

Teaching Sabbatical  
at Department of Mathematics  
University of California, Berkeley  
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View from my office in Evans hall.

# 1 Planning

As soon as I got the decision from STINT (some days before Christmas 2021) we started the preparation. The plan was that my wife and our two kids, 8 and 10 years old would come along the whole fall semester. My 17-year-old son would stay with us during the second half of the semester and my 20-year-old daughter and her boyfriend would just visit us during a couple of weeks.

The Mathematics department at UC Berkeley did not seem to initially have all the information about what a STINT fellowship was. There were a lot of emails going back and forth until they knew the arrangement, but after this confusing start they were always very professional and friendly.

I early decided to make a planning trip to Berkeley. This turned out to be a good choice and something I can recommend. I had the opportunity to both meet some colleagues at the department and to check out housing.

There were some problems to get all the documents for the visa application, the so called DS-2019. The department really did all they could but the documents got stuck somewhere at the university. I started in February and I got the documents in the beginning of June. My advice to coming STINT fellows is to really start early with this process and keep asking until you get the documents. Thanks to that the embassy did not ask for an interview we did receive the visas on time.

## Housing

To find housing in Berkeley is not easy and not cheap. I contacted former STINT fellows that had been to UC Berkeley. I got the contact information to their landlord, and fortunately the house they rented was available during the fall. It was a house with a small garden about 2 km from Campus. The price was \$ 4 300 including utility (gas, electricity, water, internet etc). This was extreme compared to Swedish prices but a fair price in Berkeley. During the planning trip I met with the landlord and signed the contract. I also looked at the house and met the current tenant.

## Finding school and internship for the children

It was rather clear from the beginning what kinds of documents that were needed for the kids to attend the school in Berkeley. For example they needed a *proof of residence*. Mean to say, but you needed to prove that you lived in Berkeley before you lived in Berkeley. My landlord were experienced about this so he put my name on the internet bill and I could use that as a proof and send it to the school authorities.

It was harder to get exact information from our home city. It was only some weeks before departure that we got a list of instructions that needed to be fulfilled before our kids would be granted leave for the fall semester. Before that we had made all the practical arrangements with my kids current school. They would bring a lot of material and in some subjects they would do homework corresponding to what their classmates would do.

My 17 year old son is studying at an animal care program in high school (sv. Naturbruksgymnasium) and during the fall of 2022 he was supposed to have a five weeks internship in a business related to animal/pets. We early started looking for a place for him. When I was in Berkeley during my planning trip I visited a pet shop. It was a pet shop specialized in reptiles and amphibians. They were positive but not used to have interns. In US it is unusual that you have these kinds of specialized programs in high school.



Figure 1: Our house in Berkeley

## Preparing teaching

Already before the planning trip it was decided that I would be teaching a course in cryptography. I have taught a similar course at Linnaeus University for the last couple of years. They even used the same literature!

During the planning trip I met with the teacher that created the course some 10 years ago, Prof. Ken Ribet. He is well known for developing some of the theory used for proving the famous Fermat's last theorem. He was also the president for American Mathematical Society, 2017-2019.

The course was very briefly described. It was more or less just two sentences describing the content. Hence, there was a lot of flexibility. After discussing with Prof. Ribet I decided to change the contents a little bit compared to last time the course was given. The parts that were added are interesting for many applications in information security today. In order to fit in these parts I had to remove some other parts.

During the last day of my stay in April I had booked a meeting with the teacher that had the course last fall. Unfortunately, there was an incident on campus that day. The campus police feared a shooting was probable so the whole campus was shut down. A "shelter in place" was commanded. The teacher I was supposed to meet was lock up with his morning class and I was lock up in my office. Instead of an in person meeting it had to be a meeting through Zoom a couple of weeks later.

After that meeting I decided more or less to follow the old syllabus when it came to homework and exam. During the course there would be 10 homework assignment, two midterm project assignments and a final project. More or less the students would have one assignment each week. This was a much heavier workload than we give our students at Linnaeus University in similar course.

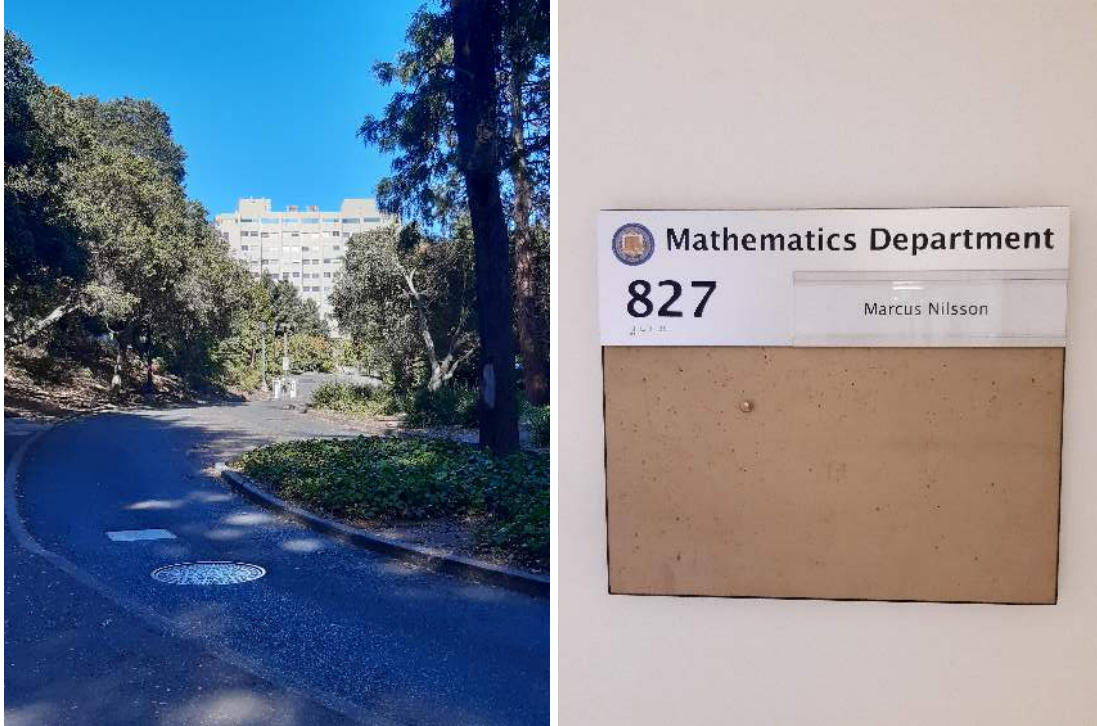


Figure 2: My office was on the 8th floor in Evans hall.

There is a large freedom when it comes to writing a syllabus at UC Berkeley. Not only regarding the contents but also how the examinations and grading were arranged. The staff and department management did not want to give any advice "It is up to you" was a usual answer. Taking to Prof. Ribet and the former teacher of the course were very valuable and I got the information and input I needed.

## 2 Arrival and Onboarding

We arrived in the beginning of August, a couple of weeks before the fall semester started. When we arrived at San Francisco airport our landlord met us at the airport and drove us to the house in Berkeley. It was a strange feeling driving through the Bay area to what will be our home for almost five months, very exciting but also a little scary. We settled rather soon, the house felt like home and people we met were nice and welcoming. A few days after our arrival our neighbours across the street visited us. They had a kid in the same age as ours.

I got an office at the Mathematics department from the first day. My name was at the door and the room was well furnished. I also got access to the faculty lounge and the coffee machine. It took some days until I got my UC Berkeley computer account and my access card. *Onboarding* was the term UC Berkeley used for the process international students and faculty needed go through from arrival to the time we got our formal university accounts.

Two other STINT fellows would also be in Berkeley during the fall semester. They should have been there earlier but their stay was postponed because of the pandemic. We kept contact during the whole stay, went to after work together and had dinners with our families. It was also interesting to compare differences and similarities between our departments and how our onboarding were handled. For example I was asked to apply for an American Social Security Number, but they were not.

After a few weeks we managed to buy a car. I bought it from a friend of a colleague of



Figure 3: View from the entrance of the lecture hall.

mine. There was no problem to register my ownership of the car, but the insurance where expensive for foreign drivers (I only had my Swedish driving licence). The car gave us a lot of freedom. We mostly used for taking the kid to school and back, but we also did several excursions in the area.

### 3 Teaching

Since cryptography is a field between mathematics and computer science I had students aiming either for a major in mathematics or in computer science. The formal requirements for the course were rather low, so I could not expect the students to have the same the theoretical background. If I compare to the cryptography course at Linnaeus University it has more specific requirements.

Before the course started I published a quiz on the course page asking the students about their theoretical background. I also asked questions about their programming skills. The result was that about half of the students had a deep mathematical background. All of the students were confident in programming, even if that was not a formal requirement. Due to the result of this poll I decided to introduce much of the necessary theory in the beginning of the course, but also save some theory until it was needed for the course content. During the course I also tried to say something about theoretical aspects for those students that had that background, to keep them more motivated.

## Lectures

The teaching consisted of two 1.5 hours lectures each week. The lectures started late in the afternoon, 5 PM, Tuesdays and Thursdays. Most of the students were very committed and engaged in their education. If I asked a question in the class there were a lot of students that wanted to answer. This often led to interesting and challenging discussions. Even if they addressed me "Professor" we had a very friendly and open atmosphere in the classroom. In comparison to Linnaeus University the students were in general more active. Unfortunately only about 50% of the students in the class were attending the lectures. When I talked to colleagues I understood that this was the general case for other mathematics courses as well.

## Office hours

Besides the lectures I had two 1.5 hours of "office hours". At the office hours the students could come to my office and ask questions. I really liked this. It was a chance to get to know the students better and we had the possibility to use the large black board in my room to discuss problems in an informal way. Sometimes the students that were coming to the office hours did not have any specific questions. They were just hanging in my office, working on the assignment and chatting with other students. I only had 3 chairs in my office so it often happened that students were sitting on the floor or standing leaning towards the walls.

## Assignments and Guidance

All courses in mathematics at Berkeley have a large amount of course work, a form of continuous assessment. Usually it consists of homework assignments and quizzes. In my course 50% of the total grade was on homework assignments. I had 10 such assignments but the student could drop two of them. Hence, only the 8 assignments with best scores were taken into account. My course was a little special because also the midterms and the final exams were in form of projects assignments. This was not the general case for mathematics courses. Most of them had written exams both as midterms and final. The reason I chose projects instead of written exams was that it is hard to construct good exam problems in cryptography where you only need to use pen and paper, you often need a computer. I had to motivate to the chair of the department my choice of not having a written exam as final.

Most of the students were very ambitious about the assignments. They produced clear and well motivated solutions. They were also demanding when it came to guidance. If students could not solve a problem they were asking for guidance more or less until they got the answer. Even if it was very talented students this could be the case. My view is that (some) of the Berkeley students really want you to take them in your hand and lead them through the solution of the problem. This was a behaviour also noted by my colleagues. Their hypothesis was that it was a consequence of the American school system. There is a lot of stress for the student to pass the assignments and there are more or less no retakes.

## Evaluation

In the end of the course there was a course evaluation. The students needed to answer the evaluation before the final exam week started. We as teachers could not see the result before the last date to register the grades of the course. I guess this process was set for not letting the evaluation affecting the grading and vice versa. I chose to add some own

questions to the evaluation. These were questions about the parts in the course I added compared to earlier versions of the course and also some questions about their opinion about the examination (projects instead of a written exam). In general the students were very satisfied with the course, especially they liked to see real world applications or abstracts mathematics. Some students meant I took too much time from the lectures to explain too simple things and some wanted more detailed instructions. The response rate was 44% and almost all of the students wrote long comments on the open questions. I am not used to get such detailed answers on evaluations. I think it reflects the commitment for the education among the students.

## Grading

The raw grades in my course was computed as 50% on the homework assignments, 15% on each project assignments (the midterms) and 20% on the final project. It is up to the instructor to choose how the the grade would be computed. It varies between courses, but in general the final exam is a rather small percentage. I chose to use the same distribution as the last time the course was given.

As an instructor you had also the possibility to choose to grade with respect to a (Gaussian) curve or using a straight scale. The grading in mathematics courses at UC Berkeley are usually done by using a straight scale. For example if you have 94% or more you get grade A, for grade A- you need at least 90%. The lowest grade is D- and you need 60% for this.

In my course I used the straight scale and I had most A:s and B:s. The lowest passing grade was C+. Out of 38 students only 4 failed the course. Since students tend to mind about their grades much more than in Sweden, I had expected there would be more complains on the grading than there was. It was however a few students that tried to get higher grades with the arguments that they needed it, and that they had higher grades in general. I wonder if that method worked with some teachers?

## 4 Academic life

UC Berkeley is a fantastic place. The environment, the libraries, the famous scientists and the history give you the feeling that you are in the middle of the scientific development. Outside Evans hall (where I had my office) there are reserved parking lots for Nobel laureates. UC Berkeley is one of the universities in the world with most Nobel laureates. Unfortunately there is no Nobel prize in Mathematics but a lot of famous mathematician are or have been affiliated with this university.

## Colleagues

I got the impression that people were working very hard and that they were all very committed, and successful. But, they do not always work in their offices. Many professors seemed to work from home as much as possible. I guess this could be a consequence of the Covid-19 pandemic. For example all the department meetings were still on Zoom. Most professors also worked with their door closed when they were at the department. The possibilities for spontaneous interactions were therefore limited. I realized that you needed to contact people explicitly and set a time for an appointment if you wanted to talk to them.

There was a faculty lounge where all faculty could go for a coffee and eat their lunch, but it was not very much used. The staff and the graduate students also had their separate

lounges. During my stay I used the faculty lounge a lot and it was almost always the same colleagues that I met there. It was very different from the Swedish "fikarum".

The department also arranged Afternoon tea Monday to Thursday in one of the seminar rooms. I tried to attend this afternoon tea as often as possible. I thought it would be a good place to get to know some colleagues. A lot of graduate students and post-docs attended the tea, but not so many professors or staff. It felt like they were too busy for that kind of break.

## Taking care of students

Like most universities also UC Berkeley have the problem that the students not have enough mathematical skills when they start. They fulfill the prerequisites formally but not practically. Like Linnaeus university and most other Swedish universities Berkeley arrange preparatory course during the summer and in parallel to the courses during the fall semester.

There was also a student association for undergraduate mathematics students (MUSA). They arranged social activities, seminars and workshops. For example they arranged workshops in L<sup>A</sup>T<sub>E</sub>X (a program used by mathematicians to create nice documents). They also had a seminar series called *Math Mondays* where professors speak about their research, in a way that is accessible to undergraduate students.

## Seminars

The department of mathematics had an huge range of different seminar series. Most of the seminars were highly specialized intended mostly for the researcher in the specific field. I attended the Number theory and arithmetical geometry seminar a couple of times. One good thing was that the talks were divided into two parts. First one hour pre-talk where the speaker introduced the topic and then one hour of research talk. Even if the pre-talks were mainly indented for the graduate students, also most of the professors attended them.

There was also a department colloquium almost every week. It was intended for a wider mathematical audience. I tried to attend the colloquium as often as possible. These were talks of good quality, almost mathematical entertainment. After the colloquium the department arranged an subsidized dinner at a restaurant downtown. Graduate students payed only \$ 10 for the dinner but faculty payed \$ 30.

## Computer science department

At the Computer Science department there was a security seminar. I contacted the coordinator for the seminar and was invited. The seminar was held in a small meeting room, not like the large lecture rooms where the mathematics seminars often were held. It was a welcoming and familiar atmosphere.

This was not the only contact I had with the Computer Science department. It turned out that one of the students in my class was teaching a cryptography course at the CS department. They were a couple of students working as teaching assistants that taught the course. There was a responsible professor but all the work was done by these teaching assistants. The students of that course were computer science students that had not studied so much mathematics. My student needed some help regarding the content and examination. We had a couple of meetings were we discussed what could be suitable in a course like that. He was one of the most ambitious students of my class. Probably we will keep contact in the future.



## 5 Strike among teaching assistants and graduate students

In the middle of November most of the teacher assistants, graduate students and post-doc at all University of California campuses started a strike. The main reason behind was that their salary was so low that they could not afford to live in the areas close to the universities. There were picket lines at all the main entrances to the campus. Some days there were also striking students outside the mathematics building. They were handing out information about the strike, but they were not allowed to stop anyone from entering the buildings.

Since the assistants did a lot of the grading on assignments and final exams the strike affected the teaching and examination a lot. It was not clear which teaching assistants that were participating in the strike and we (as faculty/staff) were not allowed to ask them. Some of the assistants were just partially striking. They joined the picket line one day and the next they were teaching or correcting assignments. Some staff and faculty did not want to cross the picket lines so either worked from home or they started to work before the picket lines were up and left the university after the picket line closed at 5 pm.

As faculty we were instructed to continue teaching as planned. We were allowed to change from in-person teaching to distance- or hybrid teaching. I decided to change to hybrid teaching (I had teaching in-person but also streamed it live on Zoom). The reason was that some students might not want to cross the picket lines. Since my class started after 5 pm most of my students still participated in-person.

My teaching assistant was supposed to correct all the homework assignments. I was not sure whether he participated in the strike or not and I was not allowed to ask him. We had some discussion among the colleagues how to handle the situation. Most of us agreed that we should not do the work of the teaching assistants, for two reasons: It would be hard to find the time and we would let the teacher assistants down. I tried to contact my teacher assistant by mail (without asking the forbidden question), but I got no answer whatsoever. I had to inform my students in the end of the course that I was not sure that all of the assignments would be graded. Their final grade would then be computed on the assignments that had been corrected by the deadline (December 31).

In one of last colloquiums at the department there were a group of about 20 graduate students gathering in the lecture room (Figure 4). Just before the invited guest was going to start the lecture a spokesperson for the group made a short announcement on why they were striking and asked the university (and the professors of the department) to listen. Then the whole group left the room. We were less than 10 people left in the room when the lecture started.

There was very little information from the management of the department on how to handle the situation, probably because it was hard for them to know what to do in the situation. We had one meeting on how to handle the final exams. The teacher of the larger courses would use multiple choice questions instead of questions where the students write their complete solutions. This would decrease the time for grading considerably. The problem was how to do the proctoring (watching over the students so that they don't cheat). After the meeting there was a list where staff and faculty could sign up to volunteer with the proctoring. I decided to volunteer and I was helping one of my colleagues with the proctoring. My own course was not affected, since my students had a project assignment instead of a written exam as final.

Just before we left Berkeley and I had graded my part of the course my teacher assistant started grading the remaining homework assignments. Some days later he was finished and the students final grades were computed as planned.



Figure 4: Striking students at Colloquium.

## 6 Ideas to implement at home

Regarding the teaching, there were much more continuous assessments in courses in mathematics. At Linnaeus university we lay more responsibility on the student. We do not force the students to do homework, but we expect them to do it. We often have a written exam in the end. The problem is that the students that not do the recommended homework or participate in the lectures often fail the course. The American educational system is different with no retakes. Students seem to work harder during the courses. I guess that they also feel more stress during the end of the course.

More continuous assessment is definitely possible, but we need to do it in a smart way to limit the workload for the teachers. If we are aiming for a system where the students work harder but not feel the same stress as the American system, the Swedish system with retakes will probably provide such an opportunity.

The tendency in Sweden is that we go towards more and more detailed syllabi for courses. If we want to do a change, it has to be done almost a year before the course is given. At UC Berkeley the courses are described very briefly with focus on the content. The detailed syllabus is made by the instructor just before the course starts.

A wish would be that it is a little easier to do small changes in course syllabi in Sweden and hence increase the academic freedom for the instructors. If UC Berkeley can do this with sustained quality it should be possible do something in this vein.

## 7 Living in Berkeley

We got to know two families on our street that had kids in the same age. Even if there were some language barriers in the beginning the kids soon found out how to play computer games and board games. We were also invited to a Halloween party at one of the families.

My wife joined SWEA, a network for Swedish speaking women. Through her contacts

we also got to know a Swedish-American family. We were for example invited to a Thanksgiving dinner at the their house. This was our first Turkey dinner, but probably not the last.

During the weekends we tried or best to be tourists. We did excursions for example to Muir woods, Napa county and Silicon Valley. We also made a longer trip to Los Angeles. We visited San Francisco several time, it was very convenient to take the BART (the subway) from Berkeley. We had a BART station just 10 minutes walk from our house. From there it took only 30 min to reach downtown San Francisco.

I also attended some lunch meetings at Berkeley Rotary Club. It was interesting to hear about all their charity projects. For example they had scholarships for students from Berkeley from families with low income. It was a very friendly and welcoming atmosphere at the club and maybe some of the members will visit my club in Växjö.

In the end of October my two older kids arrived. My daughter and her boyfriend stayed for two weeks. It were two intense weeks where we tried to do as many excursions and activities as possible. From an expensive boat trip to Alcatraz to free jogging in the very hilly surroundings of Berkeley. My older son stayed with us for the rest of the semester. As mentioned above, we manage to find an internship for him in a pet shop. He really enjoyed it. It was educational for him to work in such a big and specialized shop. He also noted some differences between California and Sweden when it come to rules about animal care.

Close to our house there was a Middle school with very good sport facilities. There were several tennis courts, track and field arena and a pool. Since my kids have been training both tennis and track and field this was perfect. We also used the pool several times, the last time just the weekend before we left.

## 8 Conclusion

Berkeley and the whole Bay-area is really a fantastic place. You have some of the world's leading universities (UC Berkeley and Stanford), research labs, the cultural and metropolitan life in San Francisco and many of the world's leading tech companies.

All the money and the economic growth in the region also have a negative side. The price for housing and the lack of housing is a big problem for Berkeley. They try to build but the inhabitants are not always that happy to get a lot of new neighbours. You do not have to go many blocks from the campus entrance of UC Berkeley to meet people that are not fortunate. But, there is a great engagement to help the less fortunate families. For example, before every school holiday fundraisers were organized at my kids' school. People are in general interested in the development of the society and they are politically engaged.

Before I left the university I invited my colleagues at the math department to a "Swedish fika" (with some Swedish snacks bought from IKEA). One of my colleagues brought a former mathematics student that was running a startup company related cryptography. The core idea of the company can be regarded as rather narrow but maybe with great potential. The company had been able to attract funders that would not have been possible in Sweden, at least not with whose amounts. This is just a small example indicating that the Bay-area is the region of possibilities.

Finally I would like to thank STINT and Linnaeus University for giving me and my family this experience. Many thanks also to UC Berkeley and the Department of Mathematics for welcoming us so well.



Figure 5: A mural painting at King's middle school in Berkeley.