UNIVERSITY OF CALIFORNIA, BERKELEY
DEPARTMENT OF PHYSICS
Berkeley, California 94720-7300
http://www.physics.berkeley.edu

General University Information
Chancellor: Carolyn Christ
Dean of Graduate School: Lisa García Bedolla
University website: http://www.grad.berkeley.edu/
School Type: Public
Setting: Urban
Total Faculty: 2,082
Total number of Students: 42,519
Total number of Graduate Students: 11,666

Department Information
Department Chair: Prof. Wick Haxton, Chair
Department Contact: Brian Underwood, Deputy Director of Administration
Total full-time faculty: 65
Total number of full-time equivalent positions: 51
Full-Time Graduate Students: 297
Female Full-Time Graduate Students: 74
First-Year Graduate Students: 46
Female First-Year Students: 11
Total Post Doctorates: 44

Department Address
366 Le Conte Hall
MC 7300
Berkeley, CA 94720-7300
Phone: (510) 642-3317
Fax: (510) 643-8497
E-mail: physicsap@berkeley.edu
Website: http://www.physics.berkeley.edu

ADMISSIONS

Admission Contact Information
Address admission inquiries to: Donna K. Sakima, Graduate Student Affairs, Physics Student Services, 370 LeConte Hall #7300, University of California, Berkeley, CA 94720-7300
Phone: (510) 642-0596
E-mail: sakima@berkeley.edu
Admissions website: http://www.grad.berkeley.edu/admissions/index.shtml

Application deadlines
Fall admission:
U.S. students: December 16
Int’l. students: December 16

Application fee
U.S. students: $120
Int’l. students: $140

Admissions information
For Fall of 2019:
Number of applicants: 932
Number admitted: 133
Number enrolled: 46

Admission requirements
Bachelor’s degree requirements: Bachelor’s degree in Physics and/or related field is required, along with sufficient undergraduate training to do graduate work in physics. Please note that satisfying minimum requirements does not guarantee admission.
Minimum undergraduate GPA: 3.0

GRE requirements
The GRE is required.
The average percentiles of the General GRE scores for admission are: verbal–45% or better; quantitative–90% or better; and analytical writing–45% or better.

GRE Physics requirements
The GRE Physics is required.
Minimum accepted GRE Physics score: 730
Mean GRE Physics score range (25th–75th percentile): 910 - 990
Mean GRE Physics percentile range: 86th - 94th.

TOEFL requirements
The TOEFL exam is required for students from non-English-speaking countries.
Minimum accepted TOEFL scores:
PBT score: 570
iBT score: 90
Students who do not speak English as a native language and do not hold a Bachelor’s degree from a U.S. institution must demonstrate oral English proficiency to be appointed as a Graduate Student Instructor. Oral English proficiency can be demonstrated by a passing iBT speaking section score (26 or better).

Other admissions information
Additional requirements: Supervised undergraduate research is strongly encouraged.
Undergraduate preparation assumed: Three semesters-General Physics, Giancoli; 1 semester-Mechanics, Taylor; 2 semesters-Electromagnetism and Optics, Griffiths; 1 semester-Thermal/Statistical, Reif; 2 semesters-Atomic Physics and Quantum Mechanics, Bransden, Griffiths, Preskill, Shankar, Townsend; 2 semesters-Advanced Undergraduate Laboratory, 1st semester-Instrumentation Lab, Horowitz & Hill; 2nd semester-Advanced Experimentation Lab, no textbook. Plus mathematics courses in vector calculus, linear algebra, ordinary and partial differential equations, complex variable. (Berkeley undergraduates have in addition 1 semester of physics electives; for example, solid state physics, plasma physics, nuclear and particle physics, relativity.).

TUITION AND ASSISTANTSHIPS

Teaching Assistants, Research Assistants, and Fellowships
Number of first-year
Teaching Assistants: 36
Research Assistants: 3
Fellowship students: 7
Average stipend per academic year
Teaching Assistant: $21,150
Research Assistant: $35,000
Fellowship student: $34,000
TAs are appointed for 10 months, whereas RAs are appointed throughout the calendar year. Summer TA opportunities are available.

Tuition year 2018–19:
Tuition for in-state residents
Full-time students: $9,438.5 per semester
Tuition for out-of-state residents
Full-time students: $16,989.5 per semester
California

Fees subject to change.
Credit hours per semester to be considered full-time: 12
Deferred tuition plan: No
Health insurance: Available at the cost of $4,746 per year.
Other academic fees: Cost of the Student Health Insurance Program ($4,746) is included in tuition information.
Academic term: Semester
Number of first-year students who received full tuition waivers: 46

FINANCIAL AID

Loans
Loans are available for U.S. students.
Loans are not available for international students.
GAPSFA application required: No
FASFA application required: Yes

For further information
Phone: (510) 664-9181
Financial aid website: http://financialaid.berkeley.edu/

HOUSING

Availability of on-campus housing
Single students: Yes
Married students: Yes
Childcare Assistance: Yes

For further information
Address housing inquiries to: Housing.berkeley.edu
Housing aid website: http://housing.berkeley.edu/graduate

Table A—Faculty, Enrollments, and Degrees Granted

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>2019-20 Faculty</th>
<th>Enrollment Fall 2019</th>
<th>Number of Degrees Granted 2018-19 (2014-19)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Master’s</td>
<td>Doctorate</td>
<td>Master’s</td>
</tr>
<tr>
<td>Astrophysics</td>
<td>12</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Atomic, Molecular, &amp; Optical Physics</td>
<td>7</td>
<td>30</td>
<td>–</td>
</tr>
<tr>
<td>Biophysics</td>
<td>8</td>
<td>15</td>
<td>–</td>
</tr>
<tr>
<td>Condensed Matter Physics</td>
<td>16</td>
<td>85</td>
<td>–</td>
</tr>
<tr>
<td>High Energy Physics</td>
<td>18</td>
<td>60</td>
<td>–</td>
</tr>
<tr>
<td>Nuclear Physics</td>
<td>–</td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td>Plasma and Nonlinear Dynamics</td>
<td>3</td>
<td>10</td>
<td>–</td>
</tr>
<tr>
<td>Non-specialized</td>
<td>–</td>
<td>51</td>
<td>24(120)</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>297</td>
<td>24(120)</td>
</tr>
</tbody>
</table>

Graduate Degree Requirements
Master’s: Thirty-five semester units in approved program with satisfactory performance; comprehensive exam required; thesis not required; two semester residence requirement; no language requirement.

Doctorate: Thirty-eight graduate units in approved program with satisfactory performance, preliminary examination, candidacy qualifying examination, and dissertation required; four semester residency requirement; no language requirement.

Other Degrees: Interdepartmental research: Some graduate students are engaged in research problems involving interdepartmental collaboration of which the following are examples: (1) nuclear physics, in programs with the Chemistry Department or the Lawrence Berkeley National Laboratory; (2) astrophysics, with the Department of Astronomy, the Berkeley Center for Cosmological Physics, or the Space Sciences Laboratory; (3) solid-state physics, with the Departments of Electrical Engineering and Computer Sciences, and Materials Science and Engineering; (4) plasma physics, with the Departments of Electrical Engineering and Computer Sciences and Nuclear Engineering or the Lawrence Berkeley National Laboratory; and (5) Biophysics and medical physics. Interdisciplinary groups: there are a number of graduate Interdisciplinary Groups with Ph.D. programs separate from the Ph.D. in Physics, particle physics, with the Berkeley Center for Theoretical Physics.

Table B—Separately Budgeted Research Expenditures by Source of Support

<table>
<thead>
<tr>
<th>Source of Support</th>
<th>Departmental Research</th>
<th>Physics-related Research Outside Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal government</td>
<td>$21,486,790</td>
<td>$10,000,000</td>
</tr>
<tr>
<td>State/local government</td>
<td>$1,179,957</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>Non-profit organizations</td>
<td>$4,712,258</td>
<td></td>
</tr>
<tr>
<td>Business and industry</td>
<td>$383,653</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>$1,305,391</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$29,068,049</td>
<td>$15,000,000</td>
</tr>
</tbody>
</table>
### Faculty

#### Chair Professor


**Lee**, Adrian, Ph.D., Stanford University, 1993. Associate Director of the Radio Astronomy Laboratory, UC Berkeley. *Astrophysics. Experimental Astrophysics; Cryogenic far-infrared and mm-wave detector development.*


**Luk**, Kam-Biu, Ph.D., Rutgers University, 1983. *Particles and Fields. Experimental Elementary Particle Physics.*

**Ma**, Chung-Pei, Ph.D., Massachusetts Institute of Technology, 1993. Professor of Astronomy. *Astrophysics. Theoretical Astrophysics.*


**Nomura**, Yasunori, Ph.D., University of Tokyo, 2000. Director, Berkeley Center for Theoretical Physics (BCTP). *Particles and Fields. Theoretical Particle Physics.*


**Perlmuter**, Saul, Ph.D., Harvard University, 1986. 2011 Nobel Laureate; Director, Berkeley Center for Cosmological Physics (BCCP). *Astrophysics. Experimental Astrophysics.*


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#### Table C—Separately Budgeted Research Expenditures by Research Specialty

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>No. of Grants</th>
<th>Expenditures ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astrophysics</td>
<td>30</td>
<td>$2,603,111</td>
</tr>
<tr>
<td>Atomic, Molecular, &amp; Optical Physics</td>
<td>56</td>
<td>$4,043,444</td>
</tr>
<tr>
<td>Condensed Matter Physics</td>
<td>107</td>
<td>$10,271,531</td>
</tr>
<tr>
<td>Nuclear Physics</td>
<td>14</td>
<td>$2,103,523</td>
</tr>
<tr>
<td>Particles and Fields</td>
<td>37</td>
<td>$1,955,455</td>
</tr>
<tr>
<td>Plasma and Fusion</td>
<td>11</td>
<td>$1,150,063</td>
</tr>
<tr>
<td>Other</td>
<td>34</td>
<td>$2,505,239</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>289</strong></td>
<td><strong>$24,632,366</strong></td>
</tr>
</tbody>
</table>
California


Shapiro, Marjorie, Ph.D., University of California, Berkeley, 1984. Particles and Fields. Experimental Elementary Particle Physics.


White, Martin, Ph.D., Yale University, 1992. Astrophysics. Theoretical Astrophysics.


Associate Professor


Ganor, Ori, Ph.D., Tel Aviv University, 1996. Particles and Fields. Theoretical Particle Physics.

Ginsberg, Naomi, Ph.D., Harvard University, 2007. Associate Professor in the Department of Chemistry. Atomic, Molecular, & Optical Physics, Chemical Physics, Condensed Matter Physics. Physical & Biophysical Chemistry; Light harvesting; Spectroscopy & Imaging; Experimental Atomic, Molecular, & Optical Physics; Condensed Matter Physics & Materials Science.

Häffner, Hartmut, Ph.D., University of Mainz, 2000. Atomic, Molecular, & Optical Physics. Experimental Atomic Molecular and Optical Physics.


Müller, Holger, Ph.D., Humboldt University, Berlin, 2004. Atomic, Molecular, & Optical Physics. Experimental Atomic, Molecular, and Optical Physics.


Assistant Professor

Garcia, Hernan, Ph.D., California Institute of Technology, 2011. Assistant Professor in Department of Molecular and Cell Biology. Biophysics. Optics, Physics, Molecular and Developmental Biology. Seeking a quantitative and predictive analyses of microscopic genetic expression data through the use of equilibrium thermodynamic methods of analysis.


Yao, Norman, Ph.D., Harvard University, 2014. Atomic, Molecular, & Optical Physics, Condensed Matter Physics, Materials Science, Metallurgy, Optics. Theoretical Atomic, Molecular, and Optical Physics; Quantum Optics; Condensed Matter Physics and Materials Science.


Emeritus


Budker, Dmitry, Ph.D., University of California, Berkeley, 1993. Professor of the Graduate School. Atomic, Molecular, & Optical Physics. Experimental Atomic, Molecular, and Optical Physics.


Ely, Robert P., Ph.D., Massachusetts Institute of Technology, 1959.

Falcone, Roger W., Ph.D., Stanford University, 1979. Director, Advanced Light Source, Lawrence Berkeley National Lab; Professor of the Graduate School. Atomic, Molecular, & Optical Physics, Nonlinear Dynamics and Complex Systems, Plasma and Fusion. Quantum electronics; Experimental Atomic, Molecular, and Optical Physics; Plasma and Nonlinear Dynamics.
Frazer, William R., Ph.D., University of California, Berkeley, 1959. *Particles and Fields*. Elementary Particle Theory; Cosmology.


Marrus, Richard, Ph.D., University of California, Berkeley, 1959. *Atomic, Molecular, & Optical Physics*. Experimental Atomic, Molecular, and Optical Physics; Beam Foil Spectroscopy.

McKee, Christopher F., Ph.D., University of California, Berkeley, 1970. Professor of the Graduate School. Astrophysics. Theoretical Astrophysics; Interstellar Medium; High-energy Astrophysics.


Price, P. Buford, Ph.D., University of Virginia, 1958. *Astrophysics*. Astrophysics experiment; cosmic radiation and relativistic nuclear physics; high-energy neutrino astrophysics; microbes in polar ice.

Reif, Frederick, Ph.D., Harvard University, 1953.


Sachs, Rainer K., Ph.D., Syracuse University, 1958. *Biophysics*. Biophysics.


Smoot, George F., Ph.D., Massachusetts Institute of Technology, 1970. 2006 Nobel Laureate; Professor of the Graduate School. *Astrophysics*. Experimental Astrophysics.


**DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF**

**Theoretical**

Atomic, Molecular, & Optical Physics. Quantum optics; laser cooling and atom trapping; atom interferometers; the search for the electric dipole moment of the electron; including the search for dark matter; studies of the consequences of Bose-Einstein condensation; generation an application of ultra-short pulses of x-rays; antimatter research. Altman, Yao.

Biophysics. Detect and manipulate single molecules to elucidate molecular motors, protein folding, polymer (biopolymer) physics, single molecule rheology, dynamics of complex processes such as transcription, replication, and translation, etc. Hallatschek.

Condensed Matter and Materials Physics. Uncover new states of matter and understand their physical properties. Theoretical and computational studies of the behaviors of novel materials and nanostructures, including electronic, vibrational, optical, thermal, transport, magnetic, and superconducting properties; emergent phenomena, quantum phase transitions, and strongly correlated electron systems; many-body effects in bulk, reduced-dimensional, and nanostructured systems; surface, interface, phase transition, and alloy properties. Altman, Cohen, Dung-Hai Lee, Louie, Moore, Neaton, Yao.

Nonlinear Dynamics, Plasma and Beam Physics, and Complex Systems. Dynamics of neutral and nonneutral plasmas with applications to antihydrogen trapping, laser-plasma interaction and particle acceleration; Chaos and approach to chaos; bifurcation theory; pattern formation; fluid dynamics; semi-classical mechanics; climate change. Knobloch, Littlejohn, Wurtele.

Nuclear Physics. Low-energy neutrino physics, including solar and supernova neutrinos; nuclear astrophysics, including the origin of elements and the nuclear physics of dark matter direct and indirect detection; studies of ultra-relativistic heavy ion collisions, to probe the properties of strongly interacting matter at extreme energy densities. Haxton, Kasen.

Particles and Fields. Gauge theory of weak and electromagnetic interactions and perturbative QCD; theories of physics beyond the standard model, including grand unification, supersymmetry, supergravity, and extra dimensions; quantum field theory; string theory; theories of gravity. Aganagic, Bousso, Gaillard, Ganor, Hall, Haxton, Hoava, Kasen, Murayama, Nomura. Theoretical Astrophysics. Interstellar medium; star formation; binary stars; stellar convection; pulsars; X-ray sources; active galactic nuclei and quasars; galaxy formation; cosmology. Arons, Haxton, Kasen, Ma, McKee, Quataert, Seljak, White.

**Experimental**

Atmosphere, Space Physics, Cosmic Rays, Magnetospheric physics: space plasmas and fields; auroras; isotopic and elemental composition of cosmic rays; search for new particles and antimatter in cosmic rays; spectrum and anisotropy of the universal microwave radiation; infrared astronomical spectroscopy and spatial interferometry; millimeter and submillimeter spec-
tra; the galactic center; star formation; new astronomical detectors; automated supernova search; X-ray spectroscopy and laboratory astrophysics; high-energy gamma-ray astrophysics; experimental cosmology including particle astrophysics. Bale.

Atomic, Molecular, & Optical Physics. Precision measurements; ultra-cold quantum gases; quantum information; attosecond physics; X-ray lasers; tests of fundamental symmetries; variation of fundamental constants; quantum phase transitions; ion trapping; hybrid quantum systems; antihydrogen trapping and spectroscopy; optomechanical systems; magnetometry; low-field NMR; frequency combs; precision spectroscopy of atomic systems near and in bulk materials; NV-centers; novel approaches to microscopy; energy transfer in complex molecules; nonlinear interaction of light with matter; hot and dense plasmas. Budker, Falcone, Ginsberg, Häffner, Leone, Müller, Stamper-Kurn.


Energy Sources & Environment. The Center for Building Science, in the Applied Science Division at Lawrence Berkeley National Laboratory.

Experimental Astrophysics. Dark matter searches; astroparticle physics; observations of the cosmic microwave background; cosmology; studies of galaxy clusters; studies of star forming galaxies; study of dark energy using supernovae, galaxy counts, and Baryon acoustic oscillations; Studies of astrophysical neutrinos, solar physics, and high-energy neutrino astrophysics. Bale, Davis, Genzel, Holzapfel, Adrian Lee, McKinsey, Muller,Perlmutter, Price, Pyle, Richards, Sa- doulet, Smoot.

High Energy Physics. Neutrino physics, including studies of neutrinos produced in solar, atmospheric and reactor interactions; nuclear astrophysics; studies of symmetry breaking in nuclear systems; searches for neutrinoless double beta decay; weak interactions in nuclei; heavy ion collisions. Jacobsen, Kolomensky, Luk, McKinsey, Orebi-Gann, Shapiro, Siegrist.

Nonlinear Dynamics, Plasma and Beam Physics, and Complex Systems. Nonneutral plasmas and antihydrogen synthesis; laser-driven particle acceleration in plasmas; high-brightness electron and ion beams. Fajans.

Particles and Fields. Experiments utilizing particle accelerators such as electron-positron and hadron colliders, as well as fixed target machines to test and extend the standard model and to search for physics beyond the standard model; studies of neutrino physics using neutrinos produced in accelerators and reactors; searches for dark matter and other experimental studies in the field of particle astrophysics; development and fabrication of detectors appropriately matched to these goals. Gray, Jacobsen, Kolomensky, Luk, McKinsey, Orebi-Gann, Pyle, Shapiro, Siegrist, Haichen Wang, Witherell.

Plasma and Fusion. Plasma production and heating; magnetic confinement of high-temperature plasma; development and application of plasma diagnostic methods; atomic physics problems related to controlled fusion; accelerator research for heavy-ion driven pellet fusion; single species plasma. Fajans, Falcone.

View additional information about this department at www.gradschoolshopper.com. Check out the “Why Choose Us?” section, find out more about the department’s culture and get links to social media networks.