UNIVERSITY
OF
CALIFORNIA
MERCED

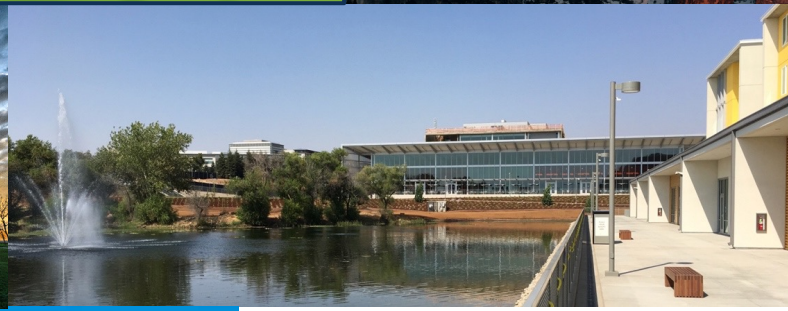
PHYSICS PHD PROGRAM OVERVIEW, FALL 2024

University of California, Merced

Prof. David Strubbe (Physics Graduate Program Chair)
Prof. Chih-Chun Chien (Physics Graduate Admission Chair)

http://physics.ucmerced.edu/

Where We Are

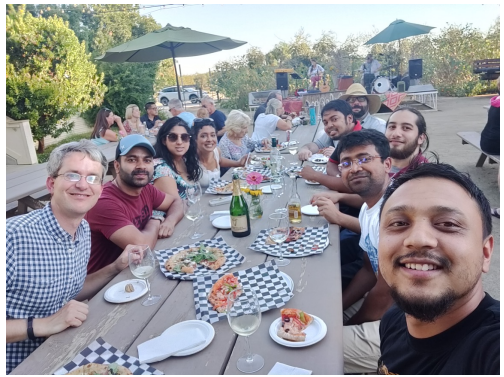


Founded 2005
10th campus of the University of California
First US research university of the 21st century
City of Merced population about 80,000
Just finished "2020 Project,"
doubling size of campus

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 فیزیک físísì طبیعیات পদার্থবিজ্ঞান 物理学 φυσική liknayan හෞතික විද්‍යාව ഭൗതിക ശാസ്ത്രം

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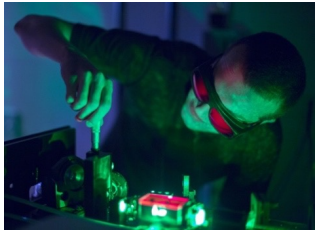
Physics Research Areas

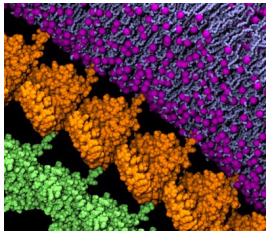
http://physics.ucmerced.edu/research1



Atomic, Molecular, and Optical Physics

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

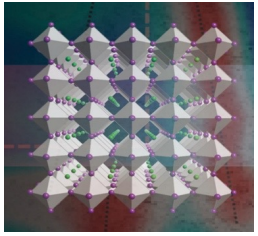
Theory
Chih-Chun Chien
Kevin Mitchell
Lin Tian



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
Venkattraman Ayyaswamy: plasma physics
Mehmet Baykara: atomic force microscopy, surface physics

Chemistry and Biochemistry
Mike Colvin: biomolecular simulation
Hrant Hratchian: electronic structure
Henrik Larsson: theoretical chemistry and AMO physics
Aurora Pribram-Jones: electronic structure
Tao Ye: bio/nano interfaces

Bioengineering
Arvind Gopinath: biophysics
Victor Muñoz: biophysics
Anand Bala Subramaniam: soft matter

Applied Mathematics
Shilpa Khatri: fluid dynamics
Tomas Rube: computational biology

Materials Science and Engineering
Jennifer Lu: material synthesis
Elizabeth Nowadnick: condensed matter theory

Lawrence Livermore National Laboratory
Alex Noy: biomaterials

CCBM
NSF-CREST
CENTER FOR CELLULAR AND BIOMOLECULAR MACHINES

Center for Chemical Computation and Theory

IMOD

VISION: NSF Partnership for Research and Education in Materials (PREM), with IMOD/Univ of Washington

Application criteria

- We are looking for students who show excellence in their coursework, potential for future research accomplishments (generally shown through previous research experiences), developed research interests, a strong motivation for graduate study, a record of working hard and overcoming obstacles, and a good fit with UC Merced faculty research.
- Degree choice: students are *rarely* admitted to pursue an MS degree. The MS degree is NOT an easier way to get into the graduate program. If you want to do a PhD, apply for the PhD.
- Coursework: bachelors or masters degree in physics or a closely related field. Essential to have taken these courses at a level beyond the first year, or will take them in spring 2025:
  - classical mechanics
  - electricity and magnetism
  - quantum mechanics
  - thermodynamics/statistical mechanics.

  Exceptions will be made rarely. Most non-physics majors will not have sufficient background.
- Research: Show understanding, interest, and accomplishments. Doesn't necessarily have to be in the same subfield that you are interested in pursuing in your PhD.

Application process

> **PRIORITY DEADLINE:** December 15, 2024 *(applications will receive priority review)*
> **GENERAL DEADLINE:** January 15, 2025 *(later applications will be reviewed on a rolling basis if space available)*
Notifications in January or February, sometimes March or April.

- 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, and definitely list faculty of interest), 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. Chih-Chun Chien (cchien5@ucmerced.edu), or automatically for domestic 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

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 234, Frontiers of Molecular and Cellular Biotechnology
- PHYS 238, Quantum Mechanics II
- 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 265, Solar Cells, Modules, and Systems
- PHYS 272, Quantum Information Science
- PHYS 274, Advanced Quantum Computing
- PHYS 280, Nonlinear Dynamics
- PHYS 281, Computational Physics
- PHYS 292, Special Topics in Physics (e.g. Scientific Writing)
- UC Santa Cruz classes taken remotely: Astrophysics I, Astrophysics II, Stars and Planets, etc.

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.
- Grading is completion-based, straightforward to pass.
- 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
- Sometimes 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 (National Science Foundation, NASA, Department of Energy, National Institutes of Health, University of California Office of the President, Department of Defense, etc.)

CENTER/RESEARCH FELLOWSHIPS

- CCBM fellowships
- Internal fellowships from Graduate Division
- NSF Research Trainee fellowships
- 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's cost of living much less than some parts of California: most affordable in the UC

	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

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, Chicago Stock Exchange

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

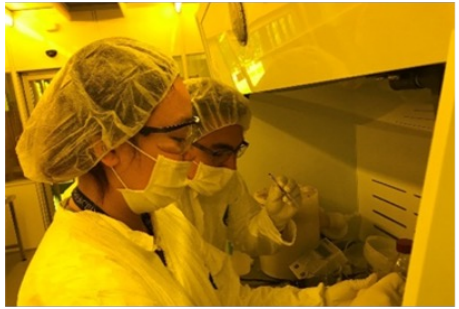
CCBM
NSF-CREST
CENTER FOR CELLULAR AND BIOMOLECULAR MACHINES

Interdisciplinary NSF biophysics center

THRUST 1: PROTEIN METAMORPHOSIS AND RESPONSIVE NANODEVICES

THRUST 2: ADAPTIVE AND RESPONSIVE MESOSCALE ASSEMBLIES

THRUST 3: ADAPTIVE CELLULAR COMMUNICATION



- interdisciplinary graduate training emphasis in Interdisciplinary Biophysical Sciences, Biomaterials and Biotechnology (IB3)
- training modules in nanobiofabrication, imaging and spectroscopy, and computation and modeling
- networking and professional development opportunities, center meetings and events, career skills workshops
- entrepreneurship and K-12 school outreach opportunities generous academic year and summer stipends, travel fellowships and more

Departments: physics, bioengineering, chemistry, mechanical engineering, materials science, applied mathematics, molecular and cellular biology

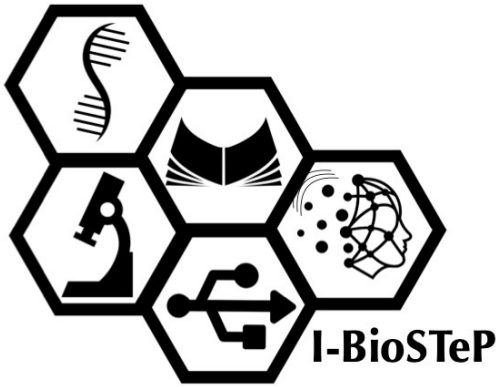
Co-Directors: Ajay Gopinathan and Victor Muñoz

Other physics faculty: Colvin, Dasbiswas, Ghosh, Gopinath, Hirst, Liu, Mitchell, Rube, Subramanian, Ye

G-RISE I-BioSTeP

INTERDISCIPLINARY BIOMEDICAL SCIENCE AND TECHNOLOGY PROGRAM: GRADUATE FELLOWSHIPS

NIH National Institutes of Health
Turning Discovery Into Health



- Applied Mathematics (AM)
- Bioengineering (BIOE)
- Chemistry and Biochemistry (CBC)
- Materials and Biomaterials Science and Engineering (MBSE)
- Physics (PHYS)
- Quantitative Systems Biology (QSB)

Courses and hands-on modules
Professional development workshops
Two years of tuition and stipend
Travel support for conferences

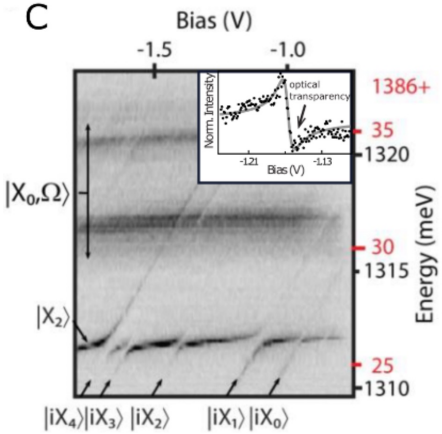
Apply at the time of application to PhD programs
Director: Prof. Ajay Gopinathan, physics

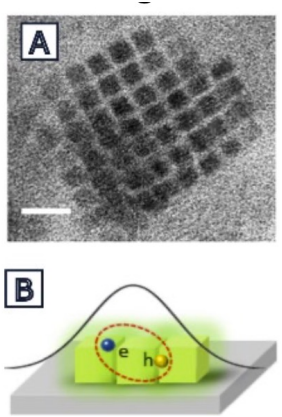
Research: computational biology and biophysics, biomolecular science and engineering

VISION: Venture for Innovation in Self-assembly and Integration of Optoelectronic Nanostructures

NSF Partnership for Research and Education in Materials (PREM)

IMOD





Tao Ye, Hui Cai, Sayantani Ghosh, Michael Scheibner (PI),
Mehmet Baykara, Beth Nowadnick, David Strubbe, Chih-Chun Chien

NSF Science and Technology Center for Integration of Modern Optoelectronic Materials on Demand (IMOD), centered at the University of Washington

Research on nano-assemblies of colloidal quantum dots for quantum light generation and light manipulation

- Graduate fellowships to fund research
- Professional development
- Collaboration with IMOD partners

https://sites.ucmerced.edu/vision-prem

Resources

- Overview of UC Merced physics graduate program: https://physics.ucmerced.edu/graduate-studies
- Detailed information on UC Merced physics application requirements and process: https://physics.ucmerced.edu/academics/graduate-studies/apply-graduate-program
- General advice on applying to grad school in physics from David Wittman at UC Davis: https://wittman.physics.ucdavis.edu/gradadvice.html

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.
- Check out recorded colloquium videos from David Strubbe, Bin Liu, Beth Nowadnick, Tomas Rube, Hui Cai, Anna Nierenberg, Sarah Loebman, Chih-Chun Chien, and others: https://physics.ucmerced.edu/events/previous-physics-colloquia
- For application questions – contact Prof. Chih-Chun Chien: cchien5@ucmerced.edu or UC Merced Graduate Admissions: grad@ucmerced.edu
- Take a virtual tour of campus: https://admissions.ucmerced.edu/visit-us/virtual-tour

- Ask some questions now!