John Jimenez: What is your earliest memory of doing mathematics and realizing that it was something you enjoyed? From here how did you get to where you are now?

When I was a little kid, I found a book of basic mathematics (precalculus, I guess) in my parents' house. I read it on my own, very slowly. I tended to have learned most concepts by the time they were introduced to us in school. I was kind of a math whiz, but there were a lot of kids good in math. I was on my middle school and high school math teams. I was pretty good but wasn't blazingly great.

After my junior year in high school, I spent the summer at Brown University in an NSF-sponsored program for students who were supposed to be talented in science. (I think that it was actually a football recruitment program.) We had courses in materials science, calculus (taught by an engineer!) and Fortran programming. I liked the calculus and the programming. Because of the program, I decided to apply to Brown for college. That was my first choice—and I got in. The real "ahah" moment was my first course in linear algebra; I took a yearlong course that was kind of H53 and H54 mixed together. I loved abstract linear algebra and decided that I'd try to become like my math professor (Frank M. Stewart). I had no real idea what a research mathematician does and had no real grasp of the path to get from where I was (an entering freshman) to where I wanted to be (a math professor).

Rose Zhang: How did you find your interest in the specific areas (of algebraic number theory and algebraic geometry)?

At Brown, I met a math professor with a very strong personality, Kenneth F. Ireland. (He died around 1990 of a heart attack when he was very young.) Ireland met me one day, asked me what I had studied, and immediately tried to get me interested in research-level arithmetic geometry. He was so persuasive that I did get interested in the subject. I liked it, and I was pretty good at it. Ireland told me to go to grad school at Harvard and to work with John Tate. I did that. The path that he had recommended meshed well with my abilities and my interests. I was lucky in that regard.

Rose Zhang: What do you usually do when you are stuck on a (mathematical) problem?

The best advice is to try different approaches, different perspectives. (It can also help to drop the problem for a while and come back to it.) I remember

that Tate would sometimes channel J-P. Serre while thinking about a problem: "What would Serre do here?" You can try on other people's approaches to see if that helps. There are all sorts of stories about people getting stuck and not knowing what to do next—only to wake up in the middle of the night with what seems to be a sudden inspiration. Some people like to think about math problems while swimming. Your mind is then in a dreamlike state, and you can think differently than you do in front of a pad of paper or a computer screen.

Fahad Kamran: What would you recommend to students who are interested in getting involved in Mathematical Research?

I think that it's wrongheaded for students to try to do research until they have a really broad and deep background in the core subjects, essentially at the graduate level. Students nowadays think that they should do research early and that this will advance them in some way. My feeling is that trying to do research just gets in the way of learning fundamental things. The only exception I'd make is for students who go to an REU to see if research is something that they like. REUs give students the *experience* of doing research and thereby enable some students to see that they really like (or don't like) research. Even if you like math, it's not clear that you'll like research in math.

Frederick Law: What are possible avenues for undergraduate mathematics research, and how critical is having research experience when applying to graduate schools?

A lot of liberal arts colleges make research projects for their undergrads, and a lot of schools offer REUs that Berkeley students have been going to. For better or for worse, there are almost no avenues for undergraduate research at Berkeley for Berkeley students. I should mention the Directed Reading Program, which is a good way for undergrads to do advanced reading under the supervision of Berkeley grad students. The undergrads get to learn some hard material and then have to give mini-lectures about that material at the end of the semester. One thing that the DRP can teach you is that lecturing is very hard. You have to know the subject deeply and have to have a feel for the audience's background and interests.

Fahad Kamran: What do you think are the most promising up and coming careers for mathematicians to be a part of.

Mathematical biology and data science come to mind. There have been lots of applications of reasonably hefty mathematics to those areas, and of course to

finance. Math students are often able to learn the relevant science quite quickly, whereas people with backgrounds in science (but not mathematics) find it hard to pick up the needed mathematics.

Frederick Law: While I know it is possible to get jobs outside academia with a math degree, bachelor's or PhD, how feasible is it to actually enter different industries without previous experience apart from a strong math background?

When an industry is young, it will take "really smart math people" and train them. When an industry is mature, some of the smart math people have prepared for careers in the industry by learning a lot of relevant subjects (statistics, programming, machine learning, whatever). Someone in industry who gets stacks of CVs from strong math people who have prepared for a job in the industry will not be super impressed by applications from math program graduates who haven't done any preparation. The moral of the story is: know your competition.

Lilian Gao: What are the most important qualities that grad schools (math-related department or in general) look forward to?

I ran graduate admissions at Berkeley for several years around 2000. We had the luxury of getting lots of applications that were nearly perfect (excellent grades, great GRE math scores, enthusiastic letters). In that context, we could try to get the best of the best. We'd look for pairs of applicants that had letters from the same writer; was the writer more enthusiastic about applicant A or applicant B? For schools other than Berkeley, most of the applicants will be non-perfect in some respect. It's hard to weigh the qualities of applicants with really different profiles, but admissions committees do their best. One important factor is that grad schools try to accept only applicants who can succeed in their programs. When a department admits students who don't complete the program, the department gets scolded by the Dean of the Graduate School on its campus.

Lilian Gao: What fields can linear/abstract algebras be applied to in real life?

There's linear algebra all over the place: in physics, chemistry, finance, biology, statistics. If you look at the roster of students in Math 110, you'll see that the majority of the students intend to major in something other than mathematics. It is said that a deep understanding of linear algebra is necessary for anyone who wants to become proficient in Big Data.

John Jimenez: How has cals math department changed since you started teaching (class sizes, popularity of the subject, faculty, competitiveness)?

The class sizes have gone up dramatically. We have many students taking our upper-division and graduate courses who are based in other departments. We have quite a few relatively new courses (combinatorics, cryptography, wavelets, ...).

John Jimenez: What are some changes you would like to see in the math department? This could range anywhere from modifying the upper div core cluster, to the addition of new classes, changing the way we score applications for admission, changing the hiring process etc.

I'd try to reform or get rid of the semi-elective system. It makes no sense to me. The other changes that you're suggesting have all been made (or are being made) incrementally. We have new classes (as noted above). Our hiring process is very formalized in order for us to be compliant with campus rules about equity and inclusion. (When I was hired as a tenured associate professor, someone phoned me in my office at Berkeley and asked me if I wanted to come teach at Berkeley. I said "sure," and that was basically the hiring process.)