

UNIVERSITY  
OF  
CALIFORNIA  
MERCED



# PHYSICS PHD PROGRAM

## *University of California, Merced*



*Profs. Chih-Chun Chien (graduate program chair), Linda Hirst (admissions chair), David Strubbe (admissions vice-chair), Anna Nierenberg and Hui Cai (admissions committee members)*

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

# Where We Are



**UCMERCED**

Founded 2005  
10<sup>th</sup> 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



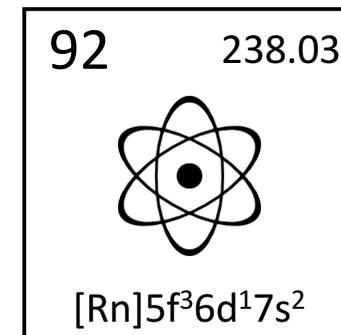
*Nearby universities and labs:*  
Stanford  
UC Berkeley  
UC Davis  
UC Santa Cruz  
UC Lick Observatory  
Lawrence Livermore Lab  
Lawrence Berkeley Lab  
NASA Ames Research Center

# Who We Are

- 21 faculty members (7 women)
- 13 affiliated faculty in other departments
- 61 graduate students (16 women) from the Central Valley, San Francisco Bay Area, Southern California, Ohio, Maryland, Iran, India, Nepal, Switzerland, Philippines ...
- 50 undergraduate physics majors
- 9000 undergraduates (55% Hispanic, 75% first-generation)



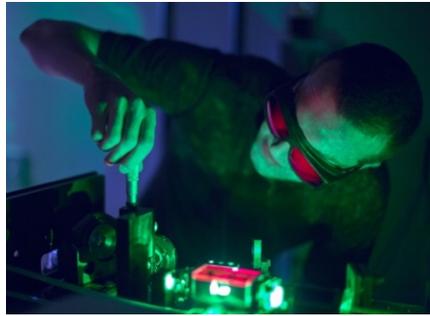
UNIVERSITY OF CALIFORNIA  
**MERCED**  
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 physics fizik  
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 فیزیک  
 পদার্থবিজ্ঞান  
 物理学 φυσική  
 liknayan



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

# Physics Research Areas and Centers

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



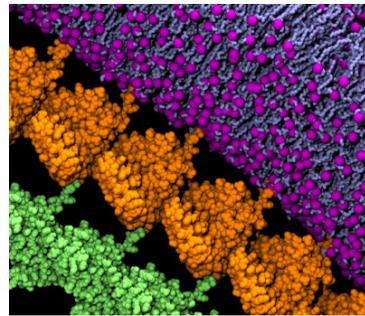
## Atomic, Molecular, and Optical Physics

*Experiment*

Sayantani Ghosh  
Michael Scheibner  
Jay Sharping  
Roland Winston  
Jing Xu

*Theory*

Chih-Chun Chien  
Kevin Mitchell  
Lin Tian



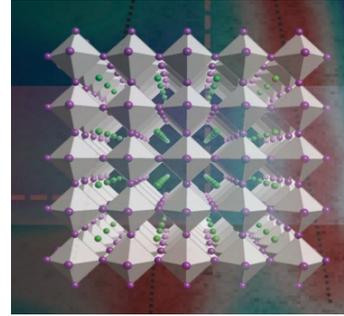
## Biophysics and Soft Matter

*Experiment*

Linda Hirst  
Dustin Kleckner  
Bin Liu  
Jay Sharping  
Jing Xu

*Theory*

Daniel Beller  
Kinjal Dasbiswas  
Ajay Gopinathan



## Condensed Matter and Solar Energy

*Experiment*

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

*Theory*

Chih-Chun Chien  
David Strubbe  
Lin Tian



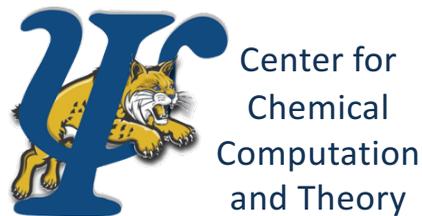
## Astrophysics and Astronomy

*Observation*

Anna Nierenberg

*Theory*

Sarah Loebman



Center for  
Chemical  
Computation  
and Theory



CCBM  
NSF-CREST  
CENTER FOR CELLULAR AND  
BIOMOLECULAR MACHINES



MACES  
MERCED NANOMATERIALS CENTER FOR ENERGY AND SENSING



University of California  
Advanced Solar  
Technologies Institute

## Other affiliated faculty

### Mechanical Engineering

Venkatraman Ayyaswamy:

plasma physics

Mehmet Z. Baykara: tribology and  
surface science

### Chemistry and Chemical Biology

Mike Colvin: biomolecular  
simulation

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

### Materials and Biomaterials

#### Science and Engineering

Sarah Kurtz: solar energy

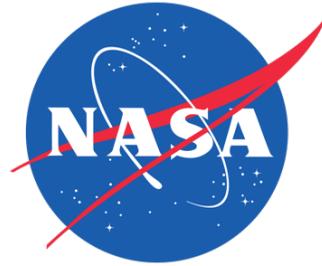
Jennifer Lu: material synthesis

Elizabeth Nowadnick: condensed  
matter theory

### Lawrence Livermore Nat'l Lab

Alex Noy: biomaterials

# Merced nAnomaterials Center for Energy and Sensing (MACES)



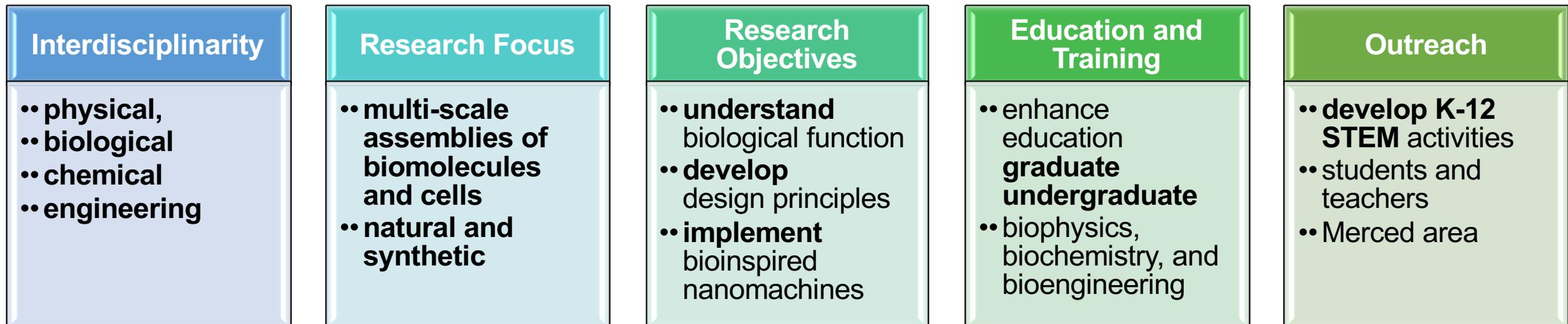
<http://maces.ucmerced.edu>

- NASA-funded center for interdisciplinary research and education
- Involves physics, chemistry, applied mathematics, and materials and mechanical engineering
- Research topics for space technology include: photovoltaics, fuel cells, surface science, biosensors

## Benefits for graduate students:

- Fellowships and research/travel funding
- Internships at NASA research centers
- Collaborations with NASA and UC Santa Cruz
- Field trips, training, and outreach events
- Networking opportunities with NASA and industry





Dr. Victor Muñoz, Bioengineering, PI/Co-Director  
Dr. Ajay Gopinathan, Physics, Co-PI/Co-Director  
Dr. Sayantani Ghosh, Physics, Co-PI  
Dr. Kara McCloskey, MBSE, Co-PI

This work is supported by funding from the National Science Foundation: NSF-CREST: Center for Cellular and Biomolecular Machines (CCBM) at the University of California, Merced (NSF-HRD-1547848).

# Application process

Apply online at **graduatedivision.ucmerced.edu**.

> **PRIORITY DEADLINE:** December 15, 2020 (*applications will receive priority review*)

> **GENERAL DEADLINE:** January 15, 2021 (*later applications will be reviewed on a rolling basis if space available*)

- 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
- 3 letters of recommendation from research supervisors, professors, etc.
- CV, statement of purpose (scientific interests, future plans), personal statement (how you got interested)
- TOEFL or IELTS 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. Linda Hirst, or automatically for students who have participated in certain programs such as Cal-Bridge, UC LEADS, or SACNAS
- Read and follow info on our webpage: <https://physics.ucmerced.edu/academics/graduate-studies>

# Graduate Learning Outcomes

- 1. Strong Foundations:** Possess a broad foundation in the fundamentals of physics and a deep understanding of your chosen subfield.
- 2. Develop skillsets:** Learn experimental, theoretical, and/or computational skills necessary to conduct and lead independent responsible research and contribute to knowledge in your chosen subfield.
- 3. Novel research:** Identify new research opportunities, which may cross traditional discipline boundaries, plan effective strategies for pursuing these opportunities and conduct research that makes a new contribution to knowledge and solves important problems in society.
- 4. Communication:** Be able to articulate both fundamental concepts of physics and details of your own research effectively, in written and oral form, to expert and non-expert audiences. This includes the publication of original research results in peer-reviewed scientific journals.

# Graduate courses

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

- 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.

## B. Electives: To be completed at any time

- An elective from the physics courses: condensed matter physics (introductory or advanced), biophysics, soft matter physics, nonlinear dynamics, computational physics, computation and modeling in the biosciences, quantum information science
- A second elective which may be chosen from any graduate level course in the School of Natural Sciences or Engineering (outside primary research area)

## C. Other:

- Introduction to Graduate Research
- Responsible Conduct of Research
- 4 semesters of Physics Seminar

# Degree requirements

## A. Preliminary examinations (“prelims”)

- Written test of undergraduate knowledge of physics
- 3 parts: classical mechanics, electricity and magnetism, quantum mechanics
- Offered at the beginning of each semester, strongly recommended to take right when you arrive
- Pass all 3 parts before the start of the 3<sup>rd</sup> year

## 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
- Answer oral questions about your subfield of physics and about your research and plan
- Advance to candidacy before the end of the 3<sup>rd</sup> year

# What to expect in the first semester

## A. RESEARCH

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

We will assign you to research advisors based on your preferences

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

## B. TEACHING ASSISTANTSHIP

- **Lead** undergraduate discussion OR labs

We offer TA training sessions during orientation week

## C. MENTORING

- **Peer mentor:** everyone is assigned a mentor from the current graduate student pool
- **Faculty mentor:** 'rotation' faculty serve as mentors with no expectation of permanent research assignment

# Typical timeline

## A. YEAR 1

- Pass preliminary exam
- Take core classes
- TA
- Explore research topics and decide on PhD advisor by end of YR 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

- Research
- Internships
- Write thesis

## BENCHMARKS EXPECTED

- Publications
- Conference presentations
- Outreach activities
- Mentoring undergraduate students

# Funding support

## TEACHING ASSISTANTSHIP (TA)

- Physics discussion or lab classes, sometimes math classes

## GRADUATE STUDENT RESEARCHER (GSR)

- Through advisor's grant funding

## CENTER/RESEARCH FELLOWSHIPS

- CCBM and MACES fellowships
- Internal fellowships from Graduate Division
- NSF Research Trainee fellowships
- Summer fellowships through physics graduate groups
- Travel funding through physics graduate group and centers

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

Stipend around \$27,000 per year, tuition paid for

Source: [livingwage.mit.edu](http://livingwage.mit.edu)

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

	Merced	Berkeley	Davis	Los Angeles	Irvine	Riverside	Santa Barbara	Santa Cruz	San Diego
<b>Living Wage (per hour)</b>	\$10.26	\$15.92	\$12.54	\$13.41	\$14.45	\$12.10	\$13.85	\$13.36	\$13.69
<b>Cost of Housing (per year)</b>	\$6,204	\$16,560	\$10,368	\$11,972	\$13,932	\$9,576	\$12,780	\$11,868	\$12,480

# Where are our alumni?

## **Postdoctoral research:**

Caltech, Stanford, Brandeis, Princeton Universities

Lawrence Berkeley, Lawrence Livermore, Sandia National Laboratory

## **Industry:**

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

## **Faculty positions:**

Merced College (community college)

Southern University of Science and Technology, China

## **Government:**

Defense Threat Reduction Agency

# Learn more

[video](#)

[brochure](#)

[flyer](#)

[website](#)

[AIP GradSchoolShopper](#)

Contact faculty of interest

For application questions: contact Prof. Hirst, [lhirst@ucmerced.edu](mailto:lhirst@ucmerced.edu)

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