Quantum chromodynamics (QCD) is established as the fundamental underlying theory of the strong interaction, yet there are only few firmly established aspects when it comes to its rich phase diagram. There are, though, systems which did/may happen to wander around in the QCD phase diagram within environments that are so extreme, in terms of temperature and/or density, as to accommodate other QCD phases than the hadronic one that we are more familiar with. These systems are our Universe, in the first microseconds after the “Big Bang”, Neutron Stars (even more so in their mergers), heavy ions in their collisions and, theoretically rather than practically speaking, a large part of modern supercomputers around the globe. We can, indeed, use supercomputers to simulate strong interaction matter under extreme conditions thanks to an almost 50-years-old numerical framework for describing non-perturbative phenomena in QCD via Monte Carlo simulations: lattice QCD. In this talk we will discuss how lattice QCD simulations allow us to explore, from a theoretical perspective, some rather interesting portions of the QCD phase diagram (in temperature and nonzero net isospin density directions). We will also discuss how we try to learn about interesting regimes, like that of nonzero net baryon densities, that lattice QCD fails accessing, by extending our parameter space even further (varying i.e. the microscopic parameters of the theory away from their physical value) and then exploiting the universal features of continuous phase transitions.
Thema: Integrability and Universality in nonlinear waves

Datum: 05.02.21

Uhrzeit: 16:15

Ort: ZOOM/Konferenzschaltung

Vortragender: Tamara Grava

University of Bristol

What is an integrable system? Intuitively, an integrable system is a dynamical system that can be integrated directly. While in principle integrable systems should be very rare, it happens that in nature, a lot of fundamental systems are integrable such as many models of nonlinear waves, models in statistical mechanics and in theory of random matrices. The study of nonlinear waves has led to many remarkable discoveries, one of them being 'solitons', found some 50 years ago. Solitons motivated the development of the Inverse Scattering Transform (IST). History and some examples will be discussed. Finally I will present some universality results about small dispersion limits and semiclassical limits of nonlinear dispersive waves.

Ansprechpartner: G. Akemann

Seminar Hochenergiephysik

Thema: tba

Datum: 23.03.21

Uhrzeit: 14:15

Ort: D6-135

Vortragender: Marco Drewes

Centre for Cosmology, Particle Physics and Phenomenology - CP3, Louvain-la-Neuve
Inhalt:

Ansprechpartner: D. Bödeker

Seminar Kondensierte Materie

Thema: Bielefeld El-Paso Minisymposium

Datum: 19.02.21

Uhrzeit: 16:00

Ort: ZOOM / Konferenzschaltung

Vortragender: PhD students and PostDocs

Inhalt:

16:00 CET, 8:00 MT: Mark Pederson and Jürgen Schnack - Welcome 16:05 CET, 8:05 MT: Patrick Vorndamme (UBI) - Free induction decay under unitary time evolution and Heisenberg interactions 16:25 CET, 8:25 MT: ??? (UTEP) - tba 16:45 CET, 8:45 MT: Julian Ehrens (UBI) - Classical Molecular Dynamics Simulations of Nanometer-thin Carbon Nanomembranes 17:05 CET, 9:05 MT: Coffee, soft drinks - Help yourself 17:10 CET, 9:10 MT: ??? (UTEP) - tba 17:30 CET, 9:30 MT: Henrik Schütter - tba 17:50 CET, 9:50 MT: ??? (UTEP) - tba 18:10 CET, 10:10 MT: Good bye - prepare for dinner/lunch

Ansprechpartner: Jürgen Schnack

Seminar Mathematische Physik

Thema: The Character Expansion in effective Theories for chiral Symmetry Breaking

Datum: 03.12.20

Uhrzeit: 16:30

Ort: ZOOM / Konferenzschaltung
On the joint moments of characteristic polynomials of random unitary matrices

I will talk about the joint moments of characteristic polynomials of random unitary matrices and their derivatives. In joint work with Jon Keating and Jon Warren we establish the asymptotics of these quantities for general real values of the exponents as the size $N$ of the matrix goes to infinity. This proves a conjecture of Hughes from 2001. In subsequent joint work with Benjamin Bedert, Mustafa Alper Gunes and Arun Soor we focus on the leading order coefficient in the asymptotics, we connect this to Painleve equations for general values of the exponents and obtain explicit expressions corresponding to the so-called classical solutions of these equations.