

UNIVERSITY
OF
CALIFORNIA
MERCED



PHYSICS PHD PROGRAM OVERVIEW, FALL 2023

University of California, Merced



Prof. David Strubbe (Physics Graduate Program Chair)
Prof. Kevin Mitchell (Physics Graduate Admission Chair)

<http://physics.ucmerced.edu/>

Where We Are



Founded 2005
10th campus of the University of California
First US research university of the 21st century
City of Merced population about 80,000
Just finished "2020 Project,"
doubling size of campus



Nearby universities and labs:
Stanford
UC Berkeley
UC Davis
UC Santa Cruz
UC Lick Observatory
Lawrence Livermore Lab
Lawrence Berkeley Lab
NASA Ames Research Center

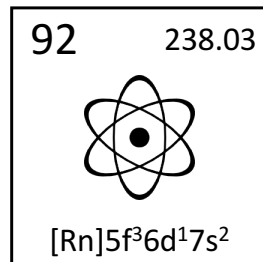
Who We Are

- 20 faculty members (7 women)
- 16 affiliated faculty in other departments
- Around 60 graduate students (1/4 women) from the Central Valley, San Francisco Bay Area, Southern California, Ohio, Maryland, Iran, India, Nepal, Switzerland, Philippines, Nigeria, Cuba, Bangladesh ...
- Around 65 undergraduate physics majors
- 9100 undergraduates (55% Hispanic, 75% first-generation)



UNIVERSITY OF CALIFORNIA
MERCED

Physik
 भौतिक शास्त्र
 physics fizik
 física físisi
 فیزیک
 طبیعیات پদার্থবিজ্ঞان
 物理学 φυσική
 liknayan



$$\sqrt{\frac{E}{m} \quad \frac{F}{a}}$$



Physics Research Areas

<http://physics.ucmerced.edu/research1>



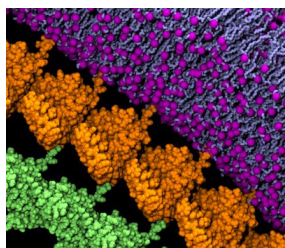
Atomic, Molecular, and Optical Physics

Experiment

Sayantani Ghosh
Michael Scheibner
Jay Sharping
Jing Xu
Roland Winston (emeritus)

Theory

Chih-Chun Chien
Kevin Mitchell
Lin Tian



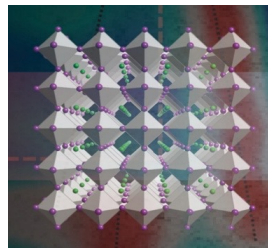
Biophysics and Soft Matter

Experiment

Linda Hirst
Dustin Kleckner
Bin Liu
Jay Sharping
Jing Xu

Theory

Kinjal Dasbiswas
Ajay Gopinathan



Condensed Matter and Solar Energy

Experiment

Hui Cai
Sayantani Ghosh
Linda Hirst
Michael Scheibner
Ray Chiao (emeritus)
Roland Winston (emeritus)

Theory

Chih-Chun Chien
David Strubbe
Lin Tian



Astrophysics and Astronomy

Observation

Anna Nierenberg
Gillian Wilson

Theory

Sarah Loebman

Other affiliated faculty

Mechanical Engineering

Venkatraman Ayyaswamy: plasma physics
Mehmet Baykara: tribology and surface science

Chemistry and Chemical Biology

Mike Colvin: biomolecular simulation
Hrant Hratchian: electronic structure
Henrik Larsson: computational chemistry
Aurora Pribram-Jones: electronic structure
Tao Ye: bio/nano interfaces

Bioengineering

Arvind Gopinath: biophysics
Victor Muñoz: biophysics
Anand Subramaniam: biophysics

Applied Mathematics

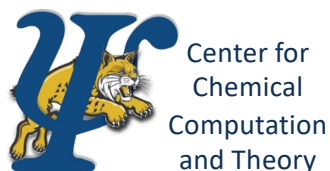
Shilpa Khatri: fluid dynamics
Tomas Rube: computational biology

Materials Science and Engineering

Sarah Kurtz: solar energy
Jennifer Lu: material synthesis
Elizabeth Nowadnick: condensed matter theory

Lawrence Livermore National Laboratory

Alex Noy: biomaterials



Application process

- > **PRIORITY DEADLINE:** December 15, 2023 (*applications will receive priority review*)
 - > **GENERAL DEADLINE:** January 15, 2024 (*later applications will be reviewed on a rolling basis if space available*)
- Notifications in January or February, sometimes March.*

- Required: bachelors or masters degree in physics or a closely related field
- The general GRE and physics GRE scores are not required and not expected. Applicants may choose to submit their scores if they wish.
- Transcripts from college, masters, community college. GPA > 3.0 on US scale (we will convert, by e.g. WES)
- 3 letters of recommendation from research supervisors, professors, etc.
- CV, statement of purpose (scientific interests, future plans, previous research), personal statement (how you got interested)
- TOEFL or IELTS exam scores for foreign applicants (unless attended English-speaking institution)
- Other work can be optionally submitted: *e.g.* masters thesis, research papers published
- Application is to the program, not specific faculty, but contacting faculty of interest is encouraged
- Application fee waivers: request to Prof. Kevin Mitchell, or automatically for students who have participated in certain programs such as Cal-Bridge, UC LEADS, or SACNAS
- **Please read and follow info on our webpage:** <https://physics.ucmerced.edu/academics/graduate-studies>

Graduate courses

A. Core Course Requirements: To be completed within the first four semesters.

- PHYS 202, Foundations of Physics
- PHYS 237, Quantum Mechanics I
- PHYS 210, Electrodynamics
- PHYS 212, Statistical Mechanics
- PHYS 205, Classical Mechanics
- May be waived if you have taken comparable graduate courses elsewhere.

C. Other Classes:

- PHYS 251, Introduction to Graduate Research
- QSB 294, Responsible Conduct of Research
- PHYS 293 (4 semesters), Physics Colloquium

Graduate elective courses

B. Electives: To be completed at any time

1. An elective from the physics courses
 2. A second elective, from physics or any other science or engineering graduate course
- PHYS 204, Biophysics
 - PHYS 209, Soft Matter Physics
 - PHYS 211, Electrodynamics and Optics II
 - PHYS 227, Machine Learning and Statistics for Physics and Astronomy
 - PHYS 230, Computation and Modeling for Interdisciplinary Biophysical Sciences, Biomaterials and Biotechnology
 - PHYS 231, Imaging and Spectroscopy for Interdisciplinary Biophysical Sciences, Biomaterials and Biotechnology
 - PHYS 232, Bio and Nano Fabrication for Interdisciplinary Biophysical Sciences, Biomaterials and Biotechnology
 - PHYS 239, Nano-Fabrication for Interdisciplinary Materials Sciences
 - PHYS 241, Condensed Matter Physics
 - PHYS 242, Advanced Condensed Matter Physics
 - PHYS 244, Modern Atomic, Molecular, and Optical Physics
 - PHYS 248, Quantum Optics
 - PHYS 274, Advanced Quantum Computing
 - PHYS 280, Nonlinear Dynamics
 - PHYS 281, Computational Physics
 - PHYS 292, Special Topics in Physics (e.g. Solar Cells and Devices; Scientific Writing)

Degree requirements

A. PHYS 202, Foundations of Physics

- Review of undergraduate knowledge of physics
- 3 parts: classical mechanics, electricity and magnetism, quantum mechanics
- Offered in the fall semester and required for all incoming graduate students.
- Opt-out exam in the beginning to waive the requirement. May also take the corresponding undergraduate courses to fulfill the requirement.

B. Qualifying examination (“qual”)

- Write a proposal summarizing research so far and giving plan for PhD thesis
- Present research and plan to committee of 3 or more faculty members
- Do “pre-qual” meeting one month before, to get feedback from faculty
- Answer oral questions about your subfield of physics and about your research and plan
- Advance to candidacy before the end of the 3rd year
- Passing lets you apply for the “masters along the way” degree

What to expect in the first semester

A. RESEARCH

- **Rotation:** Not required to select advisor right away

We will assign you to an initial research advisor based on your preferences

Introduction to Graduate Research seminar class to learn about faculty research areas

B. TEACHING ASSISTANTSHIP

- **Lead** undergraduate discussion or labs for intro classes, sometimes upper-division

We offer TA training sessions during orientation week

C. MENTORING

- **Peer mentor:** everyone is assigned a mentor from among the current graduate students
- **Faculty mentor:** 'rotation' faculty serve as mentors until you find a permanent advisor

D. SUMMER BEFORE YOU START

- **Optional Summer Bridge program:** domestic students can participate. Stipend, professional development, getting started exploring research with a faculty member.
- Other students can contact potential advisors about getting started on research early.

Typical PhD timeline

A. YEAR 1

- Pass PHYS 202 for undergraduate review
- Take core classes
- TA
- Explore research topics and decide on PhD advisor by end of Year 1

B. YEAR 2

- Begin research
- Form thesis committee
- Take elective classes

C. YEAR 3

- Focus primarily on research
- Advance to candidacy (qualifying exam)

D. YEAR 4 - YEAR 5 or YEAR 6

- Research
- Internships (e.g. at national labs)
- Write thesis

BENCHMARKS EXPECTED

- Publishing research articles
- Presenting at conferences
- Mentoring undergraduate students

Funding support

TEACHING ASSISTANTSHIP (TA)

GRADUATE STUDENT RESEARCHER (GSR)

- Grant funding (NSF, NASA, Dept of Energy, etc.)

CENTER/RESEARCH FELLOWSHIPS

- CCBM fellowships
- Internal fellowships from Graduate Division
- NSF Research Trainee fellowships (*e.g.* CONDESA)
- NIH G-RISE fellowship (biophysics)
- Summer fellowships through physics graduate group
- Travel funding through physics graduate group and centers

All admitted students receive 5-year funding guarantee (typical time to PhD)

Stipend around \$36,000 per year

Tuition and fees paid for

Source: livingwage.mit.edu; 2023

| | Merced | Berkeley (Alameda) | Davis (Yolo) | Los Angeles | Irvine (Orange) | Riverside | Santa Barbara | Santa Cruz | San Diego |
|-----------------------------------|---------|--------------------|--------------|-------------|-----------------|-----------|---------------|------------|-----------|
| Living Wage (per hour) | \$16.55 | \$22.35 | \$19.96 | \$21.53 | \$23.66 | \$18.66 | \$24.49 | \$26.01 | \$22.31 |
| Cost of Housing (per year) | \$9,192 | \$18,947 | \$14,931 | \$17,568 | \$21,140 | \$12,744 | \$22,500 | \$25,020 | \$18,876 |

Merced's cost of living much less than some parts of California: most affordable in the UC

Where are our alumni? Some examples

Postdoctoral research:

Caltech, Stanford, Brandeis, Princeton, UC Merced

Lawrence Berkeley, Lawrence Livermore, Sandia National Laboratory, Jefferson Lab

Industry:

Bosch, Apple, Intel, KLA Tencor, DigiLens Inc., Lumentum, ATT Government Solutions, Sberbank, HSBC

Faculty positions:

California State Polytechnic University, Humboldt

Merced College, Fresno City College (community colleges)

Southern University of Science and Technology, China

Mills College

Benedictine College

Government:

Defense Threat Reduction Agency, California Department of Food and Agriculture

<https://physics.ucmerced.edu/alumni-graduate>

Learn more

[video](#)

[brochure](#)

[flyer](#)

[website](#)

[AIP GradSchoolShopper](#)

Contact faculty of interest: ask about whether they are taking new students, current projects, fit of your research interests and background with the work in their lab, etc.

For application questions: contact Prof. Kevin Mitchell: kmitchell@ucmerced.edu or UC Merced Graduate Admissions: gradadmissions@ucmerced.edu

Take a virtual tour of campus: <https://admissions.ucmerced.edu/visit-us/virtual-tour>