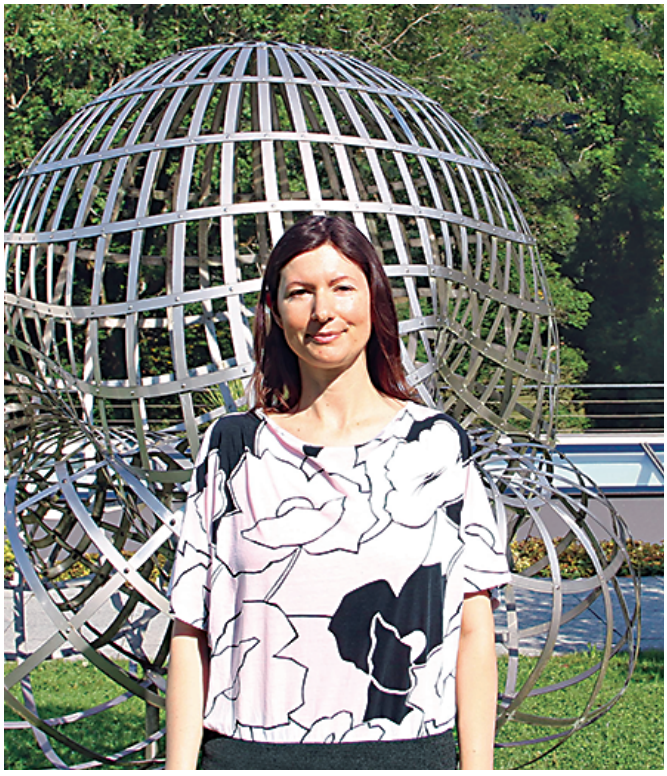
Ljudmila Kamenova Interview

Conducted by Alexander Diaz-Lopez



Ljudmila Kamenova is research assistant professor at Stony Brook University. She works in the field of complex differential geometry, in particular on hyperkähler manifolds and on Kobayashi hyperbolicity questions. In addition to her mathematical accomplishments, Ljudmila was named 2017 Long Island Bridge Player of the Year.

Diaz-Lopez: *When did you know you wanted to be a mathematician?*

Kamenova: In high school, I competed in national and international olympiads. It was a lot of fun because I could use my imagination to solve tricky problems, and I also liked the traveling aspect of it. Then I knew I wanted to be a mathematician. I have a lot of wins in national (Bulgarian) math competitions.*

Diaz-Lopez: *Who encouraged or inspired you?*

Kamenova: My math high school teacher Rumyana Karadjova was my first inspiration toward the field of mathematics. She collected a lot of interesting math problems in various subjects (combinatorics, graph theory, number theory, plane geometry) that were accessible to high school students, and she also ran a math club on Saturdays in which we solved challenging problems to prepare us for math competitions. In college, my undergraduate advisor Vasil Tsanov was also an inspiration. He was interested in a variety of subjects and this influenced me to take interest also in subjects that are related to my main field of study. And of course, in graduate school my PhD advisor, Gang Tian, encouraged me a lot.

An idea or an approach from a completely different subject can be helpful.

Diaz-Lopez: *How would you describe your research to a graduate student?*

Kamenova: I work in the field of hyperkähler complex geometry. Compact complex manifolds with vanishing first Chern class are built of irreducible blocks that are complex tori, Calabi-Yau manifolds, and hyperkähler manifolds. Hyperkähler manifolds are simply connected and admit a non-degenerate holomorphic 2-form. Some basic problems in this area include coming up with more examples, classifying hyperkähler manifolds in low dimensions and proving finiteness of their deformation types. For example, the only complex hyperkähler surfaces are K3 surfaces, and they are all deformation equivalent to each other. Hyperkähler geometry is still a relatively young field that started in the early 80s, and there are a lot of interesting directions and open problems.

For permission to reprint this article, please contact: reprint-permission@ams.org.

DOI: http://dx.doi.org/10.1090/noti1669

*In the Balkan Math Olympiad, I won a gold medal with a perfect score. In the IMO, I received a silver medal.

Diaz-Lopez: *What theorem are you most proud of and what was the most important idea that led to this breakthrough?*

Kamenova: Together with Misha Verbitsky and Steven Lu we proved Kobayashi's conjecture (which was open since 1976), which states that K3 surfaces have vanishing Kobayashi pseudo-distance. If the Kobayashi pseudo-distance vanishes, it means that there are entire curves, i.e., images of the complex line $\mathbb{C}$ under non-constant holomorphic maps. We also proved Kobayashi's conjecture for large classes of hyperkähler manifolds. The idea leading to the solution of this conjecture was to use ergodicity methods applied to hyperkähler geometry. The Teichmüller space of complex hyperkähler structures is well-studied and it admits an action of the mapping class group Γ, which one can show is ergodic using theorems of C. Moore and M. Ratner. This means that every γ-invariant measurable set has either measure 0 or 1. Using the classification of orbits and the upper semi-continuous properties of the Kobayashi pseudometric, we find hyperkähler manifolds with vanishing Kobayashi pseudometric in each orbit.

Diaz-Lopez: *What advice do you have for current graduate students in math?*

Kamenova: When it is time to choose a doctoral advisor, students should attend all topics courses and seminars that seem interesting and try to talk to the potential advisors about topics that interest them. This way the student can also judge if the two of them could communicate well. Once the advisor and the thesis topic have been selected, it is helpful to attend conferences and talk to other researchers and students in the area.

Diaz-Lopez: *If you could recommend one book to graduate students, what would it be?*

Kamenova: One of the first research math books that I read was Milnor's *Morse Theory*. I was impressed by the clarity of its exposition.

Diaz-Lopez: *All mathematicians feel discouraged occasionally. How do you deal with discouragement?*

Kamenova: I am usually interested in several problems at a time. If I am stuck on one problem, I start thinking about another project while keeping the first one on the back burner. If the difficulty is technical, one can usually overcome it eventually or apply the already developed ideas in a slightly different direction.

Diaz-Lopez: *You are an avid bridge player, recently being selected as Long Island Player of the Year. How did you get involved in playing bridge?*

Kamenova: This year (2017) was very good for me in terms of bridge even though I didn't play that much. Other than being selected as the Long Island Player of the Year, my team won a national bridge championship, and I was the player of the December NYC regional tournament with the most masterpoints. I started playing more seriously while I was a graduate student at MIT. A lot of the MIT grad students played bridge, and they were constantly looking for a fourth player. We would mostly play on Friday afternoons for a few hours.

Diaz-Lopez: *Does your mathematical background help when playing bridge?*

Ljudmila Kamenova after winning the Long Island Player of the Year award.

Kamenova: Logical thinking helps in bridge because a good player should envision the pattern of the opponents' hands from their bidding and carding. Also, while declaring a hand, one should keep in mind the different percentages of likely distributions. It often helps to be inventive and make a tricky play. On the other hand, in order to be a successful bridge player, one should also understand human psychology and "read" the opponents.

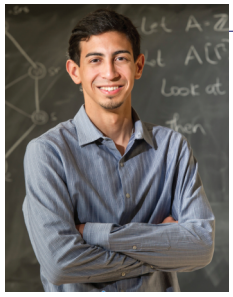
Diaz-Lopez: *Any final comments or advice?*

Kamenova: My final advice for graduate students is that no matter what subject they choose to specialize in, they should still keep learning a broad number of other subjects, because sometimes an idea or an approach from a completely different subject can be helpful in their specialized problem.

Photo Credits

Opening page photo courtesy of Archives of the Mathematisches Forschungsinstitut Oberwolfach.

Photo of Kamenova as Bridge Player of the Year courtesy of Lesley Decker-Lucas.



Alexander Diaz-Lopez

ABOUT THE INTERVIEWER

Alexander Diaz-Lopez, having earned his PhD at the University of Notre Dame, is now assistant professor at Villanova University. Diaz-Lopez was the first graduate student member of the *Notices* Editorial Board.