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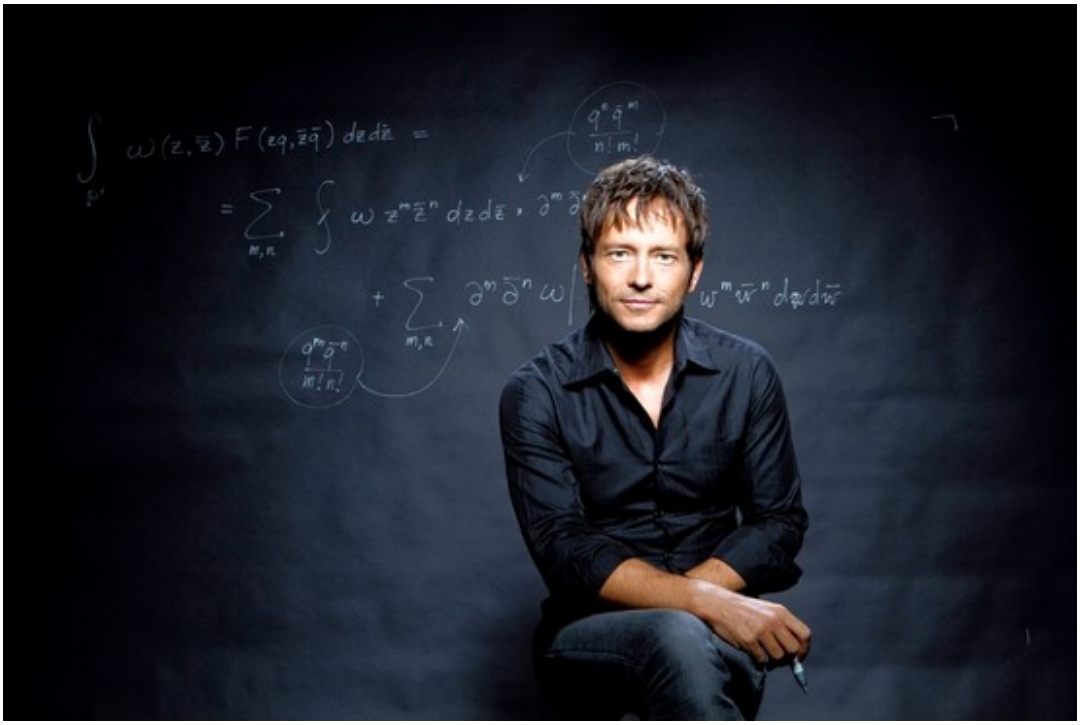
Edward Frenkel and a Love for Math

By ALEXANDRA WOLFE



Elizabeth Lippman for The Wall Street Journal; Grooming by Kara Dorman

Edward Frenkel

The words love and math aren't usually uttered in the same breath. But mathematician Edward Frenkel is on a mission to change that, uniting the terms in both his recent film, "The Rites of Love and Math," and upcoming book, "Love and Math." Both are attempts to bridge the gap between his passion for math and the popular appetite for it.

"You say the word 'math' and people shut down," says Mr. Frenkel, sitting outdoors in New York's Bryant Park. In his book, to be published in October, the tenured professor at the University of California at Berkeley argues that the boring way that math is traditionally taught in schools has led to a widespread ignorance that may have even been responsible for the recession.

"It's like teaching an art class where they only tell you how to paint a fence but they never show

you Picasso," he says of elementary school math classes. "People say, 'I'm bad at math,' but what they're really saying is 'I was bad at painting the fence.' " Love is a different story, though. "People might think they hate math but everyone loves love," he says. "I want to put more love into math."

And Mr. Frenkel, a youthful, puckish 45-year-old with a slight Russian accent and a flair for fitted shirts and tailored jeans, hopes to be math's next leading man. With YouTube videos of his lectures at UC Berkeley viewed by hundreds of thousands of people—"and that's even the most boring stuff," he adds—Mr. Frenkel does indeed talk about math adoringly. "It is this great connector," he says. "Nobody can take it away from us." What he means is that while the philosopher Pythagoras lived over 2,000 years ago, his theorem still exists today; it holds true across cultures, time and space. "How many things have the same endurance?" he asks. Mathematical formulas "have a quality of inevitability."

Mr. Frenkel's own career was far less assured. He says growing up Jewish in Russia in the 1970s and 1980s all but guaranteed rejection from Moscow State University, the primary place in Moscow to study "pure" mathematics (as opposed to applied mathematics, which is math as it relates to other disciplines, like engineering). On top of that, Mr. Frenkel's grandfather was an enemy of the state and had been sent to the gulag for eight years. Mr. Frenkel's father had applied to the university's physics department himself in the 1950s but was denied entry. "That story stayed with me and in some ways I feel like I'm fulfilling his dream as well as mine," says Mr. Frenkel.

He applied to the university anyway at age 16; the examiner failed him, as he expected. "Being Jewish in Russia was not an issue of religion—there was no religion—it was really just ethnicity, blood," he says. Despite the failure, after the test his examiner asked him, "How do you know mathematics so well?" Mr. Frenkel had learned it from a family friend who was a college math professor. The examiner advised him to apply to a different school, now called the Gubkin Russian State University of Oil and Gas, because, as Mr. Frenkel recalls him saying, "They take people like you." He got in.

"I was lucky," he says. "Unfortunately hundreds if not thousands of classmates didn't have that opportunity, and their careers were broken, their lives were broken." He and his friends from "Oil and Gas," as it was called, used to scale the fences of Moscow University, which had a better known program, and sneak into classrooms to listen in on lectures.

By his second year, Mr. Frenkel managed to solve a math problem complicated enough to warrant its publication in a journal with international reach. His next paper caught the attention of Harvard University's math department, which invited him to visit just before he turned 21. "I thought the Soviet Union wouldn't let me travel abroad," he remembers, but the Iron Curtain was starting to come down and he was allowed to go.

He arrived at Harvard as a 21-year-old visiting professor in 1989. "I bought myself the coolest jeans I could find, and I got myself a Walkman," he remembers, laughing. He went on to earn his Ph.D. at Harvard and eventually became a professor there, until the University of California at Berkeley recruited him in 1997. Mr. Frenkel spends most of his time working on the subject broadly known as the Langlands program, researching a grand unified theory of mathematics, linking various fields such as number theory, quantum physics and geometry.

He is also an advocate of the Common Core State Standards Initiative, a set of academic

standards he thinks should be applied nationally. He complains that varying state requirements make as much sense as doorways of different heights. And if more schools abolish core curricula —an idea proposed by some academics lately, to allow more focused students to take only the classes that interest them—he fears private schools would become the only ones to make difficult subjects like algebra mandatory. "So what's going to happen if you eliminate math or make it selective? The 1% is going to know mathematics," he says.

The other problem with the public's meager mathematical knowledge is its role in the global economic crisis. "Mathematical models were misused" by financial institutions, says Mr. Frenkel. "People who were in charge did not fully understand them but were using them anyway."

Mr. Frenkel thinks that the only way a mathematical dialogue will begin is if it becomes part of everyday discussion and attracts the interest of those who never thought they were good at it. So he came up with the idea for "The Rites of Love and Math," and worked with a director to write, produce and direct the film. In it, a mathematician (played by Mr. Frenkel) finds a formula for love, which he realizes is so powerful it has to be hidden. So he hides it by tattooing it on his female love interest.

"Being Russian I am very sentimental," he says, smiling. "I liked the idea that it could get under your skin and it could become part of you."

Mr. Frenkel shows the film at various screenings and has made it available on DVD and online. At the end of every screening, he says, someone always raises a hand to ask what the formula really means. That is the idea. "If I were to write a formula on the board everyone would walk out," he says. "But in the film it really...sparked this curiosity."

His coming book tells his personal story and goes own to describe his research in the Langlands program, as well as recent mathematical discoveries that aren't regularly taught in classrooms. Mr. Frenkel doesn't mind if his viewers, and soon readers, don't understand everything in his work. "If they say, 'Tell me more,' I did my job well."

Mr. Frenkel thinks rapid improvements in science and technology will prompt even more of those questions. "Mathematics will be king in this brave new world," he says. With the digitization of practically everything these days, math will increasingly be used to order information. "We need more and more math," he says. "Where there is no mathematics there is no freedom."

Write to Alexandra Wolfe at alexandra.wolfe@wsj.com

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