

Native Americans in Science), NAM (National Association of Mathematicians), and others, or participating in diversity initiatives in your department, university, or local schools. You may also take the opportunity to highlight anything about your own background which may contribute to a more diverse environment in the department you hope to join. However, you should feel under no obligation to discuss your own background. (If you are not enthusiastic about promoting diversity, I encourage you to consider how much more fun and intellectually stimulating it is to interact with the entire spectrum of humanity, rather than with just a selected portion.)

### The cover letter

The primary use that I make of the cover letter is in determining which of my colleagues to consult about a given applicant. At the University of Michigan, we require that a senior faculty member offer to mentor a postdoctoral applicant before a job offer is made. So, it is very helpful if you list one or more faculty members who you look forward to interacting with. I also recommend that you write to the faculty that you have named in your letter, letting them know that you have applied. This email exchange is often a bit awkward, for both you and the faculty member. However, if the faculty member is interested in your application, but not aware you are on the market or not on the committee, it can make the crucial difference in your getting an offer. I always make a point to look at all the files of candidates who write to me.

### After the Offer

Once you receive an offer of a position, you should think about whether there are other jobs that you would prefer. If so, you should write to the hiring committees of those positions as soon as possible and let them know that you have an offer with a deadline. You may also consider withdrawing your applications from jobs which you are no longer interested in. If you receive an offer of a one-year or one-semester position at a research institute or program, you can approach the school which made you a longer term postdoctoral offer about deferring their offer. This may or may not be possible, but there is no harm in asking. Finally, go celebrate with friends and family.

**Good Luck!**

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Dick Canary

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## Letters of Recommendation for a Liberal Arts Position

*Peter McNamara*

When I started applying for jobs in the final year of my PhD, I struggled with how well-intentioned people would give conflicting advice about what makes an application compelling. I only later realized how much the evaluation of applications varies depending on the target school and that each piece of advice is limited by the background of the person giving it; my advice should be considered in this same light. My perspective comes from reading many applications (we get several hundred for any opening in mathematics) to Bucknell University, a liberal arts university where teaching is primary but research is a close second, with a continuing and active research program expected. I do not claim that my opinions represent those of my department nor of schools like Bucknell.

I want to focus on how to solicit recommendation letters that will most help your application, and common red flags that letter writers should avoid. For advice on other parts of your application see, for example, [Che19,Tym20] for different and insightful liberal arts perspectives.

### Advice for Applicants

Job advertisements for positions at Bucknell ask for three letters of recommendation, at least one of which substantively addresses teaching; our peer schools often have similar language, perhaps with slight differences in the numbers. Many applicants send us more than three letters, which is also considered appropriate. So whom should you ask for these recommendations?

Choosing your teaching reference is the most perilous choice and it can hurt your application if the letter or letters give us little information or do not convey quality

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instruction. Some large mathematics departments have a designated person assigned to write these letters for all their students and postdocs. Letters from these overworked experts sometimes consist of little more than a summary of your student evaluations, which gives us little information. Invite this person to attend at least one of your classes, and have conversations before and after the visit about the context, learning objectives, and your observer's impressions. If this invitation is not embraced, consider who could write an additional teaching letter. Many of the strongest letters come from experienced instructors who have visited your classes and with whom you have had meaningful conversations about teaching.

A letter from your PhD advisor is essential, even after one or more postdocs. (If including an advisor letter is impossible, this should be explained by you or one of your other letter writers.) Your advisor is typically well versed in your research accomplishments and can place your work in a larger context. If improving exposition features in your conversations with your advisor, and especially if your advisor has evidence of your love of teaching or presenting, suggest that your advisor add such comments to create a version of the letter designated for liberal arts schools, but see below for pitfalls. Especially after a postdoc, it is certainly appropriate to update your advisor on recent accomplishments, publication acceptances, or other recognition that could strengthen the recommendation, as well as the kind of positions for which you are applying.

Your advisor's letter should be supplemented by one or two more letters about your research; more than that is usually unnecessary at Bucknell. As is the case for applications for any academic position, PhD students should ideally have a letter from someone outside their PhD institution, and advisors can offer suggestions. Postdoctoral mentors are a common choice as are collaborators when they are well established in your field. As with your other letters but especially in this case, make your request well ahead of time (a month is advisable) and provide any materials you think may help the writer including your CV, highlighting any information that is particularly pertinent to them. These letter writers often include compliments on a presentation of yours that they attended so you could also provide the corresponding slides, notes, or poster. Presenting research is of course different from classroom teaching, especially at liberal arts schools, but such compliments can't hurt your case.

At least one letter should come from your current institution. This is sometimes omitted when someone has only spent a few months in their current position but we like to know that you are in good standing. If you are starting a visiting position, consider who at your new department could write a strong letter about your teaching. If you are starting as a postdoc, this letter could double as a research letter from your mentor.

Finally, our finalists' applications have something that makes them stand out among the other accomplished researchers and teachers in our pool. Examples include outreach and other activities that promote equity and inclusion, teaching that was not a requirement of their position, unrequired committee service, a commitment to mentoring, and research with undergraduates. Certainly you will highlight these in other parts of your application but it bolsters your case if one of your letter writers can also describe your endeavors. If you've worked closely on these activities with a permanent faculty member, consider asking that person for a teaching or research letter that also addresses your extra contributions. I have read several letters like these that are contagiously enthusiastic!

### A Few Friendly Warnings for Letter Writers

Some PhD advisors are not familiar with the range of liberal arts colleges beyond the knowledge that teaching is highly valued. If you are the PhD advisor, do not lead off with teaching. It is certainly fine and even helpful if you follow your research recommendation with relatively short comments regarding teaching, and your advisee may ask you to include such comments in a version of your letter for liberal arts schools. But if your student's research is not the thrust of your letter, it can suggest that you do not hold it in high regard.

Some letter writers comment on the pleasant personality of the candidate but before including such a comment, make sure you would say the same thing if the candidate were of a different gender.

If writing a teaching recommendation, do not overemphasize numerical scores on student evaluations; student evaluations are well known to be biased against underrepresented groups [KSC21]. Selected student comments carry no weight unless there is some way to know they were not a curated sample. Instead, ask the candidate if you can sit in on one of their classes and then paint us a picture of the format, the various approaches used, and the interactions between instructor and students. We love concrete examples! It's even better if you can see the candidate teach in more than one course or format. Even in a campus visit, we will not be able to see how candidates relate to their own students, and your viewpoint will be valued.

Since recommendation letters are the part of the application where the candidate has the least control, I hope the advice above can help applicants have more confidence in their approach to soliciting them. A strong set of letters can do much to reinforce the narrative of the other application materials, and we appreciate all the time and expertise that goes into the recommendations.

### References

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## How to Craft a Research Statement for a Position at a Liberal Arts College

*Jennifer Schaefer*

When seeking positions in academia, a well-crafted research statement is an essential part of your application packet. You will not only use this statement to describe your current work, but you will also utilize it to convince the reader of your work's importance and to pose questions for future consideration. As a graduate student, you probably have a lot of experience speaking about these topics, both with your advisor and with other specialists in your field through seminars, workshops, or conferences. However, if your ambition is to obtain a tenure-track position at a liberal arts college, you will need to craft your research statement for a different audience and with distinct expectations and realities in mind.

Mathematics departments at liberal arts colleges are usually quite small, so the probability is high that no one reading your research statement will share your specific research area. Thus, you will want to explain your work as though you are speaking to a non-specialist. Many suggest starting your research statement by first placing your current

work into the context of the field. How is it connected to other areas of mathematics? What are the big questions scholars in your area are trying to answer? How is your work related to the important questions of the field? Provide basic definitions, examples, or visuals, anything that you think would help a general mathematical audience understand the value of your work.

Your research statement should not only describe your current project(s) but should also demonstrate plans for future work and independence. Liberal arts colleges are often located in rural areas without easy access to large universities with research seminars, graduate students, and postdocs. This, coupled with the reality that your departmental colleagues will more than likely not share your research area, means the search committee will be looking for confirmation that you will be able to sustain a research agenda at their college. Use your research statement to show the committee that you have ideas for future projects and have begun to develop a network of collaborators outside your advisor and your intended institution.

Doing research with undergraduate students is especially valued at liberal arts colleges and at some institutions it will be a requirement of the job. So, the search committee will be looking for new colleagues that are genuinely interested in working with undergraduate students. If you have had the opportunity to advise undergraduate research projects, please describe these experiences. What did your students do? What was your role? What did you learn about advising such projects that you could implement in the future? Regardless of whether you have had experience advising undergraduate research, you will want to explain how your research can be broken down into accessible projects for undergraduates with limited mathematics backgrounds. If you have ideas for projects ready to go, by all means provide a list!

Finally, keep your research statement brief. Most recommend a length of three to five pages. Top liberal arts colleges receive hundreds of applications (500+) for a tenure-track position. To ensure your research statement gets the attention it deserves, be descriptive, present your passion for your work, but be concise.



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