Yubi Chen

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Education

- **University of California, Santa Barbara** — **Santa Barbara (UCSB), CA**
  Ph.D. of Physics, — *September 2019–Now*
  Advisor: Chris G. Van de Walle
  Research topic: investigating electronic structures, atomic geometries of native defects in MgO, BeO, CaO, and β-Ga_2O_3 through first-principles calculations

- **University of Chicago** — **Chicago, IL**
  Master of Science, — *September 2018–June 2019*
  Core courses: machine learning, unsupervised learning and data analysis, graduate quantum mechanics I and II, advanced electrodynamics, graduate statistical physics, and topological quantum matter.

- **University of Oxford** — **Oxford, UK**
  Visiting Student of Physics, — *October 2017–March 2018*
  Core courses: flows and complexity, symmetry and relativity, quantum atomic and molecular physics, subatomic physics, general relativity and cosmology, and condensed matter physics.

- **University of Chinese Academy of Sciences** — **Beijing, China**
  Bachelor of Physics, — *September 2014–June 2018*
  Core courses: Computational Physics, Non-equilibrium Statistical Physics, Group Theory, Quantum Field Theory, Quantum Mechanics, Solid State Physics, and Electrodynamics.

Research Experience

- **First-principles calculations of native defects in MgO, BeO, CaO, and β-Ga_2O_3:** — **UCSB**
  (Oct. 2020–Now) — *Professor Chris G. Van de Walle*
  - Investigate native defect properties of MgO, BeO, CaO, and β-Ga_2O_3 including electronic structures, atomic geometries, and spin states.
  - Employ density functional theory (DFT) calculations using a hybrid functional (HSE) to compute MgO, BeO, and CaO defects.
  - Adopt DFT with on-site coulomb interactions between d and f states using HSE or random phase approximation (RPA) to obtain defects of β-Ga_2O_3.

- **Effective magnetic-phonon interaction:** — **UCSB**
  (Nov. 2019–Aug, 2020) — *Professor Leon Balents*
  - Derived magnetic-elastic interaction from magnetic dipole interaction with distortions.
  - Derived the effective magnetic-phonon interaction by integrating out magnetization from a Berry phase term (magnetization-magnetic-field interaction) and magnetization-elastic interaction.
  - Derived the Hamiltonian of acoustic phonons of an isotropic medium under a magnetic field from first principles, which is not present in current literature.

- **Electron Transport:** — **University of Chicago**
  Master's Project (Nov. 2018–May, 2019) — *Professor Peter Littlewood*

- Obtained the Hall effect for mercury chalcogenide colloidal quantum dot films using ensemble average of electron variable-range-hopping simulation on a 2-d lattice with disorder under a magnetic field.
- Used continuous-time-random-walk algorithm to expedite the simulation with a low hopping probability, which is a great improvement compared to Monte Carlo method.

- **Genome Segmentation and Viral RNA packing:** **Institute of Physics**
  Summer Research (May 2018-Aug. 2018) *Professor Rudolf Podgornik*
  - Simulated a coarse-grained model of icosahedral viruses using molecular dynamics simulations, yielding certain packing motifs of RNA-polymer Lambert-projection distribution.
  - Developed a method to explain RNA distribution motifs and verified this method by its predictions.
  - Extended physical picture of this method to explain new motifs with different characteristics successfully.
  - Quantified those motifs through spherical-harmonic-function projection, with peak positions and peak heights exactly agreeing with the predictions.

- **Construction of Electron Energy Spectrum:** **Institute of High Energy Physics**
  Bachelor's thesis (Mar. 2018-Jun. 2018) *Professor Xiaojun Bi*
  - Compared the effects of different machine learning classification methods, such as direct cut and boost decision tree (BDT) algorithms. Obtained a 99.97% electron-background-removal rate using BDT.
  - Analyzed the influences of partition methods and obtained a good energy-bin partition that can both maintain low errors and obvious spectrum fine structures.
  - Analyzed spectrum peak stability against energy-bin partition being used by Particle Astrophysics Division to get energy spectrum with high accuracy.

Programming Skills

- Proficient: Python, Linux, Mathematica, TeX.
- Intermediate: C, Fortran, Root, Lammps.
- Novice: Visual Molecular Dynamics, Matlab.