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Dynamical Origins for Non-Gaussian Vorticity Distributions in Turbulent Flows MICHAEL WILCZEK, RUDOLF FRIEDRICH, Institute for Theoretical Physics, University of Muenster — The problem of turbulence can be attacked either from a statistical or a dynamical point of view. Although a statistical theory of turbulent flows from first principles is still lacking, there have been promising attempts by Monin, Lundgren and Novikov to establish such theories. Furthermore it is known that fully developed three-dimensional turbulence is dominated by the complex interaction of filamentary vortices. These structures have a severe impact on statistical properties and are known to cause intermittency both in the Eulerian and Lagrangian frames. With the power of modern supercomputers direct numerical simulations help to gain insights into both of these questions. We will present results on the connection between non-Gaussian vorticity statistics and coherent structures. The underlying theory is cast in form of conditional averages, which allow to separate different dynamical influences like vortex stretching and vorticity diffusion.

Michael Wilczek
Institute for Theoretical Physics, University of Muenster

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