

Synopsis

In 2010, French mathematician Cédric Villani received the Fields Medal, the most coveted prize in mathematics, in recognition of a proof which he devised with his close collaborator Cécile Mouhot to explain one of the most surprising theories in classical physics. Birth of a Theorem is Villani's own account of the years leading up to the award. It invites readers inside the mind of a great mathematician as he wrestles with the most important work of his career. But you don't have to understand nonlinear Landau damping to love Birth of a Theorem. It doesn't simplify or overexplain; rather, it invites readers into collaboration. Villani's diaries, emails, and musings enmesh you in the process of discovery. You join him in unproductive lulls and late-night breakthroughs. You're privy to the dining-hall conversations at the world's greatest research institutions. Villani shares his favorite songs, his love of manga, and the imaginative stories he tells his children. In mathematics, as in any creative work, it is the thinker's whole life that propels discovery—and with Birth of a Theorem, Cédric Villani welcomes you into his.

Book Information

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Customer Reviews

This book takes us through the formulation of the theorems in "On Landau damping" by Cécile Mouhot and Cédric Villani. Villani is playful in real life, his research is playful, and the book is playful. This is a gem for a singular reason. One sees exactly how Villani (or a pure mathematician) goes from abstract to abstract without ever exiting the world of pure and symbolic mathematics, even though the subject concerns a very concrete real-world topic. I kept waiting for him to use simulations or even plots to see how the equations worked. But he did not ... he and Mouhot had

recourse to outside help (a student or an assistant) for the graphs and he calmly noted that they "looked" great. Later in the book he relied on others to do the numerical work... as an afterthought. Most physicists, quants, and applied mathematicians would have played with a computer to get the intuition; Villani just worked with mathematical objects, abstract mathematical objects, and very abstract at that. And this is a big deal for the subject because it belongs to a certain class of problems that do not have analytic solutions, usually requiring numerical approaches. Landau damping is about something many people are indirectly familiar with. Some history: Fokker's "Planck equation, itself the Kolmogorov forward equation, is used commonly as the law of motion of particles (hence diffusions in finance). We quants use it in the main partial stochastic differential equation. In plasma physics it is related to the Boltzmann equation, which, by using mean-interaction in place of every interaction (mean-field), leads to the Vlasov equation. Landau damping is (sort of) about how things don't blow up because of some exponential decay.

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