# Xiaojia J. Xu • Curriculum Vitae

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Chinese citizen, Canadian permanent resident

## Research Interests

Biophysics & condensed matter
I am particularly interested in studying **active matter** systems that exhibit emergent phenomena, such as collective behavior and self-organization, e.g. wound healing in Drosophila epithelia and flocking of starlings.

## Education

2015 - 2019 **B.A. in Physics** with Honors, Vanderbilt University (Expected)
- Thesis: "Web-based application of the Cellular Force Inference Toolkit (CellFIT)"
- Thesis advisor: Professor M. Shane Hutson
- Physics GPA: 3.9/4.0
- Minors: Scientific Computing; Earth and Environmental Science.

2011 - 2015 **GCE A-Levels**, Shenzhen College of International Education
- A-Levels in Physics, Mathematics, Biology and Geography

## Publications and Talks

### Journal articles

2018 Daniel Kidd, **Xiaojia Xu**, Cody Covington, Kazuyuki Watanabe, Kalman Varga, "Simulation of laser-induced rectification in a nanoscale vacuum-tube diode", *Journal of Applied Physics* 123, 054501. DOI: 10.1063/1.5019259

### In preparation

2018 **Xiaojia Xu**, Tyler McCleery, Shane Hutson, "Web-based application of the Cellular Force Inference Toolkit (CellFIT)".

### Talks

2019 American Physical Society March Meeting, Boston, *Contributed talk* (Scheduled)
*Web-based application of the Cellular Force Inference Toolkit (CellFIT)*

2018 American Physical Society March Meeting, Los Angeles, *Contributed talk*
*Simulation of Laser-Induced Rectification in a Nano-scale Diode Model*

2017 Vanderbilt Undergraduate Research Fair, *Poster presentation*

2017 Vanderbilt Summer Science Academy 15th Annual Research Symposium, *Poster presentation*

2017 Vanderbilt Physics & Astronomy Summer Symposium, *Oral presentation*

## Research Experiences

July 2018 - now **Biophotonics Lab**, Vanderbilt University.
Advisor: Professor M. Shane Hutson.
• Currently working on a web-based application (front-end and back-end) of the Cellular Force Inference Toolkit (CellFIT) that allows users to access the software from a browser. The updated version would include improved error handling and the implementation of additional functionality for reading and processing image stacks. The goal is to apply the web-based CellFIT to time-resolved image stacks of wound healing in Drosophila epithelia and see the spatial and temporal variations in cellular forces as the wounds close.

Aug - Dec 2017 **Center for Molecular and Atomic Studies at Surfaces**, Vanderbilt University.
Advisor: Professor Norman Tolk.
• I reviewed and evaluated several ab-initio packages to calculate energy defect density dependence of photoelastic coefficients and dielectric tensor in semiconductors. I was trained and assisted with ultrafast pump-probe experiments that were focused on generation and detection of coherent acoustic phonons in GaAs and GaP involving setup alignment, data acquisition and data analysis using Python.

Apr - Aug 2017 **Computational Condensed Matter Physics Group**, Vanderbilt University.
Advisor: Professor Kalman Varga.
• I worked on time-dependent density functional theory simulations in Fortran 90 of a nanoscale vacuum-tube diode. Recent interest in electron photo-emission from metal nanotips, motivated by improved ultrafast laser-guidance of electrons, has inspired research pointing back in the direction of vacuum transport as a path towards achieving such higher speeds. We have computationally demonstrated laser-induced rectification by simulating the effects of increased electron emission due to near-field enhancement within a periodic jellium system with geometrical asymmetry.

Jan 2016 – Apr 2017 **Atmospheric Physics Group**, Vanderbilt University.
Advisor: Professor Ralf Bennartz.
• I learned to develop software using IDL for processing data from a Multi-Angle Snowflake Camera (MASC), which is capable of collecting $\sim 10^3$ image triplets (as there are 3 cameras) during a snowfall event. The goal was to go through the images and create a particle size distribution. I also helped to set up a sun photometer as part of the NASA Aerosol Robotic Network and attempt to gather data on atmospheric chemical composition in the middle Tennessee region.

## Other Academic Experiences

June 2018 Summer School at the Center for the Physics of Biological Functions, Princeton University
• Physics of Life Summer School

June - Aug 2013 Summer College, Stanford University
• Introductory physics sequence with lab (PHYSICS 21S, 23S, 25S)

## Honors, Awards and Funding

**Applied for or results pending:**

2018 Canada Graduate Scholarships, Natural Sciences and Engineering Research Council ($17,500)

**Received:**

2018 Vanderbilt Undergraduate Conference Travel Award ($1000)

2017 Summer undergraduate research funding received from Professor Kalman Varga's National Science Foundation grants OISE 1261117 and PHY 1314463 ($5000)

2015-18 Dean's List, College of Arts and Science, Vanderbilt University
2016-17 Undergraduate research funding received from Professor Ralf Bennartz ($2900)
2012 Bronze Award, United Kingdom Mathematics Trust Senior Mathematical Challenge
2012 Highest score in year, Cambridge IGCSE Geography
2010 $1^{st}$ Place in year, top 5% in the world, University of Waterloo Gauss Mathematics Contest

## Teaching and Tutoring

Aug 2017 - now **Vanderbilt Tutoring Services**
Physics and mathematics tutor
Classes tutored:
• Physics for the Life Sciences (PHYS 1501, 1502)
• General Physics (PHYS 1601, 1602)
• Principles of Physics (PHYS 1911)
• Single-variable and Multivariable Calculus (MATH 1300, 1301, 2300)
• Methods of Linear Algebra (MATH 2410)
• Methods of Ordinary Differential Equations (MATH 2420)

Aug 2017 - Aug 2018 **Department of Physics and Astronomy, Vanderbilt University**
Teaching assistant
Graded exams and held office hours for:
• Physics for the Life Sciences (PHYS 1501, 1502)
• General Physics (PHYS 1601, 1602)

May - Aug 2018 Varsity Tutors
Calculus and programming tutor

Jan - Apr 2016 Vanderbilt Student Volunteers for Science
7th grade geology teacher

## Skills

• Proficiency in Python, Bash and LaTeX. Familiarity with Fortran 90, C, Java, HTML, MATLAB, IDL, Mathematica.
• Familiarity with parallel computing APIs: OpenMP, MPI, CUDA.
• Experience with computing clusters (e.g. ACCRE, UNIX cluster environment).
• Experience with setting up high-speed cameras, sun photometers and ultrafast pump-probe experiments.
• Languages: Fluency in English and Mandarin Chinese; elementary proficiency in Canadian French.

## Sports

2017 - now Vanderbilt Climbing Club
• Captain of the Vanderbilt Climbing Team competing in USA Climbing Collegiate Series.
• Founder and president of the club sport (under Vanderbilt Athletics).

2015 - 2016 Shenzhen Longboard downhill skateboarding team rider
• 4th place at the 2016 Sanzhoutian Cup (biggest race in Southern China at the time)

2011-2015 SCIE (high school)
• Varsity soccer team captain

## Standardized Scores

2018 **GRE General and Subject**
Verbal: 162/170 (91st percentile)
Quantitative: 166/170 (91st percentile)
Analytical writing: 5.0/6.0 (92nd percentile)

2014 **SAT General and Subject**
Critical reading: 750/800 (98th percentile)
Mathematics: 800/800 (99th percentile)
Physics: 800/800 (89th percentile)

## Employment

June 2016 – now Vanderbilt Outdoor Recreation Center
• Climbing wall staff • Equipment specialist • Trip coordinator

## Societies

• American Physical Society, undergraduate member
• Sigma Pi Sigma Physics Honor Society, Vanderbilt Chapter, member
• Vanderbilt Society of Physics Students, Webmaster

## Community Service

2018 American Physical Society Office of Government Affairs
I contributed to an advocacy initiative, which concerns the PROSPER Act, by asking the Senate not to include a new loan structure that would increase student loan debt in its version of the bill.

2016-2017 Alpha Phi Omega National Service Fraternity, Vanderbilt Chapter member
I engaged in weekly service activities for the local and national communities, including, but not limited to: Nashville Rescue Mission, Nashville Humane Association and Second Harvest Food Bank.

2016 Vanderbilt Alternative Spring Break (ASB) service trip participant
With a group of Vanderbilt students, I volunteered at Challenge Enterprises, a facility that provides opportunities for individuals with disabilities.

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http://xj-xu.github.io