SPECIAL

PHYSICAL MATHEMATICS SEMINAR

Fluid Mechanics: A unique testing ground for the foundations of (quantum) physics

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ABSTRACT:

It is generally believed that one of the greatest problems of modern theoretical physics is the unification of quantum mechanics and gravity. The first is a probabilistic theory, the second a deterministic one. Now, there exists an abstract theorem, Bell's theorem, which shows that no theory that is both local (Lorentz-invariant) and deterministic can lead to the same predictions as quantum mechanics – thus casting doubt on the whole unification program. In this talk I will review Bell's theorem and its derivation, and show that it is not valid if one assumes that particles are accompanied by a 'background field', as e.g. in de Broglie's pilot-wave theory. It appears that such a background is also present in recently discovered fluid-mechanical systems (which, as a matter of fact, inspired the present research). These systems therefore offer a unique testing ground for Bell's theorem, and for the foundations of quantum mechanics. If time is left, I will argue that fluid mechanics has great potential to give experimental insight in a variety of other foundational problems, e.g. in black hole physics.

THURSDAY, NOVEMBER 3, 2016
2:30 PM
Building 2, Room 449

Reception following in Building 2, Room 290
(Math Dept. Common Room)

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