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

General University Information
Chancellor: Nicholas Dirks
Dean of Graduate School: Rosemary Joyce
University website: http://www.grad.berkeley.edu/

Control: Public
Setting: Urban
Total Faculty: 2,082
Total number of Students: 36,142
Total number of Graduate Students: 10,257

Department Information
Department Chairman: Prof. Steven Boggs, Chair
Department Contact: Brian Underwood, Academic HR Manager

Total full-time faculty: 61
Total number of full-time equivalent positions: 47
Full-Time Graduate Students: 278
First-Year Graduate Students: 45
Female First-Year Students: 6
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: brianu@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 15  Int'l. students: December 15

Application fee
U.S. students: $90  Int'l. students: $110

Admissions information
For Fall of 2015:
Number of applicants: 826
Number admitted: 131
Number enrolled: 42

Admission requirements
Bachelor’s degree requirements: Bachelor’s degree in Physics and/or related field is required.
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.

Advanced GRE requirements
The Advanced GRE is required.
Minimum accepted Advanced GRE score: 730
Mean Advanced GRE 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.
PBT score: 570
iBT score: 68
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, Kittel & Kroemer, Reif; 2 semesters-Atomic Physics and Quantum Mechanics, Griffiths, Bransden & Joachain; 2 semesters-Advanced Undergraduate Laboratory, no required 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

Tuition year 2016–17:
Tuition for in-state residents:
Full-time students: $17,654.5 annual
Tuition for out-of-state residents:
Full-time students: $32,756.5 annual
Fees subject to change.
Credit hours per semester to be considered full-time: 12
Deferred tuition plan:
Health insurance: Yes, $4,146.00.
Other academic fees: Cost of the Student Health Insurance Program ($4,146) is included in tuition information.
Academic term: Semester
Number of first-year students who received full tuition waivers: 42

Teaching Assistants, Research Assistants, and Fellowships
Number of first-year
Teaching Assistants: 26
Research Assistants: 5
Fellowship students: 11
Average stipend per academic year
Teaching Assistant: $19,896
Research Assistant: $29,943
Fellowship student: $32,000
TAs are appointed for 10 months, whereas RAs are appointed throughout the calendar year.
FINANCIAL AID

Application deadlines
Fall admission:
U.S. students: December 15
Int'l. students: December 15

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

For further information
Address financial aid inquiries to: Financial Aid and Scholarships
Phone: (510) 664-9181
Financial aid website: http://financialaid.berkeley.edu/

HOUSING

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

For further information
Address housing inquiries to: Cal Rentals, 2610 Channing Way,
2nd Floor, University of California, Berkeley CA 94720-2272.
Phone: (510) 642-3644
E-mail: homeinfo@berkeley.edu
Housing aid website: http://www.housing.berkeley.edu/
livingatcal/graduatesstudents.html

Table A—Faculty, Enrollments, and Degrees Granted

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>Enrollments Fall 2015</th>
<th>Number of Degrees Granted 2015-16 (2011-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Faculty</td>
<td>Master's</td>
</tr>
<tr>
<td>Astrophysics</td>
<td>13</td>
<td>35</td>
</tr>
<tr>
<td>Atomic, Molecular, &amp;</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>Optical Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biophysics</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Condensed Matter</td>
<td>16</td>
<td>71</td>
</tr>
<tr>
<td>Nuclear Physics</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Particles and Fields/</td>
<td>18</td>
<td>48</td>
</tr>
<tr>
<td>Nuclear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasma and Fusion</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Non-specialized</td>
<td></td>
<td>48</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>64</strong></td>
<td><strong>251</strong></td>
</tr>
<tr>
<td>Full-time Grad. Stud.</td>
<td>–</td>
<td>251</td>
</tr>
<tr>
<td>First-year Grad. Stud.</td>
<td>–</td>
<td>42</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 ex-

amples: (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.

SPECIAL EQUIPMENT, FACILITIES, OR PROGRAMS

In addition to our own research programs and facilities, our dynamic collaborations bring access to local research facilities such as Lick Observatory (University of California, Mount Hamilton, San Jose CA); Space Sciences Laboratory (University of California, Berkeley, CA); Lawrence Berkeley National Laboratory/LBNL (DOE, Berkeley, CA); Advanced Light Source (LBNL); National Center for Electron Microscopy (LBNL); The Molecular Foundry, a nanoscience user research facility (LBNL); and Lawrence Livermore National Laboratory (Livermore, CA).

The following local, national, and international laboratories also make facilities available for graduate student research: Brookhaven National Laboratory (New York); Fermi National Accelerator Laboratory (Illinois); NASA Ames Center (California); Kitt Peak National Observatory (Arizona); SLAC National Accelerator Laboratory (California); University of California, Berkeley Micro/Nanofabrication Facility (California); the University of California, Berkeley Radio Astronomy Laboratory (California); Argonne National Laboratory (Illinois); W. M. Keck Observatory (Hawaii); CERN (Headquarters Switzerland); Gran Sasso Underground Laboratory (Italy); Assergi (Italy); Kamioka Observatory (Japan); Institute for the Physics and Mathematics of the Universe/IPMU (Japan); Paul Scherrer Institute (Switzerland); and TRIUMF (Canada).

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>$14,565,356</td>
<td>$21,222,783</td>
</tr>
<tr>
<td>State/local government</td>
<td>$264,007</td>
<td></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>$38,395</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$21,230,667</td>
<td>$21,261,178</td>
</tr>
</tbody>
</table>

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;</td>
<td>56</td>
<td>$4,043,444</td>
</tr>
<tr>
<td>Optical Physics</td>
<td></td>
<td></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>$2,463,239</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>289</td>
<td>$24,632,366</td>
</tr>
</tbody>
</table>
Chair Professor
Boggs, Steven E., Ph.D., University of California, Berkeley, 1998. Chair, Physics Department. Astrophysics. Gamm-ray spectroscopy; experimental astrophysics.

Professor
Hall, Lawrence J., Ph.D., Harvard University, 1981. Theory of elementary particles.
Haxton, Wick, Ph.D., University of California, Santa Cruz, 1971. Theoretical particle physics and astrophysics.
Hoava, Petr, Ph.D., Czech Academy of Sciences, 1981. Theoretical Particle Physics.
Jacak, Barbara 1984, Ph.D., Michigan State, 1984. Director of the Nuclear Science Division and Senior Scientist, Lawrence Berkeley National Lab. Nuclear Physics, Particles and Fields. Experimental Particle Physics. Experimental study of quark gluon plasma; plasma is formed in relativistic heavy ion collisions where nuclei are heated to trillions of degrees and quarks are no longer confined in hadrons.
Knobloch, Edgar, Ph.D., Harvard University, 1978. Theoretical astrophysics; fluid dynamics; nonlinear dynamics.
Kolomensky, Yury, Ph.D., University of Massachusetts, 1997. Experimental Particle Physics. BaBar, B hadron decays, with particular emphasis on understanding the origin of CD noninvariance.
Lee, Adrian, Ph.D., Stanford University, 1993. Associate Director of the Radio Astronomy Laboratory, UC Berkeley. Experimental Astrophysics. Cryogenic far-infrared and mm-wave detector development.
Lee, Dung-Hai, Ph.D., Massachusetts Institute of Technology, 1982. Theory of condensed matter; quantum phase transitions; strongly correlating electronic systems.
Littlejohn, Robert G., Ph.D., University of California, Berkeley, 1980. Theoretical plasma physics and nonlinear dynamics.
Luk, Kam-Biu, Ph.D., Rutgers University, 1983. Experimental elementary particle physics.
Orenstein, Joseph W., Ph.D., Massachusetts Institute of Technology, 1980. Experimental condensed matter physics.
Qiu, Zi Qiang, Ph.D., Johns Hopkins University, 1990. Experimental condensed matter physics.
Rokhsar, Daniel S., Ph.D., Cornell University, 1987. Statistical and many-body physics; biophysics.
Shapiro, Marjorie, Ph.D., University of California, Berkeley, 1984. Experimental elementary particle physics.
Stamper-Kurn, Dan, Ph.D., Massachusetts Institute of Technology, 1999. Atomic, Molecular, and Optical Physics. Bose-Einstein Condensation (BEC) of atoms.
California

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


Zelti, Alex, Ph.D., University of California, Los Angeles, 1983. Experimental condensed matter physics.

Associate Professor


Ganor, Ori, Ph.D., Tel Aviv University, 1996. Particles and Fields. Theoretical particle physics.


Häßner, Hartmut, Ph.D., University of Mainz, 2000. Experimental atomic molecular and optical physics.


Müller, Holger, Ph.D., Humboldt University, Berlin, 2004. Experimental atomic, molecular, and optical physics.


Assistant Professor


Garcia, Herman, 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.


Rajendran, Surjeet, Ph.D., Stanford University, 2009. Theoretical Physics. Theoretical Particle Physics. Inventing new experimental avenues to help answer questions on the nature of Dark Matter, the origins of the electroweak scale and the cosmological constant as well as the quantum nature of gravity.

Emeritus


Chinowsky, William, Ph.D., Columbia University, 1955.


Davis, Marc, Ph.D., Princeton University, 1973. Professor, Astronomy Department. Astrophysics. Theoretical astrophysics; extragalactic astronomy; cosmology.


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


Halpern, Martin B., Ph.D., Harvard University, 1964. Theory of elementary particles.

Kaufman, Allan N., Ph.D., University of Chicago, 1953. Plasma theory and nonlinear dynamics.


Kittel, Charles, Ph.D., University of Wisconsin-Madison, 1941. Nuclear Physics. Dark matter, astrophysics and nuclear physics; Detector technology.

Marrus, Richard, Ph.D., University of California, Berkeley, 1959. Experimental atomic physics; beam foil spectroscopy.

McKee, Christopher F., Ph.D., University of California, Berkeley, 1970. Professor of the Graduate School. Theoretical astrophysics; interstellar medium; high-energy astrophysics.

Mozet, Forrest S., Ph.D., California Institute of Technology, 1956.

Muller, R. A., Ph.D., University of California, Berkeley, 1969. Professor of the Graduate School. Astrophysics experiment; experimental physics.


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

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

Richards, Paul L., Ph.D., University of California, Berkeley, 1960. Professor of the Graduate School. Experimental condensed matter physics; infrared spectroscopy; infrared astrophysics.

Rosenfeld, Arthur H., Ph.D., University of Chicago, 1954. Physics related to environmental problems; energy and conservation.

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

Schwartz, Charles L., Ph.D., Massachusetts Institute of Technology, 1954.


Siegrist, James L., Ph.D., Stanford University, 1979. Director, Physics Division, Lawrence Berkeley National Laboratory. Experimental elementary particle physics.

Smoot, George F., Ph.D., Massachusetts Institute of Technology, 1970. 2006 Nobel Laureate; Professor of the Graduate School. Experimental astrophysics.
United States: Geographic Listing of Graduate Programs

California

Steiner, Herbert M., Ph.D., University of California, Berkeley, 1956. Experimental elementary particle physics.

Stevenson, M. Lynn, Ph.D., University of California, Berkeley, 1953. Experimental elementary particle physics.


Suzuki, Mahiko, Ph.D., University of Tokyo, 1965. Theory of elementary particles.


Tripp, Robert D., Ph.D., University of California, Berkeley, 1955. Experimental elementary particle physics.


DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF

Theoretical
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. Cohen, Dung-Hai Lee, Louie, Moore, Neaton, Vishwanath. 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; semiclassical mechanics; climate change. Fajans, Knobloch, Littlejohn, Wurtele. Nonlinear Dynamics, Plasma and Beam Physics, and Complex Systems. Dynamics of ionized gases far from thermal equilibrium and dominated by long-range electromagnetic fields with applications to controlled fusion, astrophysics, and space science. Fajans, Knobloch, Littlejohn, Wurtele. 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, string theory; theories of gravity. Aganagic, Bousso, Gaillard, Ganor, Hall, Haxton, Hoava, Murayama, Nomura, Rajendra. Relativity & Gravitation. General relativity and quantum gravity. Bousso, Littlejohn. 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, McKee, Quataert, Seljak, White. Experimental
Atmosphere, Space Physics, Cosmic Rays. Magnetoospheric 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 spectra; 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, Boggs. Atomic, Molecular, & Optical Physics. Precision measurements; ultra-cold quantum gases; quantum information; atom optics; X-ray lasers; tests of fundamental symmetries; variations 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. Altman, Budker, Falcone, Ginsberg, Haffner, Leon, Muller, Stamper-Kurn.
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, Boggs, Davis, Genzel, Holzapfel, Adrian Lee, McKinsey, Muller, Perlmuter, Price, Pyle, Richards, Saadoun, 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. Heinemann, Jacak, 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. Heinemann, Jacak, Jacobsen, Kolomensky, Luk, McKinsey, Orebi-Gann, Shapiro, Siegrist, 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.