

Yongtian Luo

Department of Chemistry, University of Washington
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EDUCATION

Doctor of Philosophy, Chemistry

University of Washington, Seattle, WA, USA

2014 –

Advisor: Assistant Professor Lutz Maibaum

Dissertation: *Theoretical, Computational and Simulation Studies of Lateral Phases on the Surface of a Multicomponent Lipid-Bilayer Vesicle with a Spherical Topology*

Grade point average: 3.85

Bachelor of Science, Physics

University of Science and Technology of China, Hefei, China

2010 – 2014

Advisor: Professor Xiao Zheng

Thesis: *Theoretical Study and Calculation on Key Physical Processes of Artificial Photocatalytic Water Splitting*

Grade point average: 3.54

RESEARCH EXPERIENCE AND SKILLS

Research background

Theoretical application of statistical mechanics in soft matter physics and biophysics, through mathematical modeling, computation and simulation of multicomponent lipid-bilayer membranes.

Computer programming skills

C and python programming languages, Wolfram Mathematica and MATLAB (Octave), Monte Carlo simulation, coarse-grained molecular dynamics simulation in GROMACS, high-performance parallel computing using multi-core processors, L^AT_EX.

PhD research experience

- Developing phenomenological continuous models of multicomponent lipid-bilayer membranes, especially unilamellar lipid vesicles (liposomes) with a 3-dimensional closed surface and a spherical topology, based on an extended Landau-Ginzburg theory which describes their surface compositional lateral phases.
- Coupling the surface compositional distributions of lipid membranes to their shape deformations as described by the Helfrich bending theory, exploring the effects of elastic properties on the surface patterns; developing coarse-grained molecular simulation models of lipid bilayers of symmetric and asymmetric leaflet compositions.
- Computing the thermodynamic properties of lipid vesicles, calculating their structure factors, surface shapes and patterns as well as phase diagrams by performing analytical and numerical computational methods through Fourier and spherical harmonic transforms (in Wolfram Mathematica and python language using NumPy, SciPy, and other packages).

- Simulating and analyzing the phase behaviors of lipid vesicles by running Monte Carlo (in python) and molecular dynamics (in GROMACS) simulations on the university multi-core supercomputer system using parallel computing; making comparisons with experiments by relating these results to small-angle neutron scattering profiles and optical microscopy observations.

Other PhD and undergraduate experience

- Mentoring senior undergraduate students on physical chemistry experiments (including calorimetry, thermodynamics, chemical reaction kinetics and quantum dots), scientific lab report writing, and data analysis using MATLAB (Octave) and basic statistics.
- In undergraduate research, theoretically studying the quantum chemical processes of water splitting in dye-sensitized solar cells by using Gaussian and GaussView.
- Having taken undergraduate courses in C language and computational physics, and graduate courses in introductory scientific computing and machine learning.

PUBLICATIONS

Yongtian Luo and Lutz Maibaum, Phase diagrams of multicomponent lipid vesicles: Effects of finite size and spherical geometry, *Journal of Chemical Physics*, 2018, 149, 174901

Yongtian Luo and Lutz Maibaum, Relating the structure factors of two-dimensional materials in planar and spherical geometries, *Soft Matter*, 2018, 14, 5686-5692

Conference presentations

- Yongtian Luo and Lutz Maibaum, Scattering Signatures of Complex Lipid Membranes: Spherical Vesicles vs. Planar Patches, poster for the 60th Biophysical Society Annual Meeting, Los Angeles, CA, 2016

TEACHING EXPERIENCE

- Teaching assistant, Physical Chemistry Laboratory (CHEM 461), University of Washington, spring and autumn quarters 2015 –
- Teaching assistant, General Chemistry courses (CHEM 120, 142, 152, 162), University of Washington, winter and summer quarters 2015 –

AWARDS

- Graduate Student Merit Fellowship, Department of Chemistry, University of Washington 2019
- Quantum Runfeng Scholarship, University of Science and Technology of China 2012, 2013
- Outstanding Student Scholarship, University of Science and Technology of China 2011, 2012
- Outstanding Freshman Scholarship, University of Science and Technology of China 2010

SERVICES

- Liaison, Cosmos Toastmasters International Club of public speaking and leadership, Seattle, WA
2017 –
- Volunteer, Global Friends Fellowship of internationals, University Presbyterian Church, Seattle,
WA
2016 –
- Volunteer, University of Science and Technology of China Library
2011 – 2014

REFERENCES

Assistant Professor Lutz Maibaum

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