XIX Training Course in the Physics of Strongly Correlated Systems

International Institute for Advanced Scientific Studies (IIASS)
Vietri sul Mare (Salerno), Italy
5 – 16 October, 2015

First Announcement: General Information

The Training Courses - taking place in the enchanting Amalfi Coast - are aimed at graduate students and PostDoc researchers, and offer the fascinating possibility to meet selected experts belonging to different areas in Condensed Matter Physics. Every year the Training Courses cover hot topics of Condensed Matter Physics offering to the participants a deep overview from different perspectives (theoretical, experimental, phenomenological).
This year the focus will be on *The Iron Age: the Pnictide Superconductors*. "The recent discovery of superconductivity with Tc=26K in doped LaOFeAs has began a wave of research into the iron-based "pnictide" family of superconductors which has quickly pushed the transition temperature to the record of 56K, by replacing La with other RE ion with smaller ionic radius. Interestingly, what has been learned so far about these materials is that they do not resemble conventional superconductors, nor do they operate with the same underlying physics found in the high Tc cuprates".
The Course is open to a limited number (around 30) of young (aged under 35) researchers. The registration fee is €400 (Euro). Lodging and meals (full-board accommodation in the selected Hotel: (Hotel La Lucertola) for the entire duration of the course (13 nights: arrival on Sunday October 4, departure in the morning of Saturday October 17, 2015), will be in the order of €1,200 (Euro). A limited number of grants, covering partially the accommodation, will be assigned to accepted participants, upon request and after a careful screening of CVs and home institution funding capabilities. A limited number of participants will have the opportunity to deliver a seminar which may be published in a volume edited by the European Physical Journal.
In the 2015 edition, young researchers will benefit from training in scientific techniques and various methodologies under the guidance of 4 highly qualified senior researchers:

Dr. Bernd Büchner
Institute for Solid State Research
Helmholtzstraße 20
01171 Dresden, Germany

Dr. Luca de' Medici
European Synchrotron Radiation Facility (ESRF)
Grenoble, France

Prof. Dr. Ilya Eremin
Ruhr-Universität Bochum
Universitätstraße 150
44801 Bochum, Germany

Prof. Dr. Jörg Schmalian
Karlsruher Institut für Technologie
Wolfgang-Gaede-Str. 1
D-76131 Karlsruhe, Germany

Topics:

Dr. Bernd Büchner (12 – 16 October)
Title: Fe based Superconductors: Materials, phase diagrams, and spectroscopy
Plan of the lectures: To be announced

Luca de' Medici (12 – 16 October)
Title: Modeling many-body physics in Fe-superconductors and other multi-orbital materials with the Slave-Spin mean-field: Mott and Hund's physics.
Plan of the lectures:
1) Hubbard models and the slave-spin representation.
2) The slave spins as an essential dynamical mean-field: Mott transitions.
3) Hund's coupling effects on electron correlation and Mott physics. Orbital selectivity.
4) DFT+Slave-spin mean-field: renormalized bandstructures of correlated materials.
5) Electron correlation and Mott and Hund's physics in Fe-superconductors.

Ilya Eremin (5 - 9 October)
Title: Cooper-pairing, magnetic frustration, and spin fluctuations in iron-based superconductors.
Plan of the lectures:
1) One-loop RG approach for the leading instabilities in ferropnictides.
2) Magnetic order: manifold of the ground states, C2 and C4 phases.
3) Spin excitations in the magnetic state within itinerant description: sign of nematic order, magnetic anisotropy of the excitations.
4) SC state: multiband effects beyond simple s+- (nodal structure, role of additional hole pockets with difference orbital structure), role of 'simple' disorder on Tc, quasiparticle interference.

Jörg Schmalian (5 - 9 October)
Title: Nematic order and fluctuations in iron based superconductors
Plan of the lectures:
1) Summary of collective field theories of magnetism, emergent order due to frustration.
2) Emergent Nematic order in iron based systems.
3) Implications for physical observables and comparison with experiment (phase diagrams, elastic constants, NMR, resistivity, etc.).
4) Impact on superconductivity, other scenarios, and other systems with emergent order.

LOGISTIC:

The Training Course is not intended as a series of formal lectures where no real contact develops between lecturers and audience. The idea is to put together, for two weeks, senior and young researchers in a close and informal atmosphere. The course lasts two weeks and sees the participation of two senior researchers per week (Monday to Friday). In the morning, each senior researcher will

deliver a lecture. The afternoon sessions are devoted to training and emphasis will be on introducing young researchers to some specific problems and guiding them through their solution. The participants will be encouraged to present their own activity. The aim is to help young researchers to become more familiar with different approaches and start new collaborations.

SCHEDULE:

(i) Morning session from 9.00 to 13.30: two lectures (two hours each) delivered by two lecturers; (ii) Afternoon session from 15.00 to 18.00: devoted to training (one hour for students' seminars, two hours for lecturers' training session).

LOCATION:

Vietri (from Veteri, its ancient Roman name) sul Mare (on sea) is located within walking distance from Salerno and marks the beginning of the Amalfi Coast. The town is about five minutes drive from Salerno , one hour from Naples Airport and three hours from Rome Fiumicino Airport . Short rides take to Positano, Sorrento, Herculaneum, Pompeii, Paestum, the Vesuvius or to the islands of Capri, Ischia, Procida (by boat).

THE DIRECTOR OF THE COURSE: FERDINANDO MANCINI
THE COORDINATOR OF THE COURSE: ROBERTA CITRO

Local Supporting Staff: Marilena Catapano, Pasquale Marra, Francesco Romeo

APPLICATION FORM (TO BE SUBMITTED NO LATER THAN **JULY 20, 2015**):

APPLICATION FORM AND LOGISTIC INFORMATION ARE AVAILABLE AT:
HTTP://WWW.IIASSVIETRI.IT/IT/HOME-XIX-T-C.HTML

FOR FURTHER INFORMATION PLEASE CONTACT:

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Previous events:

http://www.iiassvietri.it/it/training-course-in-the-physics.html