



Michigan Mathematics Alexander Ziwet Lectures October 27-29, 2009

Professor Cedric Villani

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Director, l'Institut Henri Poincaré*

*Henri Poincaré Prize, International Association of Mathematical
Physics, 2009*

Prize of the European Mathematical Society, 2008

Jacques Herbrand Prize of the Academy of Sciences, 2007

Institut Universitaire de France, 2006

Invited Lecturer, International Congress of Mathematicians, 2006

*Plenary Lecturer, International Congress of Mathematical
Physics, 2003*

*Peccot-Vimont Prize and Cours Peccot of the Collège de France,
2003*

Louis Armand Prize of the Academy of Sciences, 2001



Mathematics Arising from the Classical Kinetic Theory of Plasmas

This is a series of lectures on related problems arising in the classical kinetic theory of plasmas. A recurring theme is that messy physics sometimes leads to the discovery of beautiful mathematical phenomena.

- ***What goes on in a plasma?***

Tuesday, October 27, 2009 • 4:10 p.m. • 1360 East Hall

I will start with a presentation for non-experts of a few classical equations and problems in classical kinetic theory, especially plasma dynamics. I will discuss some of the most famous physical phenomena, and give a brief overview of results developed in lectures 2 and 3. To conclude this lecture I'll present an unexpected application of the kinetic theory of plasma to the resolution (around the turn of the century) of a conjecture

- ***Vlasov-Fokker-Planck: Relaxation with degenerate dissipation***

Wednesday, October 28 • 4:10 p.m. • 3088 East Hall

This lecture is devoted to the large-time analysis of the Vlasov-Fokker-Planck equation with smoothed interaction. This is the opportunity to present a general nonlinear "hypoocoercivity theory", and a new approach to hypoelliptic regularity.

- ***Landau damping: relaxation without dissipation***

Thursday, October 29 • 4:10 p.m. • 4088 East Hall

Lecture 3 investigates Landau's surprising collisionless damping, classically treated in the linear regime. Understanding the perturbative, nonlinear regime was an open problem for half a century. I shall present the solution which I recently devised with Clement Mouhot.

*A reception for Professor Villani will be held at 5:00 p.m.
Tuesday, October 27, in the Mathematics Upper Atrium, East Hall*

The Ziwet Lectures were established in 1934 through a bequest from Professor Alexander Ziwet, a faculty member and Chair of the UM Department of Mathematics from 1888-1925. He stipulated that his estate "should be used for the promotion of scientific work." The Ziwet lectures are one of the most prestigious lectures series in the Department.