



Mathematics

UNIVERSITY OF TORONTO

# The 24<sup>th</sup> Annual R. A. Blyth Lectures in Mathematics



**Camillo De Lellis**

Institute for Advanced  
Study and  
University of Zurich

**Monday March 25, 4:00PM**  
Room 1210, Bahen Centre for  
Information Technology  
40 St. George Street, Toronto

**Tuesday March 26, 4:00PM**  
Room 6183, Bahen Centre  
40 St. George Street, Toronto

**Wednesday March 27, 4:00PM**  
Room 6183, Bahen Centre  
40 St. George Street, Toronto

## Rigidity and flexibility in differential geometry and fluid dynamics

In the fifties John Nash astonished the geometers with his celebrated isometric embedding theorems. A folkloristic explanation of his first theorem is that you should be able to put any piece of paper in your pocket without crumpling or folding it, no matter how large it is. In more precise mathematical terms, while it was long known that sufficiently smooth isometric embeddings must abide some restrictions (the most notable being Gauss' Theorema Egregium), Nash showed that  $C^1$  isometric embeddings are surprisingly flexible. A natural question is then whether there is a threshold regularity which discriminates between the two behaviors.

Ten years ago László Székelyhidi and I discovered unexpected similarities with a classical problem in the theory of turbulence. Our remark sparked a series of discoveries and works which have gone in several directions. Among them the most notable is the recent proof of Phil Isett of a long-standing conjecture of Lars Onsager in the theory of turbulent flows: in a nutshell Onsager identified, in 1949, the threshold regularity which discriminates solutions of the Euler equations which preserve the kinetic energy from those that do not.

In these three lectures I will review the classical theorem of Nash, I will illustrate the ideas behind the proof of the Onsager's conjecture and I will finally address a recent joint work with Dominik Inauen, where we identify a critical regularity for the isometric embedding problem.

The first lecture will aim to be accessible to a general scientific audience.

The Blyth Lecture Reception will take place before the first public lecture at 3:00PM on Monday March 25, 2019 in the Department of Mathematics' Lounge, 6th floor, Bahen Centre, 40 St. George St.