

Mathematics Cédric Villani was awarded the prestigious Fields Medal in 2010. Since 2009, he has been director of the Institut Henri Poincaré,¹ where he continues his exceptional, high-flying scientific career.

Cédric Villani

A Man who Counts

BY STÉPHANIE ARC

Resembling a 19th century poet, with his long straight hair, lavalliere cravat, white shirt, and elegant suit adorned with a gleaming spider-shaped brooch, Cédric Villani is one of France's most brilliant mathematicians—he has recently received the highest international distinction in the discipline, along with three other laureates, including the French-Vietnamese researcher Ngô Bao Châu. “Since winning the Fields Medal, I’ve been in such demand that I haven’t had time for any research,” admits the 37-year old researcher. But far from complaining, he says it has been a “rather extraordinary” experience, allowing him to “meet people from all walks of life, including politicians, journalists, students, and all those who have expressed an interest in his work—a wide and heterogeneous fan base, to say the least.

For Villani, winning the Fields Medal is “an honor and a tremendous encouragement.” His devotion to mathematics dates back to his high-school days. “I was immediately drawn by the playful aspect of math,” he remembers. He was also fortunate enough to have imaginative teachers who ventured off the beaten path. “I was fascinated by what I discovered,” he adds.

AS LUCK WOULD HAVE IT

Nonetheless, the young Villani did not think of mathematics as a career and hoped he would become a paleontologist. Yet after a preparatory class at Lycée Louis le Grand in Paris, he enrolled at the prestigious École Normale Supérieure (ENS). As he puts it, “in the French education system, it’s as though the path is all mapped out.” ENS proved to be a major phase in his development, the place where he found himself. “I had always been quite reserved, but my time there made me very sociable,” says Villani.

“And I discovered the arts, especially music, which remains one of my passions.” It was at ENS that he chose to specialize in analysis as part of his math course. “It was more by luck than by choice,” he adds, “because when the algebra classes started, I needed to unwind.” Guided by his tutor Yann Brenier, and working under the supervision of Pierre-Louis Lions, himself a Fields Medal laureate in 1994, Villani dedicated his thesis to the Boltzmann equation. “No doubt the best-known equation in kinetic theory, it describes the behavior of particles in a low-density gas,” Villani explains. With this early work, he was already interested in entropy,² an essential concept in physics and the theme running through his research.

FOCUS ON PHYSICS

After completing and brilliantly defending his thesis in 1998, Villani published with his colleague Felix Otto an article on optimal transport, another recurrent theme in his research. Eager to help his interviewer understand the concept, the mathematician grabs a piece of chalk and begins drawing curves on the blackboard. “Optimal transport? Imagine you have a mound of earth to move at an excavation site. Moving each grain of soil entails transport costs. How can you spend the least money possible?” After this publication, Villani was invited to teach at Georgia Tech in Atlanta (US) for six months. “Optimal transport wasn’t my main field,” he admits, “but teaching something is a great way to learn more about it.” He retrieves two prodigiously thick treatises from a nearby shelf and continues “there were hardly any reference works on the subject back then, so my books filled a void.”³

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