over, in a sincere, enthusiastic tone.

There is no well-defined order in which events occur during the on-campus interview, but let's assume the following:

The search committee chair, who drove you to campus and gave you general information before your seminar talk, will now turn you over to the department chair. You and he or she will want to discuss conditions of the contract: how much money, whether there is summer work or grant support, how many classes each semester and at what level, whether there is access to a computer, etc. Such a discussion usually takes the form of a "hypothetical" ("If we offer you the job..."; "If the dean agrees..."), although it might be a seeming certainty, but it is well to remember that a discussion is not a contract. Many faculty have complained that they thought they "had a deal" when they were hired, only to find out later that it wasn't an agreement at all.

The dean will interview you. If you are new to this process, you might consider this pro forma; it would be wrong to do so. The funding for your proposed position comes from the provost or vice president through the dean's office. If the dean does not like a candidate, or if he or she thinks that the department is making a mistake, or if he or she finds that another department has come up with a more attractive candidate, you may be receiving a letter from the department that says, "Sorry, but the dean has canceled the search." Another possibility is that the dean will authorize only a two-year job when you and the department thought you were negotiating a tenure-stream position.

In any case, be prepared to give the dean your two-minute cocktail party explanation of your thesis topic or mathematical area. Remember, you may be speaking to someone who has a Ph.D. in quantum physics or computer science. If so, you might get follow-up questions. Be prepared to answer them in

a serious tone.

The dean may also want to explore how you feel about getting involved in a function that you see as tangential to your future position. For instance, he or she may sound you out about your willingness to direct the computer lab or tutoring center. You can have a number of possible responses to this: Maybe you don't want to give up your research in homotopy theory; perhaps you see this as your main chance to get tenure. In any case, realize that a "negotiation within a negotiation" might be taking place. You might want to listen carefully to the dean's proposal and then answer with, "That sounds interesting. Let me think about it and get back to you or the chair," thus keeping your options open.

Ask the dean about the direction the college is taking. "Do you see increases in student enrollment?" "Will department sizes be impacted in the next few years?" "What do you see as the major changes in the curriculum at your school in the next few years?" You can ask the same or similar questions of the provost or president: "What is the most critical issue your school is facing?"

Some General Recommendations for the Campus Interview

Take extra copies of your curriculum vitae to the interview, along with your teaching and research statements.

Dress appropriately. Every school wants to see that you are taking the interview seriously.

Find out as much as possible about the institution before you go there. You can ask the person who contacts you to send brochures, for instance. One of the college guide publications will also provide background information.

Make sure you show up on time. If you must be inadvertently late, know whom to contact.

Know who's coming to get you, and where and when.

In spite of the fact that employers cannot lawfully ask questions that lead to illegal discrimination on the basis of race, sex, age, national origin, or physical disability, these questions still seem to come up, innocently or otherwise. Be prepared to answer or deflect such questions as "What will your spouse do in such a small town?" "Do you plan to have children?" "Aren't you ever going back to China?"

Try to ignore any "internal bickering". The fact that the pure mathematicians want you and the applied ones have another candidate is no reason for your openly choosing sides.

The campus interview is not usually a time for micro-negotiation of the contract. Unless the institution starts it, you should not try to get a firm commitment on salary, courses taught, etc. To do so makes you look like a haggler, putting an offer in jeopardy.

Remember that social events are not social. You are being evaluated at all times. Eat and drink less. You will be tired, but you don't want to get overtired.

Keep copies of receipts. Find out where to send them for reimbursement.

Memorize names as much as possible. You never know who will have a vote on your position.

Find out when a decision is likely to be reached. Get the name of a person to contact.