Lecturers

- Anna Böhmer (Bochum)
- Annabelle Bohrdt (München)
- Robert Eder (Karlsruhe)
- Benedikt Fauseweh (Dortmund)
- Xavier Gonze (Louvain)
- Markus Grüninger (Köln)
- Erik Koch (Jülich)
- Walter Metzner (Stuttgart)
- Matteo Mitrano (Harvard)
- Michael Norman (Argonne)
- Eva Pavarini (Jülich)
- Cécile Repellin (Grenoble)
- Riccardo Rossi (Lausanne)
- Ulrich Schollwöck (München)
- Carsten Timm (Dresden)
- Luca Tocchio (Troino)

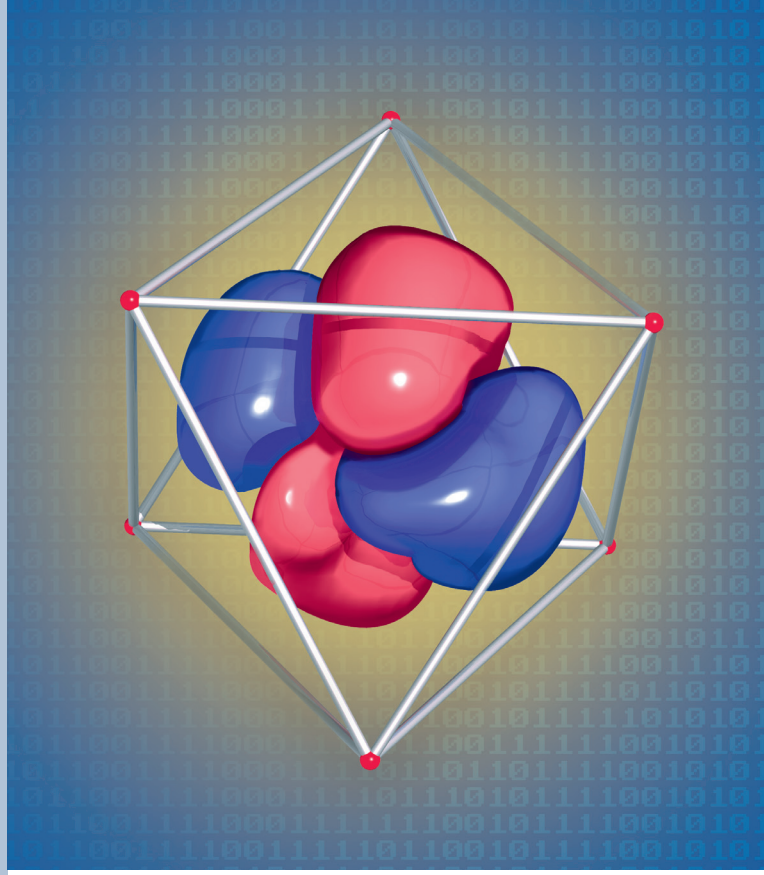
Organizers

Eva Pavarini, Forschungszentrum Jülich

Erik Koch, Forschungszentrum Jülich

Further information

Please refer to **www.cond-mat.de/events/correl26** for updated details of arrangement and final program. For further questions, please write to **correl26@fz-juelich.de**



Autumn School on Correlated Electrons

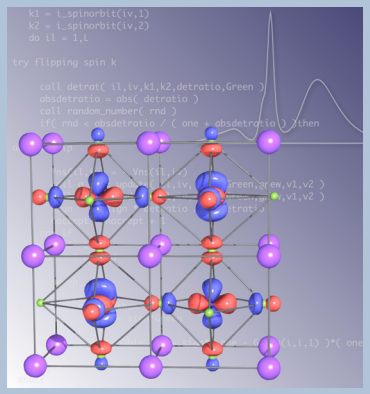
Correlated Materials: Methods and Applications

21 – 25 September 2026

Forschungszentrum Jülich

JÜLICH Forschungszentrum

ICAM-I2CAM Institute for Complex Adaptive Matter



Solving the many-electron problem is the grand challenge of condensed-matter physics. Interacting electrons form emergent co-operative states, whose nature is difficult to unravel. Progress in understanding correlated states requires the combination of complementary approaches, theoretical and experimental, in order to pinpoint the microscopic mechanisms driving the co-operative phenomena characterizing strongly-correlated systems.

The goal of this year's school is to provide students with an overview of modern many-body methods and their application to materials, with an outlook to the future of many-body simulations. The program will introduce the fundamentals: density-functional theory, the many-body problem and emergent phenomena, the Hubbard and Kondo models and their physics. More advanced lectures will introduce many-body methods: static and dynamical mean-field theories, cluster methods, DMRG, tensor networks, as well as methods tailored for quantum computers and neural networks. The lectures will show how the approaches can be used to unravel the mechanism of paradigmatic emergent phenomena in materials: non-conventional superconductivity, Mott phases, orbital ordering, topological phases and quantum spin-liquids. The topics will be treated with a focus on explaining key experiments in a realistic setting and an outlook on questions of materials design.

Lectures

Fundamentals

- density-functional theory
- mean-field theories
- model parameters
- Hubbard model

Methods

- dynamical mean-field theory
- non-local extensions
- self-energy functionals
- diagrammatic Monte Carlo
- density-matrix renormalization group
- Lanczos method

Approaches

- neural network quantum states
- digital quantum computing
- characterization of phase transitions
- Ginzburg-Landau theory

Applications

- Mott transition
- orbital ordering
- topological phases
- quantum spin-liquids
- unconventional superconductivity

General Information

Venue: The school will take place at the Forschungszentrum Jülich, in the lecture hall of the Peter Grünberg Institute, from **21 to 25 September 2026**.

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, 2026** at **www.cond-mat.de/events/correl26**. 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 Aachen Youth Hostel **www.jugendherberge.de/en/youth-hostels/aachen**. 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/correl26**.

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

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