Accelerators form the backbone of SLAC's experimental programs. They are sophisticated instruments that require advanced physics and engineering innovations to achieve the ever-increasing level of performance that enables and leads the way for the discoveries in the experimental programs. SLAC is a world-leading institute in accelerator physics and technology.

The Accelerator Directorate (AD) at SLAC is charged with performing accelerator physics research. The Accelerator Research Division (ARD) within AD has a world renowned research program in advanced acceleration techniques and is engaged in R&D on some of the most advanced accelerators in the world including the Large Hadron Collider at CERN SLAC's own Linac Coherent Light Source (LCLS), the world's first x-ray laser.

The LCLS-II project, currently under construction, offers unique research opportunities ranging from beam dynamics and free-electron laser physics to superconducting RF technology.

SLAC test facilities dedicated to accelerator research include the Accelerator Structure Test Area (ASTA), and the Next Linear Collider Test Accelerator (NLCTA).

The Facility for Advanced Accelerator Test (FACET) has concluded one of the most successful research programs in plasma-wakefield acceleration using the world's highest energy electron accelerator test facility. The FACET-II program will begin in 2019 and will be the premiere environment for advanced accelerator research for the next decade.

Finally, the End Station Test Beam (ESTB) offers many more opportunities for detector and linear collider instrumentation R&D.

Graduate fellowships are offered to Stanford students in Physics, Applied Physics, Chemistry, Electrical Engineering and Materials Science. Want to know more?

- Look inside…
- Contact Faculty/Staff directly
- ARD web-site for detailed information
https://slacportal.slac.stanford.edu/sites/ard_public/
- Applied Physics web-site / Lasers & Accelerators
http://www.stanford.edu/dept/app-physics/cgi-bin/

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(pictures in order of above list)
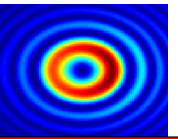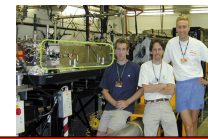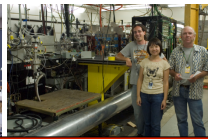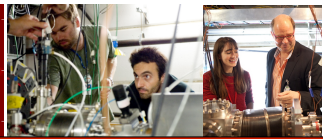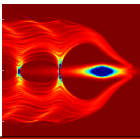
ACCELERATOR RESEARCH AT SLAC NATIONAL ACCELERATOR LABORATORY
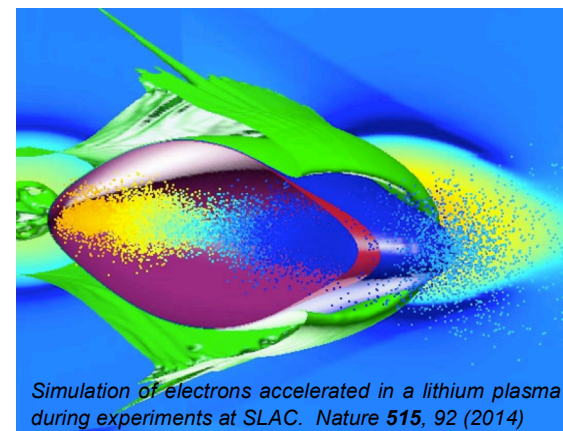
Simulation of electrons accelerated in a lithium plasma during experiments at SLAC. Nature **515***, 92 (2014)*

Graduate research opportunities in Accelerator Research

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SLAC NATIONAL ACCELERATOR LABORATORY

Research Areas

The SLAC accelerator research program is broad in scope, ranging from fundamental beam physics theory to technology development. There are active programs in:

FEL Physics, x-ray pulse shaping and beam manipulation concepts.
Contacts: Zhirong Huang, Tor Raubenheimer

Artificial intelligence and machine learning applied to accelerator operations
Contacts: Daniel Ratner, Juhao Wu

LCLS-II and superconducting RF research and development;
Contacts: Lia Merminga, Tor Raubenheimer, John Galayda

High-brightness slectron injector research.
Contact: Bruce Dunham

Ultrafast Electron Diffraction
Contacts: Xijie Wang

Storage Ring Dynamics and Novel Diagnostics;
Contacts: James Safranek, Jeff Corbett

SLAC Students and Postdocs Dominate American Physical Society Outstanding Doctoral Thesis Research in Beam Physics Awards. Recent winners:

Spencer Gessner, student of Tor Raubenheimer (2017)
Panagiotis Baxevanis, Research Associate (2016)
Agostino Marinelli, Panofsky Fellow (2015)
Sebastien Corde, research associate (2013)
Daniel Ratner, a student of Alex Chao (2012)

Doctoral research in the Accelerator Research Division takes place in a stimulating environment with strong national and international collaboration.

Most research groups are small, averaging less than 10 people. Students have the opportunity to engage in all aspects of a group's program, or focus on just one and frequently they can develop their ideas from concept and theory, through detailed simulation to leading the experimental investigation.

Instability dynamics, control techniques and high speed signal processing for high intensity beams;
Contact: John Fox

Test Facilities experimental program;
Contact: Carsten Hast

Accelerator Technology, high-gradient accelerators, THz accelerators
Contact: Sami Tantawi

Laser acceleration using nanofabricated photonic microstructures in dielectric materials.
Contact: Joel England

Plasma acceleration where electric fields in plasmas are used to generate acceleration fields of many GV/m;
Contacts: Mark Hogan, Vitaly Yakimenko

Recent Graduate Thesis Work at SLAC

Spencer Gessner "Demonstration of the Hollow Channel Plasma Wakefield accelerator," Advisor: Tor Raubenheimer, 2016 →Fellow, CERN.

Panagiotis Baxevanis "Theoretical study of novel concepts for compact, high-gain free-electron lasers," Advisor: Ron Ruth, 2015; Research Associate, SLAC.

Ken Soong "Particle Accelerator on a Wafer: Demonstration of Electron Acceleration Diagnostics with Microstructures," Advisor: Bob Byer, 2014 →Data Scientist, LinkedIn.

Edgar Peralta "Accelerator on a Chip: Grating-based Dielectric Microstructures for Laser-Driven Acceleration of Electrons," Advisor: Bob Byer, 2014 →Science Consultant, Exponent.

Christopher McGuinness "*Particle Accelerator on a Chip: Fabrication and Characterization of a 3D Photonic Crystal Accelerator*" Advisor: Bob Byer, 2012 →Postdoc, Radiation Oncology, UCSF.

Daniel Ratner "*Much Ado About Microbunching: Coherent Bunching in High Brightness Electron Beams*" Advisor: Alex Chao, 2011 →Staff Scientist, SLAC.