



**Politecnico  
di Torino**

Dipartimento di Scienze  
Matematiche "G. L. Lagrange"



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Scienze Matematiche  
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## COLLOQUIUM

Il giorno **Mercoledì 22 Maggio 2024**, alle ore **16:00**, in **Aula Buzano**, il

**Prof. Benoît PERTHAME**

del Laboratoire Jacques-Louis Lions, Sorbonne Université

terrà una conferenza dal titolo

### **Structured equations in biology; relative entropy, Monge-Kantorovich distance**

**Abstract.** Models arising in biology are often written in terms of Ordinary Differential Equations. The celebrated paper of Kermack-McKendrick (1927), founding mathematical epidemiology, showed the necessity to include parameters in order to describe the state of the individuals, as time elapsed after infection. During the 70s, many mathematical studies were developed when equations are structured by age, size, more generally a physiological trait. The renewal, growth-fragmentation are the more standard equations.

The talk will present structured equations, show that a universal generalized relative entropy property is available in the linear case, which imposes relaxation to a steady state under non-degeneracy conditions. In the nonlinear cases, it might be that periodic solutions occur, which can be interpreted in biological terms, e.g., as network activity in the neuroscience.

When the equations are conservation laws, a variant of the Monge-Kantorovich distance (called Fortet-Mourier distance) also gives a general non-expansion property of solutions.

**Bio.** Professor Benoît Perthame is a leading expert in the field of nonlinear partial differential equations. He has made seminal contributions to the mathematical theory of Hamilton-Jacobi equations, conservation laws, kinetic equations, and structured equations, by formulating new fundamental concepts and developing novel analytical techniques and asymptotic methods. Over the past thirty years, he has devoted most of his scientific activity to the study of partial differential equation models arising from the life sciences and his work has been highly influential on the development of the research area of mathematical biology. Professor Perthame is the recipient of numerous prizes, including the Blaise Pascal Medal in Mathematics (2013) and the Grand Prix INRIA-Académie des Sciences (2015). He was elected to the European Academy of Sciences in 2014, to the Academia Europaea in 2016, and to the Académie des Sciences in 2017. He was also head of the Mathematics Division of the European Academy of Sciences from 2015 to 2020 and he is the current president of the European Society for Mathematical and Theoretical Biology.

Alla conferenza seguirà un coffee break.