

Connecting with Industry and Local Community Colleges

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Physics Department 21
faculty, 2 lecturers

Astronomy and Astrophysics
is a separate department.

3 elected members of
American Academy of Arts
and Sciences

5 UCSC Outstanding
Teaching Awards

2 UCSC Excellence Through
Diversity awards

3 recent major APS awards

Santa Cruz Institute for
Particle Physics & Lick
Observatory

Topics relevant to the undergraduate program at UCSC

Applied Physics Major, with the effort to create networking with industry and its contribution to program growth and student preparation for industry and graduate school.

National Science Foundation program to network with community colleges to pick up students who make excellent physics students but who might otherwise not choose physics as a career path.

Other efforts to build a sense of supportive community.

55 Graduate students

70 Undergraduate students per year

- qualification requirement for declaring a physics major
- advising – staff and faculty

majors (mostly junior and senior):

Physics - 58

Applied Physics - 43

Astrophysics - 53

Physics Education – 6

5 year BS/MS - 3

proposed majors (frosh and sophomore) - 178

All students take Physics 182 – Scientific Communication for Physicists and write a senior thesis in close collaboration with a faculty member or other researcher in the Physics or Astronomy department.



UCSC Physics Undergraduate Students – May 2012

UCSC Applied Physics Major

About 1/4 of undergraduates are in the Applied Physics major - similar curriculum to other majors but with more flexibility in electives to encourage breadth in areas such as chemistry, math, engineering, computers, and biology.

The quality of the students is comparable to the other three majors. About half go on to graduate school and the rest readily find employment.

Physics 11 – The Physicist in Industry

Two speakers from industry each week. Dinner with the speakers and three of the 15 students.

Speakers invited this quarter:

Environmental Venture Consultant
Web-Development Consultant
Industrial Physics Researcher
Physicist/Engineer
Mechanical Engineer
Middle School Science Teacher
Inventor
Analog Design Engineer
Founder and CEO of Toy Company
Automation Engineer
Patent Attorney
Software Engineer
Radiation Physicist
Semiconductor Physicist

Four speakers this year are former Physics 11 students

Typical Applied Physics Major Summer Internships

DESY in Germany.

Summer REU program at Harvard University.

NASA Ames research center.

Summer exchange in Trento, Italy doing particle tracking sensor research.

Modeling x-ray emissions from rocket triggered lightning.

With local architect William Fisher helping with building design.

The Institute of Nanotechnology and Structural Biology, Czech Republic.

An optical engineering at a company specializing in optics for the aerospace industry.

Advanced Studies Laboratories at NASA Ames.

A Sampling of Recent Senior Thesis Titles

Projects typically based on several months of research with a faculty member as supervisor

An extremely popular feature of the UCSC Physics undergraduate program.

Dynamical Supersymmetry Breaking in a Double Oscillator Model

The Evolution of Supernovae Embedded in Stellar Groups

Investigations of the Chaotic Water Wheel

Modeling X-ray Emissions from Rocket Triggered Lightning

Energy Loss of Protons in Silicon Strip Detectors for Computed Tomography

Effect of Bismuth Doping on the Magnetic Properties of Rare-Earth Orthoferrites

Microwave Absorption in Nanostructures

Nanoparticle Quantization with a Stretchable Nanopore

Modeling Spin Transitions in LaCoO_3

Sonoluminescence: Sound into Light

Two Dimensional Modeling of Double-Diffusive Convection in the Presence of an External Magnetic Field

Optimal Control of a Taekwondo Kick

Atomic Layer Deposition of Aluminum Oxide

Resistive Charge Division in Multi-Channel Silicon Strip Sensors

Extracellular Recording of Retinal Neurons Using Novel Multielectrode

Water Wave Equation for Video Games

Development of a One Meter Electromagnetic Accelerator

Large Scale Monte Carlo Simulation of the Three-Dimensional SY Spin Glass

Design Parameters of the III-V Multi-junction Solar Cell

Effects of Cluster Dynamics on the Birth Environment of the Solar System

“Supernova: Seeding Talent in Physics and
Astrophysics to Prepare the
Next Generation Workforce in the Bay Area”

National Science Foundation \$580K/ 5 years
Adriane Steinacker and Dave Belanger

Modern Physics 101B --> Modern Physics 102
Hee-Sun Lee

101B is being redesigned as 102 for transfer students to help them integrate into the undergraduate physics program.

The course is becoming the template for redesigning our introductory modern physics course to emphasize how to think as a physicist and to prepare students for the upper division curriculum. It will likely be adopted for all physics majors.

Typical issues for community college students thinking about studying physics at a four year institution:

Support while attending school, prospects for jobs, family and community support, lack of confidence about preparation and ability. Building a persistent network with local institutions and addressing issues transfer students face.

Year 1 – four students; Year 2 – five students; Year 3 – six students

Partner Community Colleges

Cabrillo College – six students

Hartnell College – four students

Foothill College – one student

San Francisco City College – four students

About half are applied physics majors.

Approximately half are female and a majority are from other underrepresented groups.

NSF program students – Lick Observatory, Mt. Hamilton – May 2012



Concluding Comments

Creating the Applied Physics Major, and growing the Engineering Program, increased enrollments for all majors to the point of needing to restrict entry. Physics 11 helps students learn to network. The communications course builds skills students need to compete for jobs and grad school programs.

Exit Surveys – important for knowing how students view the program.
Physics 11 is viewed as very important among the applied physics majors.
Faculty interactions were nearly as valued, including research experience.
Preparation for finding a job or going to grad school received mixed reviews.
Advising received moderate appreciation.
Quality of laboratory equipment was rated lower – something we are addressing.

Small, friendly community with open doors.
Meeting with top prospective students highly successful.
Society of Physics students, end of year ceremonies, and other programs build community.

Community is built slowly with active participation of everyone. The health and diversity of the department tends to spiral upwards or downwards.