Banff International Research Station

for Mathematical Innovation and Discovery

OPEN-PROBLEM STUDY GROUPS

GROWTH AND NANOMECHANICS

Monday 14:30-15:45

The idea is to use these working sessions to explore promising approaches in addressing identified challenges/Open Problems.

Possible subtopics could include:

- Models for nanostructure growth. Knowledge about growth sequence and growth parameters' influence (temperature, concentrations of constituents, growth operating time, ...) on the formation of structure geometry [laboratory control of nanostructure geometry]? Can theory help with better recipes for optimizing this process and what are the major problems? Is there a need (from experimental side) for theoretical assistance in specifying the importance of strain and thermal effects for nanostructure device geometry formation and vice versa? Specify detailed assistance required.
- Linear (e.g., piezoelectric) and nonlinear (e.g., hysteresis, phase transformation, thermomechanical responses, electrostriction) effects.
- Dislocations, nucleation, surface effects, etc ...

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OPEN-PROBLEM STUDY GROUPS

NANODEVICES AND SIMULATION

Tuesday 14:45-15:45

The idea is to use these working sessions to explore promising approaches in addressing identified challenges/Open Problems.

Possible subtopics could include:

- Applications, e.g.,
  - Photonics. For example, in order to obtain, e.g., fast carrier transport and /or optical communication, it is necessary to achieve high efficiency, low level of noise, high operation bandwidth, etc. One issue is effective overlap between electron states of nanostructures, another is bandstructure engineering, tailoring of energy levels.
  - Quantum Computing.
  - Bionano
- Multiscale modeling, continuum, atomistic models, coupled effects in nanostructures.

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OPEN-PROBLEM STUDY GROUPS

NANOPHYSICS AND QUANTUM PHENOMENA

Wednesday 14:00-15:30

The idea is to use these working sessions to explore promising approaches in addressing identified challenges/Open Problems.

Possible subtopics could include:

- Transport phenomena, nonequilibrium physics.
- Coherence/decoherence phenomena.
- Models for coupled quantum dots. Energy levels of N-electron (small N but greater than 2) double quantum dot molecules as a function of magnetic field (with coupling to BOTH Zeeman and orbital degrees of freedom) AND energy offset between the two quantum dots (equivalently an applied electric field between the two dots OR non-identical quantum dot confinement).
- Quantum system identification.