Lecturers

- Anton Akhmerov (Delft)
- Lara Benfatto (Roma)
- Premala Chandra (Rutgers)
- Robert Eder (Karlsruhe)
- Laura Greene (Tallahassee)
- Rolf Heid (Karlsruhe)
- Jorge Hirsch (San Diego)
- Markus Holzmann (Grenoble)
- Stefan Kettemann (Bremen)
- Erik Koch (Jülich)
- Andreas Kreisel (København)
- Julian Leonard (Wien)
- Salvatore Manmana (Göttingen)
- Eva Pavarini (Jülich)
- Richard Scalettar (Davis)
- Martin Zirnbauer (Köln)

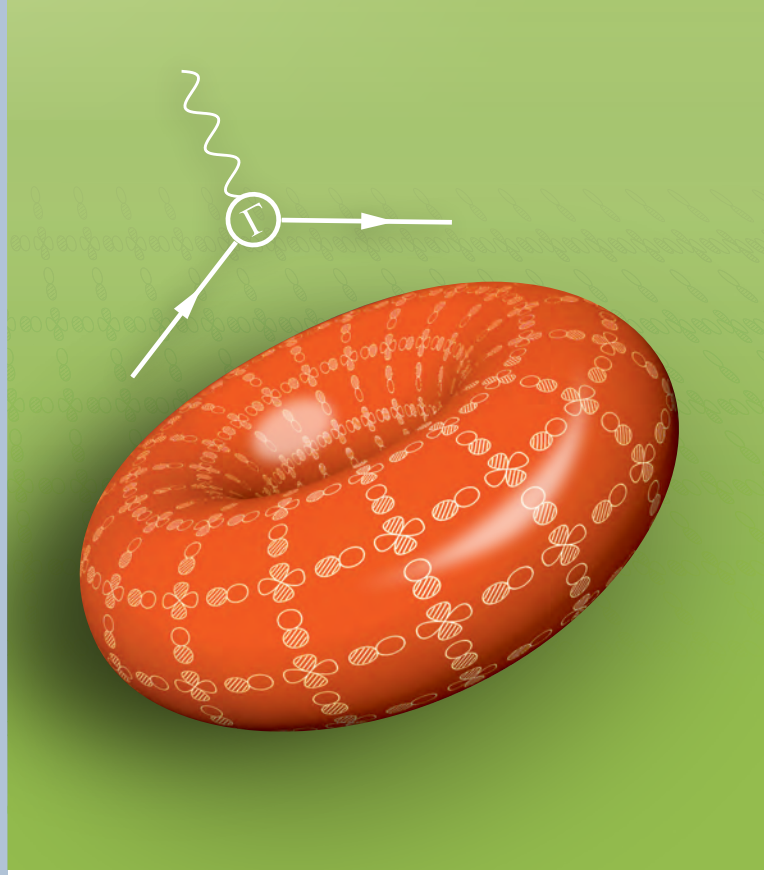
Organizers

Eva Pavarini, Forschungszentrum Jülich

Erik Koch, Forschungszentrum Jülich

Further information

Please refer to **www.cond-mat.de/events/correl24** for updated details of arrangement and final program. For further questions, please write to **correl24@fz-juelich.de**



Autumn School on Correlated Electrons

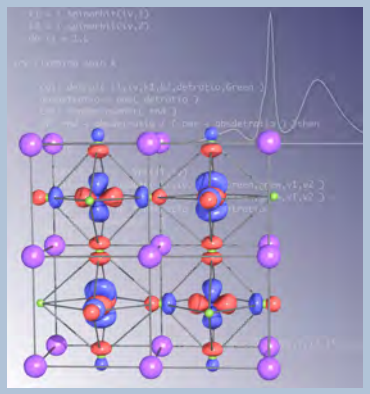
Correlations and Phase Transitions

16 – 20 September 2024

Forschungszentrum Jülich

JÜLICH Forschungszentrum

ICAM-I2CAM Institute for Complex Adaptive Matter



Emergent phenomena are the essence of condensed-matter physics and at the same time what makes the behavior of correlated materials appealing for applications. They are, however, hard to understand at a fundamental level. It is the interplay of several competing interactions – none of which can be treated as a mere perturbation, leading to the emergence of effective interactions – that makes their description a grand challenge. Addressing it requires mastery of a wide spectrum of theoretical concepts, ranging from materials modeling using first-principles approaches to advanced many-body methods based on dynamical mean-fields, stochastic simulations and renormalization techniques. The concepts of symmetry, topological invariance and the classification of transitions between phases are of crucial importance to bring order to the plethora of observed phenomena.

The goal of this year's school is to provide students with an overview of the state-of-the-art in the field of emergent phases in strongly correlated systems and the many techniques used to investigate them. After introducing the fundamental models and concepts, lectures will turn to emergent phenomena, focusing on superconductivity, Kondo behavior, Mott phases, quantum magnetism, and Kosterlitz-Thouless transitions. Experimental lectures will explore phenomena under normal and extreme conditions.

Lectures

Fundamentals

- mean-field theory
- BCS states
- Hubbard models
- dynamical mean-field theory
- quantum Monte Carlo

Concepts

- emergence
- quantum criticality
- Kosterlitz-Thouless transitions
- particle-hole symmetry
- topology

Phases

- Mott insulators
- Kondo systems
- quantum magnetism
- superconductivity
- many-body localization

Materials

- orbital order
- electron-phonon coupling
- unconventional superconductors
- low-dimensional systems
- phases of hydrogen

General Information

Venue: The school will take place at the Forschungszentrum Jülich, in the lecture hall of the Peter Grünberg Institute, from **16 to 20 September 2024**.

Participation: The school is intended for advanced graduate or PhD students and postdocs in the field of electronic structure of materials.

Admission: Interested students should apply before **May 31, 2024** at **www.cond-mat.de/events/correl24**. Accepted applicants will be informed by e-mail shortly after the deadline.

Accommodation: Students can apply for financial support to cover accommodation costs. Participants supported by the school will stay in the Cologne-Deutz Youth Hostel **www.jugendherberge.de/en/youth-hostels/koeln-deutz**. Funding for accommodation is limited.

ICAM Junior Travel Awards: We might be able to provide a limited number of ICAM Junior Travel Awards. For more information see **icam-i2cam.org** and the application form at **www.cond-mat.de/events/correl24**.

Transport: A shuttle bus will be operating in the mornings and evenings between the Youth Hostel in Cologne-Deutz and the Forschungszentrum Jülich.

Hotels in Cologne and Jülich: Participants for whom no low-cost accommodation can be found or who wish to stay in a hotel may find hotels in Cologne or Jülich through the sites and **www.cologne-tourism.com/booking/hotels-accommodation** and **www.juelich.de/hotelsundpensionen**.