



Fifth Stig Lundqvist Conference on the Advancing Frontiers of Condensed Matter Physics

11 to 15 July 2011
(ICTP, Miramare, Trieste, Italy)

The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste is organizing the **Fifth Sig Lundqvist Conference on "The Advancing Frontiers of Condensed Matter Physics"**, to take place from 11 to 15 July 2011. This Conference is co-sponsored by the Institute for Complex Adaptive Matter (ICAM-I2CAM),

The *Stig Lundqvist* series of Conferences is a unique forum for the presentation and evaluation of the most recent discoveries in condensed matter science. It has a tradition of providing a venue for the exchange of ideas among scientists who work in different, though related, areas of condensed matter science. The breadth of topics and authoritative line-up of speakers has been a distinctive trait of this series, since its conception in the 1990s. Enabled by a combination of deep theoretical insight and advanced experimental technique, the last several years have witnessed a true breakthrough in our ability to control an important class of quantum mechanical phenomena in condensed matter. Scientists working in this area now enjoy unprecedented access to a new family of quantum effects that seem certain to enhance our ability to harness quantum information.

It is widely appreciated that *topologically ordered states of matter* admit the possibility of encoding information in their entangled collective quasiparticle states. The ensuing nonlocal character is crucial: it makes the encoding fault tolerant, i.e. resistant to local perturbations that could destroy the information. Physical systems that could potentially realize this vision are found in the $5/2$ fractional quantum Hall state, in $px + i py$ superconductors, and at interfaces to a new class of materials called *topological insulators*. Research is now proceeding at a rapid pace on topologically protected states as theorists explore schemes for producing and manipulating entangled states and experimenters test various forms of matter that can provide realizable platforms for these phenomena. Candidate systems for this application are appearing in traditionally disparate areas of condensed matter science: two dimensional semiconductor heterostructures, unconventional superconductors, hybrid spin-orbit coupled materials, and even in cold atom systems.

The program will be designed to provide ample time for **debates and discussions** among the participants. The oral sessions will include keynote presentations and within possibilities, contributed shorter talks, and will incorporate introductions that are accessible to a broad interdisciplinary audience. In addition, we will have **Poster Sessions for Contributed Papers**.

TOPICS

- Entanglement in Topologically Ordered Phases
- Topological Insulators (Theory)
- Topological Insulators (Experiment)
- Quantum Hall States
- Nanoscale Electronics
- Cold Atoms

Some of the aspects covered by the Stig Lundqvist Conference will also be introduced in the **Workshop and School on Topological Aspects of Condensed Matter Physics**, <http://agenda.ictp.it/smr.php?2248>, which precedes the Conference, and will take place at ICTP from 27 June to 8 July 2011.

PARTICIPATION

Scientists and students from all countries that are members of the United Nations, UNESCO or IAEA may attend the activity. As it will be conducted in English, participants must have an adequate working knowledge of this language. Although the main purpose of the Centre is to help researchers from developing countries through a programme of training activities within a framework of international cooperation, a limited number of students and post-doctoral scientists from developed countries are also welcome to attend.

As a rule, travel and subsistence expenses of the participants are borne by their home institutions. However, limited funds are available for some participants, who are nationals of, and working in, a developing country, and who are under 45 years of age. Such support is available only to those attending the entire activity. Every effort should be made by candidates to secure support for their fare (or at least half-fare). There is no registration fee for attending the activity.

HOW TO APPLY FOR PARTICIPATION

The Application Form can be accessed at the activity website: <http://agenda.ictp.it/smr.php?2249>. Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form. Deadline for receipt of applications: **1 MARCH 2011**

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SPEAKERS:

P. COLEMAN (Rutgers)

Xi DAI (Beijing)

S. DAS SARMA (Maryland)

M. FRANZ (U. British Columbia)

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Z. HASAN (Princeton)

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