MISSION

The Niels Bohr International Academy (NBIA) is a center of excellence for theoretical physics and neighboring disciplines at the Niels Bohr Institute. Our mission is to attract the best and the brightest to Denmark and provide the environment to enable break-through research in theoretical particle physics, gravitational physics and astrophysics, theoretical astrophysics, biophysics and active matter, particle astrophysics, and condensed matter theory.

MEMBERS

The NBIA staff includes several Professors, including a Villum Kann Rasmussen Professor and a DNRF Chair. A significant number of NBIA Assistant Professors and Associate Professors have started new research groups in their disciplines by attracting prestigious national and European grants. The NBIA hosts a large number of post-docs, PhD-students, and MSc-students. We have a steady stream of international visitors, who are invited to give seminars or collaborate with NBIA members.

ACTIVITIES

The NBIA hosts around ten workshops, symposia and PhD-schools every year. We also reach out to the public with a number of activities, including an annual series of public lectures in collaboration with the Danish Open University. All in all the NBIA offers an incredible stimulating environment for students!

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CONDENSED MATTER THEORY

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The Niels Bohr International Academy

The NBIA invites prospective MSc students to an informal event

"MSc Projects @ NBIA" on October 12, 2022

Join us to learn more about our diverse research program and the possibilities to carry out your MSc project at NBIA.

For registration and further information please visit:

www.nbia.nbi.ku.dk/mscday2022

The Niels Bohr International Academy

PARTICLE ASTROPHYSICS

Research in this field lies at the rich interface between astrophysics, cosmology, and fundamental physics. We are particularly interested in exploring the Universe through cosmic rays, photons, neutrinos, and gravitational waves. A strong focus at NBIA lies on neutrino astrophysics. We study the role of neutrinos in powering sources, their use as powerful probes of hidden source interiors, and seek to unveil the fundamental properties of neutrinos from studying their interactions in dense environments and on cosmic backgrounds, and from their detection in neutrino telescopes.

THEORETICAL ASTROPHYSICS

This line of research at the NBIA spans a variety of topics, using a broad range of theoretical techniques and numerical tools. Topics of interest include: accretion flows around young stars and compact objects, the formation of black hole binary systems and subsequent mergers, the interstellar medium, the intergalactic medium in galaxy clusters, as well as the early evolution of our solar system and exoplanetary systems. We have access to powerful computer resources and interact on a daily basis with the Computational Astrophysics Group at the NBI.

CONDENSED MATTER THEORY

The condensed matter theory group at the NBIA seeks to understand how to create, control, measure, and protect quantum coherence and entanglement in quantum many-body systems. This is crucial for building large controlled interacting quantum devices, such as solid-state qubits, nanowires and nanotubes. We maintain close links with the Center for Quantum Devices, with many opportunities for theory-experiment collaborations on these fundamental topics.

THEORETICAL PARTICLE PHYSICS

At the Large-Hadron-Collider, we now probe fundamental interactions at the shortest distances ever reached, prompting the advancement of new computational methods to boost the precision of theoretical predictions encoded by scattering amplitudes. Such amplitudes are increasingly the subject of deep fascination and open up a captivating research interplay in mathematics, theoretical physics, and phenomenology. Central research questions revolve around powerful geometric reformulations of perturbation theory that hugely enhance computational capabilities.

GRAVITATIONAL PHYSICS

Measurements of gravitational waves by the LIGO/Virgo and forthcoming detectors deliver compelling opportunities for testing theories of fundamental physics, including the regime of strong gravity as probed by black holes just before merging. To this end, it helps to utilize ideas and methods from quantum field theory and scattering amplitudes to produce new theoretical precision. Other queries are more phenomenological. Are black holes the simplest possible macroscopic objects? Do event horizons exist? Can gravitational waves convey information about inaccessible dark matter in the Universe?

BIOPHYSICS & ACTIVE MATTER

NBIA has recently launched an exciting new initiative to expand into soft matter physics and the hot topic of active, self-organizing matter: bacterial colonies, cellular tissues, or filaments inside living cells. A distinctive feature of these active materials is their ability to autonomously create coherent flows with the entire material moving as a unit. Such coherent flows of cells occur in vital biological processes - from wound healing and organ formation to bacterial invasion and tumor progression - and are the subject of intense studies due to their potential for medical intervention.