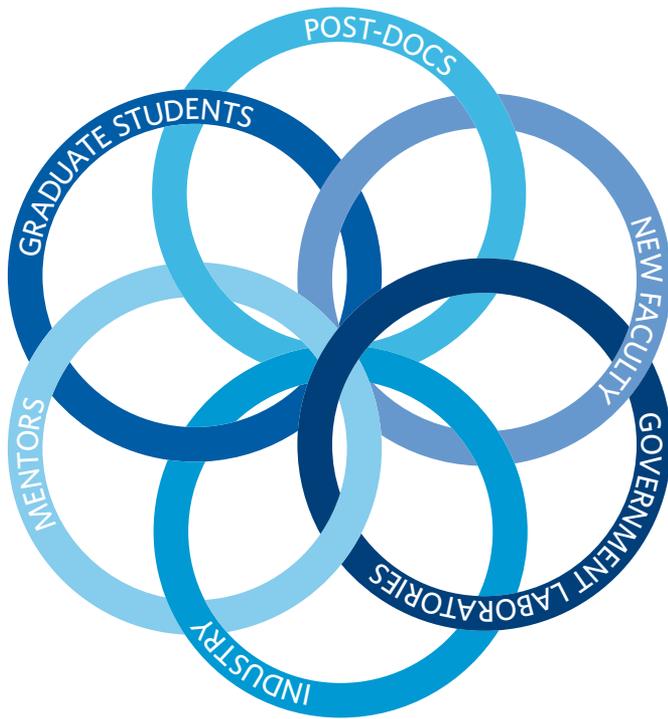


EARLY CAREER

The Early Career Section offers information and suggestions for graduate students, job seekers, early career academics of all types, and those who mentor them. Angela Gibney serves as the editor of this section. Next month's theme will be advice from our advisor and online resources.



Advice from Our Advisor and Planning for the Job Market

Lessons from Our Advisor

Christopher Hacon and Jessica Sidman

Advisors are the ultimate role models for future mathematicians, and students learn as much by watching as from direct advice and instruction. The scope of what a good advisor can do is quite broad, as it includes providing guidance in finding and solving a first research problem, giving talks, writing and publishing a good paper, establishing a research program, and applying for jobs. Additionally, an advisor is someone who supports a student through the ups and downs of being stuck, finding (and patching) holes in arguments, and finally proving their first theorems. Just as importantly, they provide a human connection between the mathematics that exists in books and research articles and the mathematics that we create as a community.

In what follows, we will discuss some lessons that we have learned from our advisor Robert K. Lazarsfeld, or Rob to his students and colleagues. Rob works in algebraic geometry, and has had a long and distinguished career at UCLA, Michigan, and Stony Brook. In addition to his research, he is particularly known for the clarity of his exposition in both his mathematical writings and his talks, as well as for being an outstanding advisor to almost 30 students. While preparing this note we contacted many of Rob's former students who described some of their most memorable and meaningful interactions with Rob. We are grateful to be able to share edited versions of some of these comments below.

On the importance of building a community. Throughout his career, Rob has always been at the center of extremely active algebraic geometry groups which provide an ideal environment for PhD students and postdocs. His presence is a catalyst for activity and a guarantee that good things will happen. Rob is intentional about setting up regular activities to provide forums for mathematical discussion, and predictable opportunities to meet are an

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DOI: <https://dx.doi.org/10.1090/noti2326>

important part of fostering an inclusive community. One student describes what they found upon arriving at UCLA: "He would meet with each one of us for an hour every week, there was a reading course on Hartshorne, an active weekly research seminar, and of course the bi-annual Western Algebraic Geometry Symposium."

Creating and sustaining this amount of activity requires organizational savvy. Rob is someone who recognizes his students' strengths and will delegate jobs, like giving feedback on practice talks, to students he trusts. For the students tasked with organizing seminars he offers practical advice such as "Always invite speakers three months in advance. Anyone will agree to anything if it's not for three months."

On choosing research topics. Rob's students describe an atmosphere of constant support and intellectual generosity paired with "a combination of highly relevant advice when needed, as well as a hands-off approach when I was independent enough to find my own path," that gives students the freedom to "discover their own mathematical personalities."

Rob knows how to help students find the balance between dreaming big and setting realistic goals. One student cites a conversation near the end of their PhD:

I showed Rob an argument I was particularly proud of. It was clear that he was immediately excited about the possible applications and suggested that I should consider applying these techniques to more ambitious problems and well-known conjectures. Since then I have always tried to include a mixture of grand or even outrageous goals as well as more realistic short-term objectives and stepping stones in my research plans.

Another shares getting a reality check:

At one point, I was trying to prove (or disprove) the Harbourne-Hirschowitz-Nagata Conjecture by brute-force. Rob said "Why it is true is more important than whether it is true," which made me (thankfully) decide not to waste too much time on that particular question.

Getting this balance right at the beginning of one's research career is crucial for productivity that will be evaluated both on the job market and in pre-tenure years.

On giving talks. Rob always delivers great talks, following the philosophy, "Keep your talks natural and easy. Great violinists play simple." He gives the impression that giving flawless talks is a gift that comes effortlessly to him, however to those who know him, it is clear that it is a well-honed skill perfected over the years. His talks are written as answers to questions, which make the mathematics seem to flow naturally. From student comments it is clear that he thinks about his audience as much as the mathematics. He urges students to think about who might be listening, "Rob

often remarked that I should imagine that I am delivering my talk in front of several distinguished senior mathematicians that are not necessarily experts in my field," as well as how they might be feeling, "Before my first talk Rob made me do a practice talk and he insisted that it had to be with an audience. Afterwards he kept telling me to take out unnecessary definitions and details. At some point he said 'it's going to be 4 o'clock in the afternoon, and people will be tired.'" Helping students be rigorous about what not to include in a talk is a gift to the speaker and their audience. At times, Rob's advice gives surprising insight into the level of practical detail with which he plans his talks. For example, he told one student, "it's ok if you can't pull this off because it's sort of a third order suggestion, but after you state the theorem, can you pause just a beat longer? If you have a drink, that is a good time to take a sip," leaving students wondering if Rob is really thirsty when he takes a drink during a talk or if it is an intentional pause for the audience that he is trying to make seem more natural.

On writing. Students describe writing their first paper under Rob's supervision as an often painful but extremely instructive process.

When I wrote my first paper, I told him that it would be fast because I had already written everything down in LaTeX. He said, "I make a distinction between writing things down and writing things up. You'll start with the introduction." Then I had to bring him what felt like endless iterations of the introduction and watch him read it while I sat with him in his office and he told me to use more active verbs. He improved my writing so much, and although he made many, many suggestions, he made me do all the revisions. I had friends from graduate school who were jealous of this very painful process. Some got very little help and others had their work rewritten for them. I remain truly grateful.

When I showed Rob my first draft of my first paper, I was shocked by the number of corrections and the amount of red ink that he was able to add to a 5 page document. I immediately realized that when writing a paper you have to absolutely bring your A game, every single word matters and has to be chosen carefully. At the end of the meeting he surprised me even more by telling me that I had done a great job. I truly appreciate the efforts he put in to help me improve, the honesty in his criticisms and the constant encouragement.

Of course, a significant amount of time in our weekly meetings was devoted to checking the accuracy of our mathematical arguments and

proofs. After understanding the main new idea in a proof, Rob would often zero in on some key technical aspect trying to make sure that not only it is absolutely correct, but also explained in the most efficient way possible. Once again he would encourage us to keep our audience in mind and make our arguments clear enough to convince a graduate student and sound enough to withstand careful inspection by a senior mathematician who is in a very bad mood.

On applying for jobs. In addition to helping students navigate graduate school, a good advisor will also assist them as they move through the next steps of their careers. Some of Rob's advice includes:

Complete the transition to postdoc quickly and fully: "Go to this conference as a young mathematician, not a student. Saying that the theorem is from your thesis makes you sound like a student. You are a junior mathematician now."

A good research statement should be easy to read and appeal to a wide audience: "Make your research statement shorter. Use bigger font. Get your main theorem on the first page."

When deciding where to apply and ultimately accept a job offer, he reminds students to look beyond what they see on paper and try to make evidence-based decisions. If you are unsure about accepting an offer, you may visit or make a phone call to a senior faculty member and have a candid conversation where you can make a human connection.

On advising. One of the aspects of Rob's advising that is most commonly praised is his constant generosity in sharing his ideas and insights and his determination to give credit where credit is due, to colleagues and students alike. Listening to him discuss his own students' work during his talks is particularly instructive. For example, in a talk in which he mentioned a result describing the multiplier ideal of a monomial ideal, he referred to it simply as "a beautiful result of Howald," thus letting the theorem stand on its own, as the result of a fellow mathematician, instead of referring to it as something proved by "my student." We will remember the long hours that Rob devoted to teaching us mathematics and helping us along with his advice and ideas, but maybe more importantly we will also remember how he let us and our results stand on our own.



Christopher Hacon



Jessica Sidman

Credits

Photo of Christopher Hacon is courtesy of Ana Jovanovic-Hacon.

Photo of Jessica Sidman is by Jordan Tirrell.

Advice for the Virtual Job Market

Kristin DeVleming

While I am in no way an expert on the topic, I successfully navigated a remote academic job market in 2020–2021. Thus, I have compiled some advice for the job market, particularly in the virtual setting. The pandemic has offered unique opportunities for academic change, and it is important now more than ever to be technologically capable and adaptable to new circumstances. As we anticipate future change, we should be prepared for more virtual seminars, classes, and even interviews, and experience with these types of online communities is a valuable attribute for job candidates. Much of the advice below applies to the job market in general, but I have tried to suggest skills and tools to develop that pertain especially to the virtual world.

Pre-application Season

If you do not already have one, make a website. In the words of a wise collaborator of mine, "If you don't have a website, you don't exist!" The existence of a website dedicated to YOU means that interested parties can find out who you are, where you are, and the types of things that you think about. It is also a place for you to advertise your own work and the fact that you are on the job market. At a minimum, your website should include:

- Your name, university, and status (like: "third year graduate student" or "postdoc") and a *picture of yourself*. Having a picture is incredibly valuable for those looking at your website—they may realize that they recognize you from some conference/talk/class/etc.
- Some key words describing your research and links to your preprints and publications, if you have already written papers. If not, you can include lecture notes that you've taken, expository pieces that you've written, brief descriptions of your current work, or simply summarize some problems that interest you!
- Other relevant information: are you involved with outreach? graduate student seminars? community activities? Your website should be a snapshot of

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DOI: <https://dx.doi.org/10.1090/noti2325>