Arbeitskreis junge DPG (AKjDPG)
Working Group "Young DPG"

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With this program, the working group young DPG wants to reach out to as many participants as possible. First-time conference attendees and those still feeling lost on the variety of topics and sessions during the conference, we offer the chance to learn about the topics of the conference on a very fundamental level in our tutorials. You are cordially invited to join them on Sunday!

Also, take note of the PhD symposium which is organised for the first time at this conference. The symposium is organised by a group of PhD students and deals with extreme gravity as a path towards new insights on fundamental physics. The symposium aims at giving Bachelor, Master as well as PhD students an insight into this topic. It also connects topics from different sections such as gravitational with nuclear physics.

Last, but not least, we will also explore the city and especially the bars of Munich and would like to welcome many participants joining us!

Overview over Invited Talks and Sessions

(HS 1, 2, and 3)

Tutorials

AKjDPG 1.1	So	16:00–17:00	HS 1	**Birth and Death of Neutron Stars** — •Hans-Thomas Janka
AKjDPG 1.2	So	17:00–18:00	HS 1	**Introduction to nuclear physics of neutron stars** — •Ingo Tews
AKjDPG 2.1	So	16:00–17:00	HS 2	**The role of Entanglement in AdS/CFT** — •Mario Flory
AKjDPG 2.2	So	17:00–18:00	HS 2	**An introduction to quantum information and entanglement** — •Tobias Osborne
AKjDPG 3.1	So	16:00–17:00	HS 3	**Plasmas at atmospheric pressure: Overview on Physics and Applications** — •Ronny Brandenburg
AKjDPG 3.2	So	17:00–18:00	HS 3	**Introduction to High Temperature Plasma Physics** — •Felix Warmer

Invited Talks of the PhD symposium - Extreme matter meets extreme gravity: compact objects as laboratories for fundamental physics (SYPS)

See SYPS for the full program of the symposium.

SYPS 1.1	Mi	15:00–15:40	HS 5	**Black-hole superradiance: Probing ultralight bosons with compact objects and gravitational waves** — •Paolo Pani
SYPS 1.2	Mi	15:40–16:10	HS 5	**Modelling and analyzing a binary neutron-star merger: Interpreting a multi-messenger picture** — •Tim Dietrich
SYPS 1.3	Mi	16:10–16:40	HS 5	**What can neutron-star mergers reveal about the equation of state of dense matter?** — •Ingo Tews

Sessions

AKjDPG 1.1–1.2	So	16:00–18:00	HS 1	**Tutorial Physics of Neutron Stars (joint session AKjDPG/HK)**
AKjDPG 2.1–2.2	So	16:00–18:00	HS 2	**Tutorial Quantum Information and Entanglement (joint session AKjDPG/MP)**
AKjDPG 3.1–3.2	So	16:00–18:00	HS 3	**Tutorial Plasma Physics (joint session AKjDPG/P)**

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Dienstag 20:00 – 23:00 Treffpunkt Audimax

AKjDPG 1: Tutorial Physics of Neutron Stars (joint session AKjDPG/HK)

Zeit: Sonntag 16:00–18:00 Raum: HS 1

Tutorium AKjDPG 1.1 So 16:00 HS 1

Birth and Death of Neutron Stars — •Hans-Thomas Janka — Max Planck Institute for Astrophysics, Garching, Germany

Neutron stars are born in catastrophic explosions of massive stars as supernovae, and they can get destroyed during the violent collision with a companion star in a close binary system. Such events belong to the most energetic phenomena in the universe, and they are among the brightest cosmic sources of electromagnetic radiation, neutrinos, and gravitational waves. Therefore they are prime targets in the new era of multi-messenger astronomy, which has received an enormous boost by the recent first measurement of gravitational waves from the late inspiral phase of two neutron stars, followed moments afterwards by the detection of a short gamma-ray burst and the discovery of the kilonova emission from a radioactively heated cloud of ejecta. Such events offer unique possibilities to probe regimes of extreme gravitational, particle, nuclear, and plasma physics that are hardly accessible by laboratory experiments. Our understanding of the complex processes taking place in the astrophysical sources and of their interplay on microscopic and macroscopic scales heavily relies on numerical simulations, which are indispensable to make quantitative predictions of observables and to interpret the measured signals. The tutorial will discuss recent progress of three-dimensional computational modeling in this fast-advancing field.

Tutorium AKjDPG 1.2 So 17:00 HS 1

Introduction to nuclear physics of neutron stars — •Ingo Tews — Theoretical Division (T-2), Los Alamos National Laboratory, Los Alamos, NM 87545

Neutron stars are fascinating stellar objects born in core-collapse supernovae. Their masses reach up to two solar masses but their radii are of the order of only 10 km. Due to these extremely high densities, up to 10^{15} g/cm^3 in their cores, neutron stars represent ideal laboratories for fundamental physics. In particular, neutron stars probe nuclear physics at densities far beyond the regime accessible in terrestrial experiments.

In this presentation, I will give an introduction to the nuclear physics relevant for the structure of neutron stars. I will present current state-of-the-art results for the equation of state of neutron-star matter and neutron-star properties, and discuss current observational limits.

AKjDPG 2: Tutorial Quantum Information and Entanglement (joint session AKjDPG/MP)

Zeit: Sonntag 16:00–18:00 Raum: HS 2

Tutorium AKjDPG 2.1 So 16:00 HS 2

The role of Entanglement in AdS/CFT — •Mario Flory — Jagiellonian University, Łojasiewicza 11, 30-348 Kraków, Poland

In this tutorial, we start with an accessible introduction to the Anti-de Sitter/Conformal Field Theory (AdS/CFT) correspondence, which is a conjecture that relates the physics of a quantum field theory with conformal symmetry to the physics of a higher dimensional gravity theory with a negative cosmological constant. One result of particular importance in AdS/CFT is the Ryu-Takayanagi formula, which equates entanglement entropy on the CFT-side of the correspondence to a generalisation of the Bekenstein-Hawking black hole entropy on the AdS-side. We will explore how this result shapes our modern understanding of the AdS/CFT correspondence, and of how the curved geometry of the AdS-space arises from quantum information theoretic aspects of a CFT.

Tutorium AKjDPG 2.2 So 17:00 HS 2

An introduction to quantum information and entanglement — •Tobias Osborne — Institut für Theoretische Physik, Appelstr. 2, 30167 Hannover

In this tutorial I will give an introduction to the theory of quantum information and quantum entanglement. Particular emphasis will be given to the foundational protocols of quantum information theory, inluding, teleportation and superdense coding, and also on the operational definition and quantification of entanglement. Applications in high energy physics and holography will be sketched.

AKjDPG 3: Tutorial Plasma Physics (joint session AKjDPG/P)

Zeit: Sonntag 16:00–18:00 Raum: HS 3

Tutorium AKjDPG 3.1 So 16:00 HS 3

Plasmas at atmospheric pressure: Overview on Physics and Applications — •Ronny Brandenburg — Leibniz-Institut für Plasmaforschung und Technologie e.V. (INP Greifswald) — Universität Rostock, Institut für Physik

Plasmas at atmospheric pressures are known from lightnings, but are also of great industrial importance. Technically they can be operated in many different electrode geometries, discharge regimes, and, with a great variety of their basic plasma parameters. In particular non-thermal as well as thermal plasmas exists at elevated pressures. While thermal plasmas are used for material processing (e.g. welding and spraying) and chemical conversion, non-thermal plasmas have been intensively studied in the context of surface treatment, environmental remediation, ozone generation, flow control, analytics, light sources and life-science applications. The first part of the tutorial will give an overview about the classification and application of plasmas at atmospheric pressure.

The research on atmospheric pressure non-equilibrium plasmas intensified over the last two decades leading to a large variety of plasma sources. Although the fundamental understanding of these discharges is emerging, there are still numerous unexplained phenomena in these complex plasmas. The properties of these plasmas span over a huge range of electron densities as well as heavy particle and electron temperatures. The second part of the tutorial will provide an overview of the key processes for its generation and stabilization as well as for their unique physical and chemical properties.

Tutorium AKjDPG 3.2 So 17:00 HS 3

Introduction to High Temperature Plasma Physics — •Felix Warmer — Max-Planck-Institut für Plasmaphysik, Wendelsteinstraße 1, 17491, Greifswald

This introductory lecture explores the physics properties of the fourth fundamental state of matter: the plasma, i.e. the most common state of baryonic matter of the visible universe. Plasmas offer a plethora of interesting physics such as collective behaviour and long-range collisions owing to the Coulomb nature of the interaction. Of specific interest are high temperature plasmas as found in space as well as their artificial counterpart on earth for application to magnetic confinement fusion. High temperature plasmas, like in fusion devices, are also often magnetised adding a wealth of additional interesting effects – a considerable fraction of which is highly non-linear affecting plasma transport properties by more than an order of magnitude. In particular, plasma turbulence is a fascinating subject challenging our intellectual faculties and fascination. Based on these examples, this lecture will provide an introduction to the topic of high temperature plasma physics suited for students and physicists from other fields.