MP 1 Hauptvorträge I

Zeit: Dienstag 10:15–13:00 Raum: TU MA043

Hauptvortrag MP 1.1 Di 10:15 TU MA043

Knotted soliton-a candidate for the QCD string — •Ludvig Faddeev — Steklov Institute of Mathematics, 27, Fontanka, 191011, St.Petersburg, Russia

An exact change of variables for the Yang-Mills lagrangian in 3+1 dimensional space-time is proposed. It reveals the degrees of freedom of a particular nonlinear sigma model, which was shown to have solitonic excitations, concentrated around the knot in space. It is proposed that this string-like object could be interpreted as a QCD string.

Hauptvortrag MP 1.2 Di 11:10 TU MA043

On the statistical mechanical foundations of thermodynamics — •Jürg Fröhlich — Theoretische Physik, ETH–Hönggerberg, CH–8093 Zürich

I will discuss mathematical results concerning some of the foundations of thermodynamics, in particular of the fundamental laws, in nonequilibrium (quantum) statistical mechanics. Adequate notions of entropy will be introduced; reversible and especially reversible isothermal processes will be discussed; and the 2nd law in the form of Clausius and of Carnot will be derived. Along the way we will encounter phenomena like "Return to Equilibrium", "Convergence to Nonequilibrium Stationary and Time-Periodic States", and "Entropy Production".

Hauptvortrag MP 1.3 Di 12:05 TU MA043

Simple models of turbulent advection — •Krzysztof Gawedzki — Laboratoire de Physique, ENS Lyon

Turbulent advection of pollutants, heat, chemical agents or magnetic fields is a non-equilibrium phenomenon with applications to environmental issues, meteorology, engineering or astrophysics. The simplest models of turbulent transport study passive advection of scalar or vector quantities by random velocities with prescribed statistics and may be viewed as examples of random dynamical systems. Such reduced models show many expected features of the full-fledged hydrodynamic turbulence, including cascades of conserved quantities and intermittency. Their analysis allows to relate transport properties of flows to non standard behaviors of fluid particles that is made possible by the lack of regularity of turbulent velocities. The simplified models exhibit a new robust mechanism of intermittency involving hidden statistically conserved quantities.