1 Aoki Group

Subject: Theoretical condensed-matter physics

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Our main interests are many-body effects in electron systems, i.e., superconductivity, magnetism and fractional quantum Hall effect, for which we envisage a materials design for correlated electron systems and novel non-equilibrium phenomena should be realised. Studies in the 2009 academic year include:

- Superconductivity in repulsively interacting electron systems
  - Superconductivity in iron-oxypnictides with a disconnected Fermi surface [1,2]
  - Superconductivity in an aromatic crystal [3]
- Quantum Hall effect and physics of graphene
  - Optica Hall effect in graphene[4]
  - Quantum Hall effect in graphene: Topological aspects[5], edge states, Landau-level laser
  - Photovoltaic Hall effect in graphene[6]
  - Quantum dots in magnetic fields [7]
- Non-equilibrium and nonlinear phenomena in correlated electron systems
  - Landau-Zener tunnelling in the breakdown of Mott’s insulator [8,9]
  - Nonequilibrium steady states of photoexcited correlated electrons[10]
  - Dynamics of superfluid-Mott insulator transition in cold atoms in optical lattices
- Realization of tight-binding photonic bands[12]