Großes Physikalisches Kolloquium an der Universität zu Köln

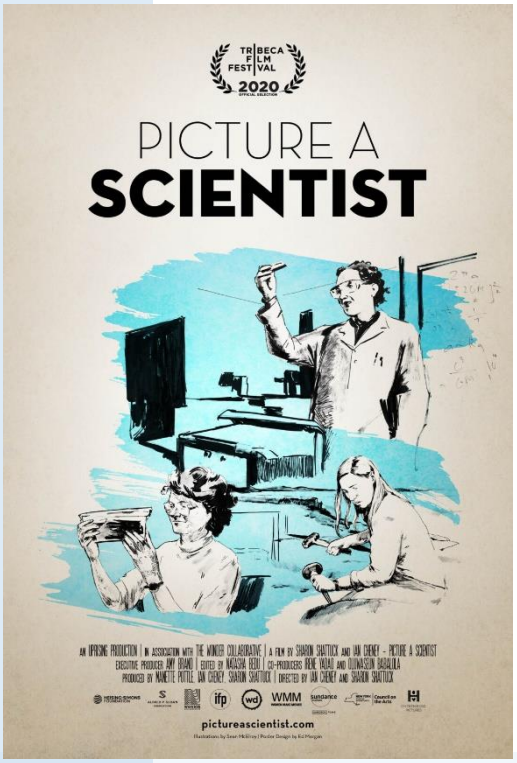
Picture A Scientist

Filmscreening + Discussion

16.04.2024
16^{30} Uhr
HS III

When you picture a scientist, who do you see?

PICTURE A SCIENTIST chronicles the groundswell of researchers who are writing a new chapter for women scientists. Biologist Nancy Hopkins, chemist Raychelle Burks, and geologist Jane Willenbring lead viewers on a journey deep into their own experiences in the sciences, ranging from brutal harassment to years of subtle slights. Along the way, from cramped laboratories to spectacular field stations, we encounter scientific luminaries - including social scientists, neuroscientists, and psychologists - who provide new perspectives on how to make science itself more diverse, equitable, and open to all.



The topic of discrimination, sexism and racism in science shown in the documentary film using the example of women who research and teach in scientific subjects is (unfortunately) still relevant and has to be constantly discussed and addressed. Therefore we want to raise awareness by reaching as many people as possible, from lecturers to students as well as other people.

The screening is sponsored by the Awareness Fonds of the Department for Equal Opportunities of the University of Cologne.

Diversity & Equality

Großes Physikalisches Kolloquium im Sommersemester 2024 – Hörsaal III der Physikalischen Institute, Zülpicher Str. 77, 50937 Köln
https://physik.uni-koeln.de/veranstaltungen-ordner/veranstaltungen/oeffentliche-vortraege/gpk Zoom Zugang: siehe dort

Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Ulrich Gerland
Technische Universität München

Inferring the rules of simple life

23.04.2024
16^{30} Uhr
HS III

In physics, we are used to describing the world around us in terms of particles, or quasiparticles, with defined properties and interactions. Even when the particles have substructure, this description remains useful, for as long as the particles remain intact. Living matter consists of very complex “particles”, with internal states that are often hidden to the observer. Inferring the quantitative properties and interactions of these biological particles from targeted experiments is an exciting endeavor for physicists. I will try to demonstrate this for the case where the particles are micron-sized bacterial cells, using examples from our own and other groups work.

Image by “brgfx" on Freepik
https://www.freepik.com/free-vector/germs-with-monster-face_6880052.htm

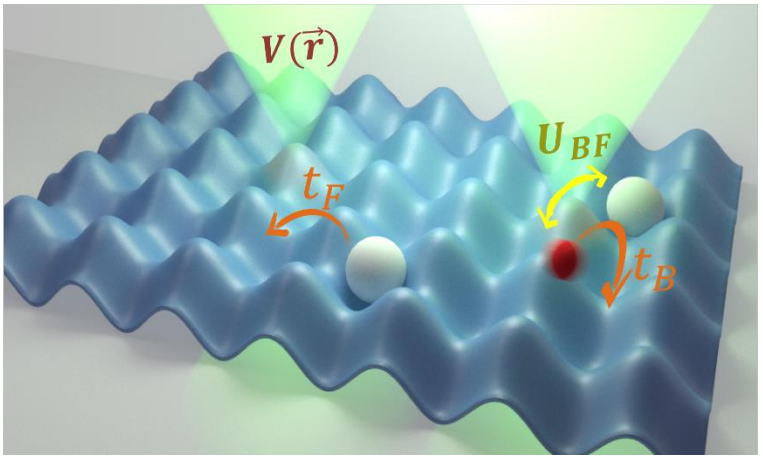
Großes Physikalisches Kolloquium an der Universität zu Köln und Verleihung des Ising-Preises

Prof. Dr. Ignacio Cirac
Max-Planck-Institut für Quantenoptik in Garching

30.04.2024
16^{30} Uhr
HS III

Quantum Simulation in the NISQ era

Advancements in quantum computing have enabled the development of small-scale quantum computers and simulators that adhere to the principles of quantum physics. Despite its rapid progress, those devices are not yet flawless and errors accumulate, posing serious challenges to their application to interesting problems. In this talk I will first address how those errors affect the results of both quantum computations and the simulation of quantum many-body systems. In particular, I will present several quantum simulation algorithms, and discuss the potentiality of displaying quantum advantage in the presence of imperfections. Finally, I will describe some new ingredients of such algorithms, like the preparation of highly entangled states, and discuss how they can be sped up with the help of measurements.



Großes Physikalisches Kolloquium an der Universität zu Köln

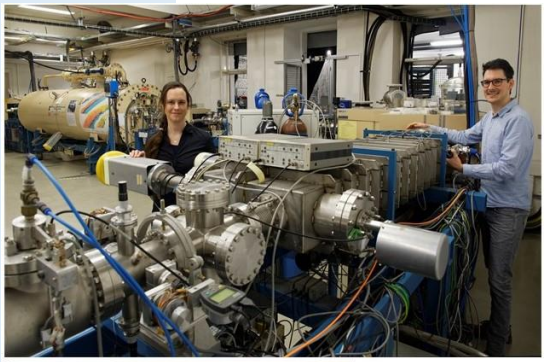
Ass.-Prof. Dr. Karin Hain
Universität Wien

What do isotope signatures of long-lived radionuclides tell us about their emission sources?

14.05.2024
16^{30} Uhr
HS III

Since the beginnings of the „nuclear age“, man-made radionuclides have been released into the environment either by atmospheric nuclear weapons tests, nuclear accidents or from the nuclear fuel cycle. Long-lived radionuclides like uranium (U), plutonium (Pu) or technetium (Tc), are mostly not an immediate hazard due to their low specific activity, but they will be part of our environment over thousands of years and require long-term monitoring. A comprehensive understanding of their environmental migration behaviour is essential to protect the population from future exposure and also for the application of these radionuclides as tracers to study environmental transport processes, e.g. ocean currents. For this purpose, contributions from sources other than the globally distributed nuclear weapons fallout need to be quantified to determine the distribution pathways to the sampling station. Isotopic ratios of radionuclide releases into the environment have proven to be useful signatures for contamination source identification.

The concentrations of such radionuclides in the general environment are fortunately still extremely low so that their analysis requires an ultra-sensitive method like Accelerator Mass Spectrometry (AMS). After a general introduction to the AMS technique, the sources for anthropogenic radionuclides and their expected characteristic isotope signatures emitted into the environment will be introduced in the talk. Selected projects carried out at the AMS facility VERA (Vienna Environmental Research Accelerator), for which source identification is highly relevant like the search for a marker to identify the basis of the proposed new geological age of “the Anthropocene”, will be presented. On-going developments involving the unique instrumentation for Ion-Laser-Interaction Mass Spectrometry, e.g. for the very challenging detection of ^{99}Tc or ^{135}Cs, will be touched in this context.



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Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Amelie Saintonge
Max-Planck-Institut für Radioastronomie

To be anounced

4.06.2024
16^{30} Uhr
HS III

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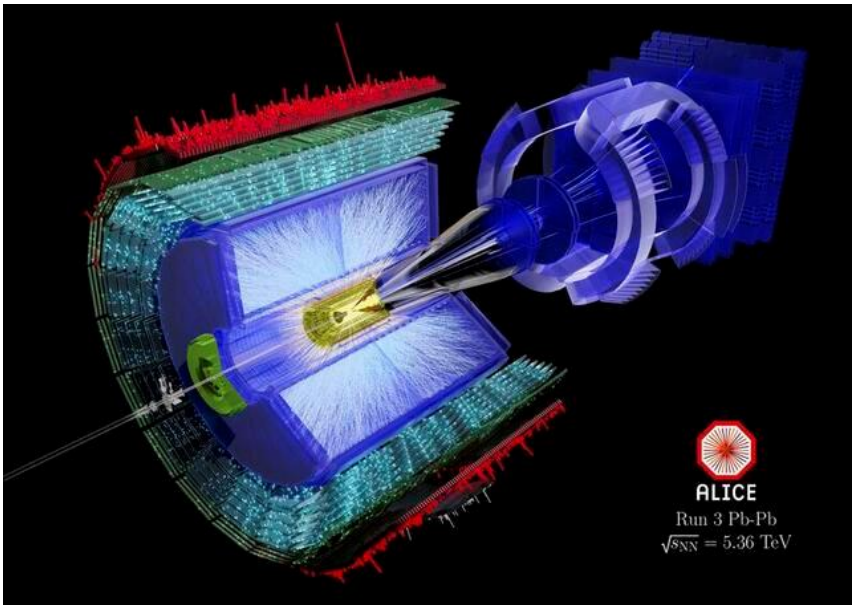
Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Silvia Masciocchi
Universität Heidelberg and GSI Darmstadt

Hot QCD matter flowing as a fluid

2.07.2024
16^{30} Uhr
HS III

Very high energy densities are reached in ultra-relativistic collisions of heavy ions. Under these conditions, the confinement in strongly-interacting matter is lifted, and a quark-gluon plasma (QGP) is formed. At the highest temperatures realized in the laboratory, this system offers us the opportunity to study QCD matter under extreme conditions.
The successful heavy-ion program at the LHC provides data of increasing precision. I will illustrate how experimental evidence supports the description of the QGP by fluid dynamics. This has been recently extended to include even rare and penetrating probes such as heavy quarks.
Through this description and making use of neural networks and Bayesian inference, we are able to determine fundamental properties of QCD with increasing precision.
A quick look into the formidable detectors with which we gain this evidence in ALICE will complete the overview.



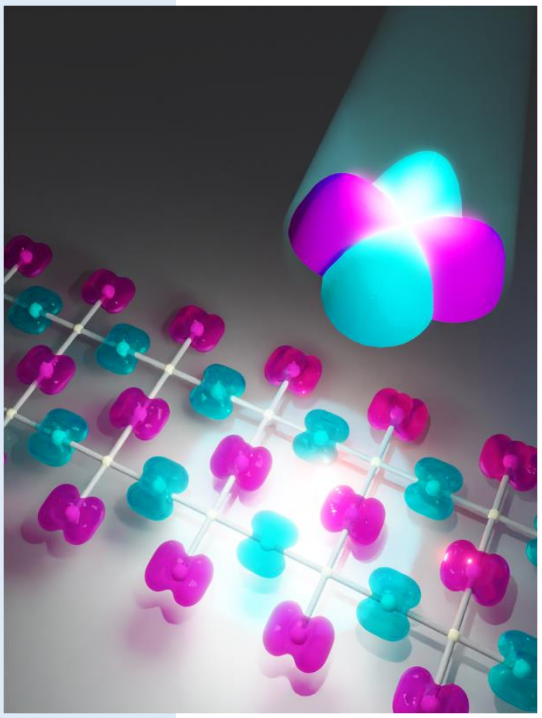
Großes Physikalisches Kolloquium an der Universität zu Köln

Prof. Dr. Jairo Sinova
Johannes Gutenberg University Mainz, Germany

Unconventional magnetism in spintronics: the emergence of altermagnetism and beyond

9.07.2024
16^{30} Uhr
HS III

Antiferromagnetic spintronics has been a very active research area of condensed matter in recent years. As we have learned how to manipulate collinear antiferromagnets actively and their emergent topology by means of new types of spin-orbit torques, a key problem remained: the inefficiency of relativistic mechanism. The necessity of relativistic effects to manipulate and detect Néel order arises from the spin degeneracy of collinear antiferromagnets in the non-relativistic limit – or at least it was thought. The discovery of d-wave magnetic order in momentum space motivated a closer look at the symmetry classification of collinear magnetic systems. This has emerged as the third basic collinear magnetic ordered phase of altermagnetism, which goes beyond ferromagnets and antiferromagnets.



Altermagnets exhibit an unconventional spin-polarized *d/g/i*-wave band structure in reciprocal space, originating from the local sublattice anisotropies in direct space. This gives properties unique to altermagnets (e.g., the spin-splitter effect), while also having ferromagnetic (e.g., polarized currents) and antiferromagnetic (e.g., THz spin dynamics and zero net magnetization) characteristics useful for spintronics device functionalities. I will cover the basic introductory view to altermagnetism and its consequences to spintronics as well as new emerging exchange driven phenomena akin to spin-orbit coupling effects, such as p-wave magnetism, emerging from the basic concepts that gave rise to the discovery of altermagnetism.