## Institut de Physique Théorique Theoretical physics courses



## From mathematical singularities to physics of turbulence

## Bérengère Dubrulle (IRAMIS/SPEC)

13rd, 20th, 27th of June 2025 and 4th of July, from 10:00 to 12:30. In person at IPhT and live online.

Turbulence, a phenomenon observed by physicists in natural and laboratory flows, is thought to be described by Navier-Stokes equations (NSE). Yet, it is not yet known whether the Cauchy problem is well posed for these equations, and whether solutions of finite energy are regular or unique. In the physics community, the "singularity hypothesis" is generally discarded, following the reasonable principle that "singularities are a mathematical curiosity, in nature they do not exist".

In these lectures, I will discuss how recent progresses in mathematics, numerical simulations and laboratory experiments changed such simple vision leading to a new picture where quasisingularities living beyond Kolmogorov scale play a central role.

Topics covered:

- The basic empirical laws of turbulence
- Some mathematical aspects of Navier-Stokes equations
- Symmetries and their consequences
- Singularities and anomalous laws
- Predictability of turbulence

To receive the latest news on this course and the video-conference links, please subscribe to its newsletter, as explained at the website courses.ipht.fr. An open, non-interactive livestream will also be available at youtube.com/ipht-tv.

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IPhT, CEA Paris-Saclay Orme des Merisiers bât. 774 F-91191 Gif-sur-Yvette

