

Special Issue

Entropy in Fluids

Message from the Guest Editor

Entropy of a system provides a measure of missing information (or randomness) about the system. The concept of entropy was introduced by Clausius in 1865 to reformulate the Second Law of Thermodynamics in a more elegant way. In a revolutionary stroke in 1870, Boltzmann demonstrated how entropy can indeed be used to understand the macroscopic world via the underlying molecular dynamics. In general, the fluid flows are out of equilibrium, so it is not formally possible to ascribe the concept of entropy to fluid flows. However, one typically circumvents this issue by assuming the fluid to be locally close to equilibrium. In the same vein, fully developed turbulence (FDT) in fluids is a dissipative dynamical system with enormous strongly-interacting degrees of freedom in a state far removed from absolute statistical equilibrium. Nevertheless, as Kraichnan ingeniously pointed out in 1964, equilibrium states prove to be useful to FDT, because they indicate the direction toward which the nonlinear interactions in conjunction with a selective rapid viscous decay of high-wavenumber modes drive the system and produce an energy cascade.

Guest Editor

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Message from the Editor-in-Chief

The concept of entropy is traditionally a quantity in physics that has to do with temperature. However, it is now clear that entropy is deeply related to information theory and the process of inference. As such, entropic techniques have found broad application in the sciences.

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