Svetlana Jitomirskaya was awarded a 2023 Barry Prize for distinguished Intellectual Achievement. In this video, Sergiu Klainerman of Princeton University interviews Dr. Jitomirskaya. They discuss her career, including experiences of stark and explicit discrimination as a routine part of university life in the Soviet Union, and the importance of freedom, equal rights, and open inquiry to education in the United States.

Sergiu Klainerman, Princeton University

I'm here with Svetlana Jitomirskaya, and first of all, congratulations on your Barry Prize. This is a new prize, and you are in the first cohort of the prize, which I am sure is going to become an important prize that will celebrate not only personal scientific excellence, but also some kind of commitment to both academic freedom and academic excellence. Of course, in your case, these are both true.

Let's start by discussing how you became a mathematician. What attracted you to mathematics, especially given that you were in the Soviet Union at the time?

Svetlana Jitomirskaya, University of California-Irvine

Yes, it's a strange story because growing up, I did not plan to become a mathematician. I was very interested in literature, Russian poetry specifically. That was my plan up until the end of high school. But when it came to thinking seriously about where I would go to university, I realized that pursuing my passion in the humanities was basically impossible without constantly bowing to the state ideology, without praising the Communist Party in every sentence. I wouldn't have been able to study the poets I loved without doing some stuff that I didn't like. I realized that this was not something I wanted to do.

I considered for a while going to a small college in Estonia where a famous linguist, Lotman, worked and to study with him because this would avoid all these problems. It was one of the few possibilities in the Soviet Union. But he was also known as a dissident, and that's why he was working in a small college in Estonia. My parents got really scared, and they talked me out of it. They were very much against the regime, but in a quiet way. They really were scared of a dissident life for me.

Klainerman

They didn't want to risk your life.

Jitomirskaya

Yes. They convinced me that I should not do that. So math was kind of second best for me.

Klainerman

Obviously you were good in math. You could do one of those two things, and you found that math gave you more freedom.

Jitomirskaya

Yes, math was least ideologically engaged. Still, I was very self-conscious about the fact that I was choosing what was second best and not what I thought was my true passion. After I really started learning math at the university and only after that, I developed a passion for math. I remember thinking sometime during sophomore year that I couldn't imagine myself studying anything else. But this came late to me; it was not since childhood.

Klainerman

Of course, you are much younger than me, but there were lots of problems studying mathematics also. It was not easy for Jews in particular.

Jitomirskaya

There was an easy path for me to study mathematics at my hometown's university where they accepted Jewish applicants, but in the best universities in the country, which were in Moscow and St. Petersburg, they wouldn't. That was indeed a big obstacle. The fact that I was admitted to Moscow State University is kind of a miracle that I still cannot fully explain. The whole rhetoric of the society was internationalism and friendship between all the nations, but in reality, things were different for some nations, specifically for Jews. One probable explanation given for this by the authorities, although it was never an official explanation, it was just a rumored explanation, was that there should not be more Jews at such places than their proportional representation in the country, which was 1 percent or so. People were admitted to a major. At Moscow State University, about 500 math majors were admitted. Many would drop out after the first year. Later the class shrank to 300 students, but 500 had been admitted. Of those, there would be two or three Jewish students.

No religion of any kind was outlawed in the Soviet Union. So "Jewish" meant ethnically. Everyone had a line in their passport received at age 16 that indicated their nationality. But the government was on the lookout, as in fascist Germany, for hidden Jews, those who wrote their nationality as Russian or Ukrainian (Ukrainian was considered good at the time), but who actually had a Jewish parent or even grandparent because every person could choose between the nationality of their father or mother to put in their passport. I was one of those hidden Jews. I was Ukrainian in my passport, but I'm ethnically Jewish. I didn't have much hope that I would get admitted because they were really on the lookout for people like me. But I was by some miracles. My file literally was lost between my first exam and my second exam. I know that in my first exam, a written exam in mathematics, they simply graded differently for Jews and non-Jews. I know that my exam was graded in a Jewish way. So I got a C.

My second exam was an oral exam in mathematics. Everybody was taken to their rooms. I knew very well that there would be a room for Jews where they would be subject to much more difficult questions, and I was preparing for that, but I don't think I would have passed it. But my file, which was a paper file, was lost. For 40 minutes, they couldn't find it. They took everyone else to their rooms, and they couldn't find my file. After 40 minutes, they found it and took me to a room. I was not subjected to the Jewish questions. It was a normal exam. Moreover, my examiners looked at my written exam and said, "What is that? How could they give you a C? You should appeal." The people examining me had no clue what was going on.

So, a true miracle allowed me to study at Moscow State University. In principle, one could have gotten a good education and a good math education at a number of other universities in the country and many people did, but really the best opportunities, the best kind of exposure to top mathematicians was at the places where Jews were essentially not allowed. I just got lucky by some accident. It was so unexplainable that I felt it was important for me to pay back for this luck and take all the opportunities that the university was offering to study for all those Jewish applicants who were not admitted. And that's what I did. And that's how I fell in love with math.

Klainerman

You obviously got a great education at Moscow State. When did you leave the Soviet Union?

Jitomirskaya

I left straight after getting a PhD in 1991. My PhD was also from Moscow State with the same advisor, Yakov Sinayev, which was typical. It was typical at the time I started the beginning of my junior year of undergraduate, that there were a total of five years. It was three years of undergraduate plus later graduate school. When I started with him, he said, "You shouldn't even dream of going to graduate school." The reason was not because I am a woman—he was actually very encouraging to me originally, but he knew I am Jewish. I was this hidden Jew. He said that they would never let me. Then I got lucky again! This was still the bad times, the middle 1980s. By the time I finished my undergraduate, it was perestroika and things had changed. I was admitted to graduate school with no incident while just a few years before it would have been out of the question.

Klainerman

Was it difficult to find a job in the United States coming from the Soviet Union?

Jitomirskaya

Yes, my path was a little strange because my husband is a chemist and he was offered a postdoc, and I just decided I would follow him with or without a job. I contacted Abel Klein, a mathematician at UC Irvine, whom I met in Moscow when he visited my advisor. He managed to get a part-time lecturer position for me at UC Irvine. That was my first job. I was not really planning to stay in academia at that time as I had some serious self-esteem issues. Then it so happened that I stayed in Irvine for 32 years.

Klainerman

You claim that there was a series of lucky incidents.

Jitomirskaya

There was a series of lucky incidents, yes. At that time, we were not really planning to leave the Soviet Union. We actually had return tickets; we were planning to go to the United States for a short time. It was not the Soviet Union anymore, and that was the motivation. There was a lot of excitement in Russia about it becoming a free country. But it was clearly a third-world country, where it didn't pay to do research. It was impossible to be in research there, but there was a lot of hope for the future. We were hoping that after a few years in the United States, we would go back to reasonable jobs there. This hope has been slowly dashed forever.

Klainerman

So you stayed in the United States, which was good for this country. Can you say a few words about your mathematical research interests?

Jitomirskaya

I'm a mathematical physicist, which means I work on problems that are at least motivated by physics and are of potential interest to physicists. That is very exciting. I was very lucky to have a couple of occasions when I could actually say something new to the physicists or prove them wrong. I prove theorems, which is an area of pure mathematics. Some of my results, even though it's called mathematical physics, are not really related to anything practical because they concern some phenomena that happen in timeframes that are longer than the lifetime of the universe, even if it is increased by a factor of two, as we have recently heard. Still, the fact that these phenomena exist, one can say that they point to some better understanding of more practically relevant phenomena.

Much of the stuff I do is simply mathematics. Mathematically speaking, the area is between many fields. It uses tools from many fields: functional analysis, ergodic theory, harmonic analysis, probability, number theory, even algebraic geometry a bit. It is very exciting, and there are a lot of very interesting things going on right now. It's very rapidly developing. The field where I've made most of my contributions is so-called quasi-periodic operators. Quasi-periodic Schrödinger operators are objects that come from quantum mechanics, but are related to structures that look periodic at a small time, at small scales, but then, at other scales, are actually not periodic and look a bit chaotic. This leads to various phenomena, and they become very amenable to rigorous analysis in some sense, which leads to some very satisfactory results that can describe systems for all levels, for all values of parameters.

Klainerman

Okay, very good. Let's talk a little bit about your adopted country now that you are a mathematician in an adopted country. How do you view the strengths or weaknesses of how math is being taught and practiced at an essential level in the United States?

Jitomirskaya

I love America very much. I think of myself as American now. I think it's a country of tremendous opportunities and tremendous will and strength for innovation, particularly in education. I'm very hopeful that the United States will embrace all the innovations that come from AI. I see the possibilities for online education, for example, things like Khan Academy. I'm sure there will be similar engines, which can provide high-quality, one-on-one tutoring to all. These are the definite advantages, the fact that such things are centered in the United States, happening in the United States.

The disadvantages are of course that various political forces prevent this from happening at scale and that various education decisions are made locally at the school district levels. As a result, in some school districts it's good, and it's bad in some school districts. It's horrible in some states, it's better in some states. It's horrible, and it's all a function of time. In the same state, it can go from good to bad. Various political forces prevent good things from happening.

The really bad thing is the bad preparation of many teachers. I mentioned the good thing—the fact that there are now possibilities to offer high-quality, individual online tutors coupled with the realization that bad math preparation of many teachers is a bottleneck for high-quality education. Hopefully, society should realize this, and that should lead to some good solutions, maybe even in the near future.

Klainerman

What you are describing is AI and other incredible new possibilities. It's education at an individual level, like homeschooling, which is becoming very big.

Jitomirskaya

There were some very bad developments recently, for example, this California math framework attempted to dumb down education in the entire state. It's the state of California, no less, which is a bellwether for what happens in much of the rest of the country. It's being successfully fought back as we speak, because, for example, just this month, a committee of professors from each of the UC campuses unanimously rejected a possibility for some of these non-math-based data science courses that were promoted by this California math framework to validate for algebra 2 in UC admissions. It reinforced the role of strong mathematics preparation for all admissions, not only for the UC system, but also for the Cal State system, which is actually more relevant there. This was just recently approved by the regents of the UC system.

Things are going back to sanity, and I am very optimistic that people will start to understand the merits of good education and of accessibility to good education to all who are willing to get it. Another recent development in California, in San Francisco in the recent election, 82 percent voted to reinstate algebra 1 in eighth grade for students in the city, which was outlawed there for some 10 years and people got fed up. I am really amazed by this 82 percent vote, and it makes me very hopeful.

Klainerman

I didn't know about this; that's very interesting. But obviously, in all these things we are dealing with a lot of bureaucracy. Of course, we see a lot of bureaucracy in universities. Major universities. How worried are you about this?

Jitomirskaya

This is definitely a very bad trend. I saw some graphics showing how bureaucracy in the universities has grown in the last several decades by several factors while the number of faculty stayed about the same. Clearly this is not good. In a sense, again, the innovations, the AI, and all should actually help reduce the bureaucracy. I'm hoping that this process will soon start. Maybe I'm too naive and too stupid, but I am an optimistic person. I am very hopeful that this was a period of growing pains in some sense that will come to an end and that things will go back to how they should be with bureaucracy playing a much more minor role.

Klainerman

I do believe that you're right to be optimistic, but optimism is not enough. It's important that people like you fight against the bad things that have happened.

Jitomirskaya

Yes, it's important to fight against the bad things, even minor bad things, because otherwise they tend to grow into more serious bad things. Those bad periods can last for many years, and it may be your lifetime. You don't want that. I want all these good things that I am optimistic are about to happen in my lifetime.

Klainerman

That's wonderful, Svetlana. It is wonderful to hear your voice, and congratulations again for the Barry Prize. I'm sure that we'll hear more about you in the future. Thank you.

Jitomirskaya

Thank you very much, Sergiu.