

Lecturers

- Federico Becca (Trieste)
- Xavier Blase (Grenoble)
- Andrea Donarini (Regensburg)
- Robert Eder (Karlsruhe)
- Jim Freericks (Washington)
- Karen Hallberg (Bariloche)
- Erik Koch (Jülich)
- Arne Lüchow (Aachen)
- Gerardo Ortiz (Bloomington)
- Eva Pavarini (Jülich)
- Nikolai Prokof'ev (Amherst)
- Xinguo Ren (Hefei)
- Marcelo Rozenberg (Paris)
- Anders Sandvik (Boston)
- Miles Stoudenmire (New York)
- Cyrus Umrigar (Ithaca)
- Shiwei Zhang (Williamsburg)

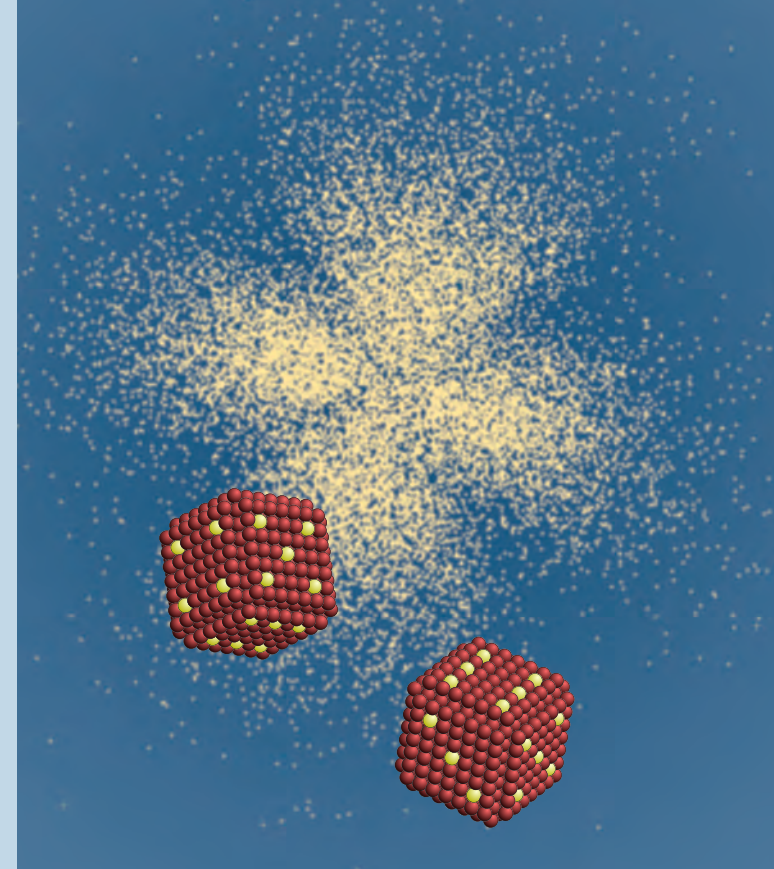


Organizers

Eva Pavarini, Forschungszentrum Jülich
Erik Koch, Forschungszentrum Jülich
Shiwei Zhang, College of William and Mary

Further Information

Please refer to www.cond-mat.de/events/correl19 for updated details of arrangement and final program. For further questions, please write to correl19@fz-juelich.de

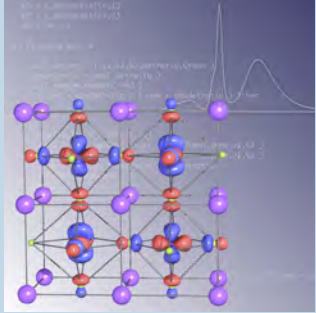


Autumn School on Correlated Electrons

Many-Body Methods for Real Materials

16 – 20 September 2019
Forschungszentrum Jülich





Emergent many-body phenomena are at the core of the exciting properties of strongly correlated materials. Understanding them requires confronting the many-body problem. While, at first, this appears an impossible task, substantial progress has been made by combining physical insights with modern numerical approaches. A successful strategy uses the understanding gained from simple models for the construction of physically motivated wave-functions. Results for the ground state of real materials can then be obtained by optimizing them numerically. Methods for determining spectra are, instead, based on Green functions. A key idea is to map the complex realistic many-body Hamiltonian to a simpler auxiliary model that can be solved numerically.

The goal of this year's school is to provide an overview of the state-of-the-art of these techniques, their successes and limitations. After introducing fundamental models and key concepts, lectures will focus on quantum Monte Carlo for optimizing correlated wave-functions, stochastically sampling series expansions for obtaining Green functions, and renormalization group techniques. Advanced lectures will address approaches to Mott physics, transport phenomena, and out-of-equilibrium dynamics. Applications will cover correlated systems ranging from transition metal compounds and frustrated spin systems to correlated molecules.

Lectures

Concepts

- strong correlations
- paradigmatic models
- Green function, self-energy, Feynman diagrams
- Luttinger-Ward functional

Wave function methods

- variational and diffusion Monte Carlo
- Jastrow and multi-reference wave functions
- BCS, RVB, and Pfaffians
- density matrix renormalization group
- tensor network wave functions

Green function methods

- dynamical mean-field theory
- LDA+DMFT
- sampling series expansions
- linear response functions
- Green functions in and out of equilibrium

Materials

- transition metal compounds
- correlated molecules
- Mott insulators
- heavy fermions
- frustrated systems

General Information

Venue: The school will take place at Forschungszentrum Jülich, in the lecture hall of the Peter Grünberg Institute, from 16 to 20 September 2019.

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, 2019** at www.cond-mat.de/events/correl19. 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.aachen.jugendherberge.de. 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/correl19.

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 Jülich or Aachen through the sites www.aachen-tourist.de and www.juelich.de/hotelsundpensionen.