

UCSC Astronomy & Astrophysics Orientation Guide

Contents

1. Introduction
2. Upon Arrival
3. The Astronomy & Astrophysics Department
 - 3.1 Who's who
 - 3.2 Projects/Acronyms
 - 3.3 PhD Requirements
 - 3.4 Courses
 - 3.5 Research Project
 - 3.6 Preliminary Exam
 - 3.7 Board Review
 - 3.8 Qualifying Exam
 - 3.9 Thesis Defense
 - 3.10 Advising
 - 3.11 Department events
 - 3.12 Your Department responsibilities/ Czars
 - 3.13 Computing
 - 3.14 Funding/Support
 - 3.15 Miscellany
4. The University
 - 4.1 What's where; campus facilities
 - 4.2 Structure
 - 4.3 Transportation and parking
 - 4.4 Housing
5. Santa Cruz and environs
 - 5.1 Geography
 - 5.2 Housing
 - 5.3 Transportation

Useful websites

1. Introduction

WELCOME TO UCSC!

This handbook serves as a general reference for graduate students in the UCSC Department of Astronomy and Astrophysics. Included is information on our program, faculty and staff contacts, and helpful general information regarding the campus and the surrounding area of Santa Cruz.

The majority of the information contained in this orientation guide is also available at our website <http://www.astro.ucsc.edu>. Specifically useful for new students is the following page: Graduate ⇒ [Information for New & Prospective Graduate Students](#).

The Astronomy and Astrophysics department staff are available to assist you with questions pertaining to the rules and regulations of the university. The Graduate Advisor will serve as your primary administrative contact during your time with the department, and will provide you with information about course enrollment, orientation activities, academic employment and payroll, university policies and procedures and deadlines for each quarter. If you have additional questions about the program after reviewing the information in this handbook, you may contact the Graduate Advisor at any time for assistance.

We wish you the best of luck with your career as an Astronomy Graduate Student!

Department Contact Information:

Patti Schell, Dept. Manager 459-3581 pmschell@ucsc.edu

Cathy Clausen, Dept. Assistant 459-2844 caclause@ucsc.edu

Maria Sliwinski, Dept. Graduate Advisor 459-2844 <mailto:sliwinsk@ucsc.edu>

2. Upon Arrival

Department Office (ISB 201)

Please check in with our Graduate Advisor, Maria Sliwinski. Maria will make arrangements for keys to be issued to you for the building and your office space.

Payroll

Teaching Assistants - Before starting your Teaching Assistant appointment you will need to go in person to the Physical and Biological Sciences Payroll Office (511 Physical Sciences Bldg.) to complete important payroll paperwork. If you are a U.S. Citizen you must bring a driver's license or picture ID AND social security card, birth certificate; or passport. If you are not a U.S. Citizen you must bring your visa, I-20 and or DS-2019, I-94 passport w/photo AND social security card. Each student will need to provide a document that establishes personal identity such as a passport, Driver's License, State ID card, or Valid Student ID. Each student will also need to provide a document that establishes employment eligibility such as a US Birth Certificate or Social Security card. All non-citizen and nonresident alien students will have to have a Social Security card and will also need to provide all visa and passport documentation, including the I-94 and I-20 forms. If you will be employed as a TA during Fall 2009, you will receive your first of three monthly paychecks (for the period of 10/1/09-12/31/09) on 11/1/09.

Graduate Student Researcher –Prior to starting your appointment as a Graduate Student Researcher, please contact Heather Komocsi with the Lick Observatory Business Offices located on the 3rd floor of the ISB Building. She can be reached at extension 9-5050 and is located in ISB room # 393.

Office Space

Please contact grad student Kate Rubin who is responsible for the assigning of office space. Kate will show you where your desk is located. Kate is located at ext 9-3809 and is in room # 113 in the ISB building.

Also, please check your individual assigned mailbox in the Astronomy mail room, ISB 260.

UCSC Student ID

UCSC Student I.D. Card provides a student unlimited rides on [Santa Cruz Metro buses](#). Metro service for students is funded through the Student Transit Fee. Student ID cards are issued through the ID Card Services office located on the first floor of the Bay Tree Bookstore building in between the Digital Copy Center and the Express Store. Contact [ID Card Services](#) by calling 831-459-2990 or idcards@ucsc.edu

A valid quarter sticker is necessary when showing your UCSC Student ID Card to ride Metro buses; stickers are available each quarter in the Astronomy Department office, ISB 201.

TAPS provides temporary bus passes at the start of Fall and Winter quarters for new students that have not obtained their Student ID Card; new students please contact Kris West in the Graduate Division for the temporary passes.

California Driver's License and Residency

Get a CA driver's license or ID, and register your vehicle with the DMV. Even if you do not own the vehicle (like it's your parents'), technically you must register it anyway within 10 days.

Besides getting your CA driver's license, do other things that establish your California residency, like open a bank account, register to vote, etc. The best way to establish residency is with a lease/rental agreement.

Register for Fall Quarter

Your requirement is to be enrolled in 10 units (2 courses), which equates to full time status. (This is also a requirement in order for you to get paid!) You can elect to add more if you wish. Since Astronomy 205 is undemanding, we strongly encourage you to do so for Fall Quarter. If you are planning on being a TA in the fall, please contact Maria Sliwinski first to discuss enrolling in an addition elective course, as your workload will need to be considered.

At this time please enroll in the following courses for fall quarter:

- Astronomy 204 – Astrophysical Flows (5 units)

Professor Greg Laughlin will be teaching this required core course fall quarter, MWF from 9:30am – 10:40am in ISB 356. Since courses begin on Thursday, September 24 your first meeting of Astronomy 204 will be on Friday, September 25. Please note that this course is offered in alternate years only and will not be offered again until the 2011/12 academic year.

- Astronomy 205 - Introduction to Astronomical Research (5 Units)

This group meeting and required core course introduces you to the faculty and their work. The course meets MWF from 2pm – 3:10pm in ISB 126. Since courses begin on Thursday, September 24 your first meeting of Astronomy 205 will be on Friday, September 25.

- Astronomy 292 – Seminar (Colloquium)

This course carries no credit but will be one you will need to enroll in each

quarter. Unless otherwise posted, Astronomy Colloquium will always take place on Wednesdays at 3:30pm in Natural Sciences Annex 101. Our first colloquium will be September 30.

Elective course offerings Fall Quarter are:

- Astronomy 240A - Galactic and Extra Galactic Stellar Systems

Professor Connie Rockosi, T TH 2pm – 3:45pm

- Astronomy 257 - Modern Astronomical Techniques

Professor Mike Bolte, T TH 10am -11:45am

Physics, Earth and Planetary Sciences, and Applied Math also offer many astronomy useful courses. Elective course offerings Fall Quarter are:

- Applied Math & Statistics 217 – Intro to Fluid Dynamics

Professor Gary Glatzmaier, T TH 8am – 9:45am

- Physics 210 – Classical Mechanics

Professor A. Sher, MWF 11am – 12:10pm

3. The Astronomy & Astrophysics Department

3.1 Who's who

GRADUATE STUDENT CONTACT LIST

| # | Name | Year | Email |
|----|------------------------------|------|---|
| 1 | Arnold, Jacob | 3 | jacob@astro.ucsc.edu |
| 2 | Cheng, Judy | 4 | jyc@ucolick.org |
| 3 | Cheung, Edmond | 2 | echeung1@ucsc.edu |
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| 5 | Da Silva, Robert | 2 | rdasilva@ucsc.edu |
| 6 | Dorman, Claire | 1 | mailto:cdorman@ucsc.edu |
| 7 | Duran Sierra, Maria | 2 | mduransi@ucsc.edu |
| 8 | Fang, Jerome | 1 | mailto:jjfang@ucsc.edu |
| 9 | Fumagalli, Michele | 2 | mfumagal@ucsc.edu |
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| 12 | Guedes, Javiera | 5 | javiera@ucolick.org |
| 13 | Guillochon, James | 3 | jfg@ucolick.org |
| 14 | Howley, Kirsten | 6 | kirsten@ucolick.org |
| 15 | Johnson, Jess | 6 | jjohnson@ucolick.org |
| 16 | Kiziltan, Bulent | 6 | bulent@ucolick.org |
| 17 | Kollipara, Priya | 4 | pk@ucolick.org |
| 18 | Kretke, Katherine | 6 | kretke@ucolick.org |
| 19 | Lopez, Eric | 2 | edlopez@ucsc.edu |
| 20 | Lopez, Laura | 5 | lopez@astro.ucsc.edu |
| 21 | Ma, Haitao | 6 | ma@ucolick.org |
| 22 | Medling, Anne | 3 | anne@astro.ucsc.edu |
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| 25 | Miller, Neil | 4 | neil@astro.ucsc.edu |
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| 29 | Patel, Shannon | 6 | patel@ucolick.org |
| 30 | Rashkov, Valery | 2 | vrashkov@ucsc.edu |
| 31 | Roberts, Luke | 3 | lroberts@ucolick.org |
| 32 | Rubin, Kate | 6 | rubin@ucolick.org |
| 33 | Ruhlen, Laurel | 2 | lruhlen@ucsc.edu |
| 34 | Schlaufman, Kevin | 4 | kcs@ucolick.org |
| 35 | Strickler, Rachel | 2 | rrs@ucolick.org |
| 36 | Wolfgang, Angie | 1 | mailto:awolfgan@ucsc.edu |

Faculty and Affiliated Faculty

ANTHONY AGUIRRE (Physics)

Phone: 459-2449 Email: <mailto:Aguirre@scipp.ucsc.edu>

Heavy-element enrichment of the intergalactic medium. Inflation, eternal inflation and "Multiverses"

REBECCA BERNSTEIN

Office: 281 ISB Phone: 459-2835 Email: rab@ucolick.org

Galaxy formation and evolution. Astronomical instrumentation and optical design.

GEORGE BLUMENTHAL (Chancellor)

Office: Kerr Hall Phone: 459-4291 Email: <mailto:chancellor@ucsc.edu>

Cosmological issues such as the role played by dark matter on the origin and evolution of structure in the universe, the generation of primordial density fluctuations and fluctuations in the CMB. George is currently Chancellor at UCSC and so his participation in the Department will be limited.

MICHAEL BOLTE (Director, Lick Observatory)

Office: 363 ISB Phone: 459-3896 Email: <mailto:bolte@ucolick.org>

UCO/Lick Director. Observation of old stellar populations in globular clusters and measurements of the ages and chemical abundances of the individual stars. Among other research interests are the dynamics of globular clusters, identifying the main sequence critical mass for white dwarf formation, and extremely metal poor (EMP) stars.

JEAN BRODIE

Office: 345 ISB Phone: 459-2987 Email: <mailto:brodie@ucolick.org>

Studies extra-galactic globular clusters systems, young massive star clusters, and galaxy formation. Brodie also works on instrumentation for astronomy, such as the development of a multi-object spectrograph.

HARLAND EPPS

Office: 191 Nat. Sci. Phone: 459-3454 Email: <mailto:epps@ucolick.org>

Optical design of high-performance astronomical instruments such as the LRIS and HIRES spectrograph cameras for Keck, Flamings-2 for Gemini-South, the BINOSPEC binocular spectrograph for MMT, among others.

SANDRA FABER (Dept. Chair)

Office: 101 CfAO, Phone: 459-2944 Email: <mailto:faber@ucolick.org>

Department Chair. Observational and theoretical studies of the formation and evolution of galaxies, including: stellar populations; black holes in galactic nuclei; dark matter; velocity fields; high-z galaxies. Also: adaptive optics and astronomical instrumentation.

JONATHAN FORTNEY

Office: 275 ISB Phone: 502-7285 Email: <mailto:jfortney@ucolick.org>

Planetary physics, with a goal of understanding planets as a class of astronomical objects. Fortney studies planetary atmospheres, the interior structure and thermal evolution of exoplanets, as well as brown dwarfs and our solar system's giant planets

GARY GLATZMAIER (Earth and Planetary Sciences)

Phone: 459-5504 Email: glatz@es.ucsc.edu

Develops global three-dimensional time-dependent computer models to study the structure and dynamics of the interiors of planets and stars.

RAJA GUHATHAKURTA (Graduate Program Director)

Office: ISB 271 Phone: 459-516 Email: raja@ucolick.org

Associate Department Chair. Observational studies of globular clusters, galaxies, and galaxy evolution, including: interacting galaxies; dwarf galaxies; faint blue galaxies; Tully-Fisher relation; dust and reddening; stellar populations; gravitational lensing; dark matter. Also: adaptive optics.

GARTH ILLINGWORTH

Office: 267 ISB Phone: 459-2843 Email: <mailto:gdi@ucolick.org>

Observational studies of high-z galaxies; galaxy formation and evolution, including: structure; kinematics; stellar populations. Also: space telescopes.

DAVID KOO

Office: 263 ISB Phone: 459-2130 Email: <mailto:koo@ucolick.org>

Observational cosmology: angular and redshift distributions of galaxies, quasars, and gas; clustering; stellar populations; galaxy evolution. Also: adaptive optics and astronomical instrumentation.

MARK KRUMHOLZ

Office: 273 ISB Phone: 459-1312 Email: krumholz@ucolick.org

Formation of massive stars and star clusters, origin of the stellar initial mass function, life cycle of molecular clouds.

GREG LAUGHLIN

Office: 279 ISB Phone: 459-3208 Email: laugh@ucolick.org

Theoretical astrophysics, including topics in planet formation and evolution; extrasolar planet searches; multiple-planet systems; dynamical interactions; evolution of the universe into the distant future.

DOUG LIN

Office: 337 ISB Phone: 459-273 Email: <mailto:lin@ucolick.org>

Theoretical astrophysics: star and planet formation; dynamical evolution of planetary, stellar, and galactic systems; galaxy formation; galactic structure; globular clusters and dwarf galaxies; interacting galaxies; astrophysical fluid dynamics; AGNs; accretion.

PIERO MADAU (Associate Chair)

Office: 361 ISB Phone: 459-3839 Email: <mailto:pmadau@ucolick.org>

Theoretical astrophysics, including: early structure formation; reionization; the intergalactic medium; universe at high-z; radiative transfer; high-energy astrophysics.

CLAIRE MAX (Director, Center for Adaptive Optics)

Office: 213 CfAO Phone: 459-2049 Email: <mailto:max@ucolick.org>

Adaptive optics instrumentation; science with adaptive optics; solar system science.

JERRY NELSON

Office: 215 CfAO Phone: 459-5132 Email: <mailto:jnelson@ucolick.org>

Design and construction of large telescopes, project Scientist for Keck telescope and Thirty Meter telescope, development of adaptive optics systems. Jerry is on leave this year working on the Thirty Meter Telescope project.

FRANCIS NIMMO (Earth and Planetary Sciences)

Office number: A219 E&MS Bldg. Phone: 459-1783 Email: fnimmo@es.ucsc.edu

Mars, icy satellites, planetary geophysics

JOEL PRIMACK (Physics)

Office: 322 ISB Phone: 459-2580 Email: <mailto:joel@ucolick.org>

Theoretical cosmology, including: nature and composition of dark matter; galaxy formation and evolution by analytic and semi-analytic methods; N-body and hydrodynamical simulations of structure formation and galaxy interactions.

JASON X. PROCHASKA

Office: 359 ISB Phone: 459-2135; Email: <mailto:xavier@ucolick.org>

Observational cosmology and galaxy formation, including: quasar absorption line systems, chemical abundances at high-z and in the Galaxy, missing baryons, high-z galaxy dynamics, star formation. Also: ISM, cosmological simulations, metal-poor stars.

ENRICO RAMIREZ-RUIZ

Office: 363 ISB Phone: 459-3400; Email: <mailto:enrico@ucolick.org>

Studies the violent universe with an emphasis on stellar explosions, gamma-ray bursts, and accretion phenomena near compact objects.

CONSTANCE ROCKOSI

Office: 261 ISB Phone: 459-5246 Email: <mailto:crockosi@ucolick.org>

Galactic structure, stellar populations, CCD detectors, astronomical instrumentation.

DAVID SMITH (Physics)

Office: 321 Natural Sciences II Email: dsmith@scipp.ucsc.edu

Studies high-energy processes in astrophysical sources (supernova remnants, neutron star and black hole binaries, classical novae, etc.) and solar flares via their x-ray and gamma-ray emission.

GRAEME SMITH

Office: 135 ISB Phone: 459-2907; Email: <mailto:graeme@ucolick.org>

Observational studies of old stellar populations; stellar evolution; Galactic chemical evolution; red giants; comets.

STEVE THORSETT (Dean, PB Sci Division)

Office: Dean's office PBS Phone: 459-5170 Email: <mailto:thorsett@ucolick.org>

Dean of Physical and Biological Sciences Division. Observational studies of compact objects, including: pulsar timing, dynamics, ages; neutron stars; GRBs, GRB afterglows. Also: radio observations; instrumentation; high-precision VLBI; GRB host galaxy observations; high-energy astrophysics.

STEVE VOGT

Office: 343 ISB Phone: 459-2151 Email: <mailto:vogt@ucolick.org>

Design and use of high-resolution spectrometers; extrasolar planets; quasar spectra.

STAN WOOSLEY

Office: 259 ISB Phone: 459-2976 Email: woosley@ucolick.org

Theoretical high-energy astrophysics, including supernovae and gamma-ray bursts. Also: stellar evolution, particularly of high-mass stars; hydrodynamics; nucleosynthesis; nuclear astrophysics.

ADJUNCT FACULTY**RACHEL DEWEY**

Office: 269 ISB Phone: 459-3081; Email: dewey@ucolick.org

Radio pulsars; astronomy education and outreach.

ADRIANE STEINACKER

Office: ISB 157 Phone: 459-2790; Email: <mailto:asteinac@ucsc.edu>

Magneto-hydrodynamical (MHD) simulations of protoplanetary accretion disks and the interaction between turbulent accretion disks and planetary cores.

ASTRONOMERS vs. PROFESSORS?

Some of our faculty (Professors) are entirely affiliated with the Astronomy & Astrophysics Department; others (Professor/Astronomer) are appointed 20%

with the department and 80% with the University of California Observatories /Lick Observatory (UCO/Lick). This does affect who teaches more classes but otherwise this is not a concern for graduate students. In all respects all faculty members are well-integrated in the department, and students may work with whomever they wish.

3.2 Projects/Acronyms

Members of UCSC Astronomy & Astrophysics are affiliated with large collaborations and other major projects. Here is a brief summary:

CfAO (Center for Adaptive Optics)

<http://www.ucolick.org/~cfao>

Astronomical images taken from ground-based observatories suffer blurring from turbulence in the atmosphere. "Adaptive optics" is a set of technologies and techniques for correcting these aberrations in real-time, resulting in images as sharp as those taken from space. The Center for Adaptive Optics is a major NSF-funded center based in Santa Cruz, but with member institutions from other campuses of UC and from across the nation. Claire Max is director of the CfAO; other Center faculty include Sandra Faber, David Koo, Jerry Nelson and Raja Guhathakurta. In addition, further researchers (Drew Phillips), a great host of postdocs, and several grad students are affiliated with the Center.

CELT/TMT (Thirty-Meter Telescope)

<http://www.ucolick.org/~celt/>

The University of California and Caltech are exploring the idea of a 30-meter telescope, and have dubbed this project the California Extremely Large Telescope. CELT has now merged with other partners and the whole project is called the Thirty-Meter Telescope. CELT and the CfAO are somewhat related because CELT is being designed for AO from the start. Jerry Nelson and Terry Mast (who were instrumental in the design and construction of the Keck telescopes) are working on this project. Other faculty affiliates include Mike Bolte, Raja Guhathakurta, Joe Miller, and Steve Vogt.

CODEP (Center for the Origin, Dynamics, and Evolution of Planets)

<http://natsci.ucsc.edu/codep/>

CODEP is the Center for the Origin, Dynamics, and Evolution of Planets. Over the next four years, CODEP will coordinate the hiring of four new faculty members, some in Astronomy & Astrophysics, some in other departments. CODEP affiliates in the Department include Peter Bodenheimer, Doug Lin, Steve Vogt, Connie Rockosi and Stan Woosley. Astrophysics grads also enjoy the valuable resources of some other CODEP faculty, including Gary Glatzmaier of the Earth Sciences Department (who is an expert on magnetohydrodynamics and dynamos) and Francis Nimmo (who is an expert on impacts within the solar system and other aspects of planetary science).

DEEP (Deep Extragalactic Evolutionary Probe)

<http://www.ucolick.org/~deep/>

DEEP is composed of researchers at UCSC in collaboration with researchers at Berkeley, Caltech, U. of Chicago, Hawaii, and Johns Hopkins, is a long-term Keck and HST project. The broad goals of this large-scale survey of distant, faint field galaxies include studying galaxy formation and evolution, the origin of large-scale

structure, the nature and role of dark matter, and the overall geometry of the universe. Phase I of DEEP, already complete, involved Keck observations with the then-current suite of instruments, and HST observations. The current phase of DEEP employs DEIMOS, a spectrograph for Keck just constructed at Santa Cruz, and SIRTf. Members of the DEEP team at Santa Cruz include Sandra Faber, Raja Guhathakurta, David Koo, and several postdocs.

GLAST (Gamma-ray Large Area Space Telescope)

<http://glast.gsfc.nasa.gov>

The Gamma-ray Large Area Space Telescope is a future NASA mission that should launch as early as 2008. It will study high-energy astrophysical phenomena, including but not limited to neutron stars and GRBs. Steve Thorsett is an interdisciplinary scientist on the GLAST team, and several faculty in the UCSC Physics Department are also involved.

HETE (The High Energy Transient Explorer)

<http://space.mit.edu/HETE/>

The High Energy Transient Explorer mission launched, and the project is under way. HETE's goal is to provide precise localizations of gamma-ray bursts. This will facilitate follow-up observations of the afterglows, and further our understanding of GRBs a great deal. Stan Woosley and Steve Thorsett are affiliated with the project.

HST (Hubble Space Telescope)

<http://www.stsci.edu/>

Of course, one of the premier instruments of astronomy today is the Hubble Space Telescope. Harland Epps was involved in the optical design of the NICMOS instrument; Sandra Faber was on the WFC team. Garth Illingworth is affiliated with the Advanced Camera. Many (if not most) researchers at UCSC work with HST data regularly.

NGST (Next Generation Space Telescope)

<http://ngst.gsfc.nasa.gov/>

A high priority in major astronomy funding over the next decade, the proposed Next Generation Space Telescope will be an orbiting 6-meter class telescope. It is intended to pick up where HST leaves off. Garth Illingworth has some connection to the project.

SCIPP (Santa Cruz Institute for Particle Physics)

<http://scipp.ucsc.edu>

The Santa Cruz Institute for Particle Physics is primarily concerned with accelerator experiments at SLAC and CERN but is also involved in particle and high-energy astrophysics. Missions include the Milagro cosmic ray airshower detector, the GLAST, Satellite, and the Atlas detector at CERN. In addition, SCIPP supports the work of theoretical cosmology. Joel Primack, George Blumenthal, and several members of the Physics Department faculty are

affiliated with SCIPP.

TASC (Theoretical Astrophysics Santa Cruz)

<http://www.astro.ucsc.edu/tasc/index.html>

TASC is a research unit spanning four affiliated departments: Astronomy & Astrophysics, Physics, Earth and Planetary Sciences, and Applied Mathematics. We work closely with each other and with experimentalists, instrumentalists, and observers at the University of California Observatories, the Santa Cruz Institute for Particle Physics, the Center for Adaptive Optics, the Center for the Origin, Dynamics, and Evolution of Planets, and the Institute for Geophysics and Planetary Physics

UCO/Lick (The University of California Observatories/Lick Observatory)

<http://www.ucolick.org>

The University of California Observatories/Lick Observatory is an organized research unit of the UC system. Lick Observatory, located atop Mt. Hamilton near San Jose, harbors 3-m and 1-m “workhorse” telescopes that are extensively used by faculty and graduate students. In addition, UCO/Lick administers the UC portion of access to Keck Observatory atop Mauna Kea, which is shared with Caltech. The twin Keck telescopes (10-m) are the largest in the world, and UCSC researchers make extensive use of this facility.

3.3 PhD Requirements

Please refer to the following document located on our webpage:

<http://www.astro.ucsc.edu/graduate/newgrad.html>

“Astronomy PhD Requirements for the Incoming Class”

Formal requirements are published in the UCSC Catalog under the Astronomy and Astrophysics program link.

<http://reg.ucsc.edu/catalog/index.html>

3.4 Courses

In your first two years (that's 6 quarters), you will take all required classes. In addition, you will need to register for at least one quarter of independent study with your advisor and TA for one quarter.

“MyUCSC” (<https://my.ucsc.edu>) provides students, faculty and staff access to a personalized portal full of campus resources. Through MyUCSC, students can register for classes; check grades, read news and updates, and much more. Graduate students are graded Satisfactory / Unsatisfactory or at a student option, a letter grade. (The consensus opinion is that there is no advantage to

opt for the letter grade)

Your performance in all courses taken for credit is also evaluated according to the Narrative Evaluation System. A narrative evaluation usually runs from one to four paragraphs in length and describes (1) the nature and requirements of the course (2) your strengths and weaknesses in the various aspects of the course (3) your general understanding of the course content. Narrative Evaluations are utilized during the Department Board Review (see section 3.7) and become a part of your official academic record.

You are required to take the following 11 courses:

Seven required courses: 202, 204, 205, 212, 220A, 230, 233

(All courses with the exception of "ASTR 205 Introduction to Astronomical Research" are offered in alternate academic year)

Four electives may be taken from the list of electives (see below).

List of electives:

Astr. 207, 214, 220B, 220C, 222, 223, 224, 225, 226, 231, 235, 237, 240A, 240B, 257, 260, 289,
Earth Sc. 275,
Eng. 206, 214, 217
Phys. 210, 215, 216, 217, 218, 227

Fall 2009 Graduate Courses:

ASTR 204 (G. Laughlin)
ASTR 205 (H. Epps)
ASTR 240A (C. Rockosi)
ASTR 257 (M. Bolte)
ASTR 292 Seminar

Winter 2010 Graduate Courses:

ASTR 202 (E. Ramirez-Ruiz)
ASTR 222 (D. Lin)
ASTR 235 (G. Laughlin)
ASTR 292 Seminar

Spring 2010 Graduate Courses:

ASTR 230 (M. Krumholz)
ASTR 240B (G. Illingworth)
ASTR 289C (C. Max)
ASTR 292 Seminar

Course descriptions (for those courses to be offered in 2009/10)

Please see our webpage (<http://www.astro.ucsc.edu/courses/graddesc.html>) for the complete description of all our courses:

ASTR 202 Radiative Processes

Survey of radiative processes of astrophysical importance from radio waves to gamma rays. The interaction of radiation with matter: radiative transfer, emission, and absorption. Thermal and non-thermal processes, including bremsstrahlung, synchrotron radiation, and Compton scattering. Radiation in plasmas. E. Ramirez-Ruiz

ASTR 204 Astrophysical Flows

Explores how physical conditions in astrophysical objects can be diagnosed from their spectra. Discussion topics include how energy flows determine the thermal state of radiating objects and how the physics of radiative transfer can explain the emergent spectral characteristics of stars, accretion disks, Lyman-alpha clouds, and microwave background. Enrollment restricted to graduate students. G. Laughlin

ASTR 205 Introduction to Astronomical Research

Lectures by UCSC faculty on current areas of astronomical and astrophysical research being carried out locally. H. Epps

ASTR 222 Planetary Formation and Evolution

Theory and observations of protoplanetary disks. Origin and evolution of the solar nebula. Formation and evolution of the terrestrial planets and the giant planets. D. Lin

ASTR 224 Origin and Evolution of the Universe

Introduction to the particle physics and cosmology of the very early universe: relativistic cosmology, initial conditions, inflation and grand unified theories, baryosynthesis, nucleosynthesis, gravitational collapse, hypotheses regarding the dark matter and consequences for formation of galaxies and large scale structure. (Also offered as Physics 224. Students cannot receive credit for both courses.) J. Primack

ASTR 226 General Relativity

Develops the formalism of Einstein's general relativity, including solar system tests, gravitational waves, cosmology, and black holes. (Also offered as Physics 226. Students cannot receive credit for both courses.) S. Profumo

ASTR 230 Diffuse Matter in Space

Fundamental physical theory of gaseous nebulae and the interstellar medium. Ionization, thermal balance, theory and observation of emission spectra. Interstellar absorption lines, extinction by interstellar dust. Ultraviolet, optical, infrared, and radio spectra of gaseous nebulae. M. Krumholz

ASTR 235 Numerical Techniques

Gives students a theoretical and practical grounding in the use of numerical methods and simulations for solving astrophysical problems. Topics include N-body, SPH and grid-based hydro methods as well as stellar evolution and radiation transport techniques. Enrollment restricted to graduate students. G. Laughlin

ASTR 240A Galactic and Extragalactic Stellar Systems

Structure and evolutionary histories of nearby galaxies. Stellar populations, galactic dynamics, dark matter, galactic structure and mass distributions. Peculiar galaxies and starbursting galaxies. Structure and content of the Milky Way. Evolution of density perturbations in the early universe. Hierarchical clustering model for galaxy formation and evolution. C. Rockosi

ASTR 240B High Redshift Galaxies

Galaxy formation and evolution from observations of intermediate-to-high redshift galaxies (z 0.5-5). Complements and builds on 240A. Cluster galaxies and field galaxies. Foundation from classic papers on distant galaxies. Recent discoveries from IR and sub-mm measurements. Impact of AGNs and QSOs. Overview of modeling approaches. Identify theoretical and observational issues. G. Illingworth

ASTR 257 Modern Astronomical Techniques

The physical, mathematical, and practical methods of modern astronomical observations at all wavelengths are covered at a level that will prepare students to comprehend published data and plan their own observations. Major topics include: noise sources and astrophysical backgrounds; coordinates systems; filter systems; the physical basis of coherent and incoherent photon detectors; astronomical optics and aberrations; design and use of imaging and spectroscopic instruments; antenna theory; aperture synthesis and image reconstruction techniques; and further topics of interest at the discretion of the instructor. M. Bolte

ASTR 289 Adaptive Optics and Its Application

Introduction to adaptive optics and its astronomical applications. Topics include effects of atmospheric turbulence on astronomical images, basic principles of feedback control, wavefront sensors and correctors, laser guide stars, how to analyze and optimize performance of adaptive optics systems, and techniques for utilizing current and future systems for astronomical observations. C. Max

ASTR 292 Seminar(no credit)

Seminar attended by faculty, graduate students, and upper-division undergraduate students. The Staff

3.5 Research

Right from the beginning the department wants you to focus on the research project. Ideally during the fall quarter you will meet faculty during the ASTR 292 seminar, and be able to choose one of first year projects they offer.

A good thing is to use the Independent Study course in the winter and spring to prepare for your project or to finish it up. Your first summer is coming sooner than you think, so start thinking about this! When you're done, if you can get a publication out of it, that's great. You must also give a talk (in the form of a FLASH, see below) on your Research Project.

You are not limited to the project; more published papers early in your career will greatly improve your resume for job applications later. It is certainly allowed (sometimes even encouraged) to change topics completely between your Research Project and your thesis. So don't worry that in your first year you are choosing the field you will spend the rest of your life on. Of course, if you find that you do want to continue in a certain specialty beyond the Research Project requirements, and into a thesis, well that's fine too.

FLASH

FLASH (the Friday Lunch Astronomy Seminar Hour) is a weekly talk given by visitors, faculty, postdocs, or grads. In connection with the Research Project, you must give a FLASH by the end of your 2nd year to finish the completion of this requirement.

3.6 Preliminary Exam

The prelim is a 5-hour written examination on graduate-level astronomy; astrophysics. The department offers the prelim every June. Any sections that you pass the first year, you will not have to take the second year. Your last attempt is in the summer after your second year.

We suggest you review past exams from previous years; this is the best way to grasp what level the exams are based on. Hard copies from previous years are in the main office ISB 201 and on our web page at:

<http://www.astro.ucsc.edu/graduate/prelim.html>

3.7 Board Review (Department Review)

The faculty reviews the progress of all students at the end of their second year. By the time of the Department Review, you should have completed your classes, your Research Project and its FLASH, and passed the prelim. However, passing the Department Review (sometimes called the Board Review) is separate from passing the Prelim—passing one does not necessarily entail passing the other.

"Passing" the Department Review typically, means being granted a Master's and being encouraged toward thesis work. In other instances you may be provisionally passed with the opportunity to re-take the prelim or an extension on your FLASH. In principle, the faculty could choose not to pass you.

3.8 Qualifying Exam

After completing classes, prelim, and all Research Project requirements, it's time to start thinking about a thesis. The Qualifying Exam is the place to propose and defend a thesis topic; that means you don't necessarily have to complete lots of the thesis work before this exam. The Qual is a defense-style exam: you give some presentation but also face comments, objections, and suggestions from your committee (three members of Astronomy Dept. plus one from outside). Students are encouraged to complete their Qual by the end of their 3rd year, and are required to do so before the end of their 4th. Upon passing the Qual, one becomes ABD student (advanced to candidacy, **All But Dissertation**). If you don't take the QE before the beginning of your 5th year in the program, you are not within the normative time.

When you are ready to proceed with your Qualifying Exam, please contact the department's Graduate Student Advisor, Maria Sliwinski. There are several documents, deadlines and fees due by various deadlines. Maria will assist you in coordinating all required steps with the Graduate Division.

MORE Flashes

You need to give a couple more FLASHes as you progress on your dissertation work; this is good practice for your thesis defense and all the talks you'll have to give as you apply for postdocs.

3.9 Defense

Finally, you must write a thesis and defend it in front of your Committee. The defense can be public, with graduate students attending as well. Your thesis should be composed of several publications you've written while you worked; that will help with your postdoc applications.

When you are ready to proceed with your Qualifying Exam, please contact the department's Graduate Student Advisor, Maria Sliwinski. There are several documents, deadlines and fees due by various deadlines. Maria will assist you in coordinating all required steps with the Graduate Division. Please also refer to the Graduate Division website for important information regarding the dissertation: <http://graddiv.ucsc.edu/regulations/handbook.php>

3.10 Advising

Your faculty advisors are of two types:

First-year academic advisor: "graduate shepherds" will be assigned from our department faculty. They will be keeping track of you in a general way through your second year until the Board Review. Address any academic questions you

have to them. It would be good to schedule a get acquainted meeting soon. The graduate shepherds for the 2009-10 academic year will be Professors Claire Max and Rebecca Bernstein.

Research supervisor: this is the faculty member who will advise you on your first-year research project. This is the first person here who will get to know you well. You may want to use this person for a letter of recommendation later. You may even wind up doing your thesis with this individual. Either way, this is a time to make a very favorable impression, so work very hard on this first project and be aggressive in contacting your advisor and working together closely. Visiting once per week is a minimum. Agree on milestones for the next week and follow through faithfully. Quarters in which you have fellowship funding provide particularly valuable research time.

Visits with research supervisors are of two types. The most frequent is the regular conference on the progress of a research project. The second occurs less frequently but is crucial and that is stepping back from the day-to-day activities and considering your future plans. This second type is easy to overlook in the press of day-to-day business. Consider using this timeline as a template checklist for the second type of visit.

The once-per-quarter required visits with advisors to fill out the Quarterly Advising Forms are intended to be used for the second purpose. Have one of the graduate Shepherds fill out your Quarterly Advising Form until you have found a First Year Project. After that have the form filled out by your research supervisor.

3.11 Department Events

Daily Coffee - There is an informal coffee/tea/cookie break at 10:30 am every day, which is a daily discussion of astronomy events and research with professors, postdocs and grad students. It takes place in the first floor open space of the Center for Adaptive Optics building. The web page for morning coffee discussion papers is: <http://cargo.ucsc.edu/coffee>.

Colloquium is on Wednesday afternoons. Cookies and coffee start at around 3:30pm, usually in the 1st floor open space of the CfAO. Then people wander up to Nat. Sci. Annex room 101, where the colloquium talk is actually held. The talk typically starts around 4:00. (See czars section for important info about colloquium cookies.)

On Wednesdays a group of selected graduate students take the colloquium speaker to lunch at the University Center. The food is great and is covered by the Department, so be sure and pay attention to those emails announcing lunch.

The FLASH - Friday Lunch Astronomy Seminar Hour - is held on Fridays at 12:30 in ISB 102. Bring your lunch and see a talk. Sometimes there are FLASH-like talks on other days, given names like MLASH, THLASH, etc. The talk schedule for a week is emailed out every Monday and is also posted on the UCSC Astro Google Calendar and News and Events Page: (http://www.astro.ucsc.edu/news_and_events/index.html)

Physics and Earth and Planetary Sciences: The Physics Department colloquium (http://physics.ucsc.edu/sem_news/index.html) is on Thursday afternoons, with a similar 3:30 cookies and 4:00 talk schedule. The CODEP seminars move around, the schedule may be found at <http://codep.ucsc.edu/>.

3.12 Your Department responsibilities; Czars

Every grad student who has not yet passed his/her Qual is needed to purchase and prepare cookies and coffee for the weekly colloquium. When it's your turn, you are to buy about \$20 worth of cookies and other goodies. You prepare the coffee, cookies, and set up the room where the refreshments will be served. You clean up after the colloquium, turn in your receipt to the office (Maria) to get reimbursed, and you're done. The Cookie Czar will explain all this to you as well. You may wonder why this is our job – the origins are lost to unrecorded history.

Various other responsibilities are delegated through czarships. In principle, czars are elected democratically by the grads; in practice, czars often choose their successors and the voting is a formality. As the name suggests, czars typically have complete reign over their domain. Czars are determined in a meeting held in the fall, long enough after you get here that you'll have figured most of this out.

Czar Czar: Serves as a voice for the grad students in interactions with the faculty, goes to faculty (or subcommittee) meetings as appropriate for issues affecting grads, interacts with the dept. manager, assesses mood of grads, interfaces with dept to keep guide up to date.

RSI: Grads often suffer from repetitive stress injuries; this person interacts with the appropriate part of UCSC to make sure our desks are set up ergonomically.

Head TA: Runs training for new grads; available as a resource throughout the year.

NICS Computing: Interacts with faculty, NICS, and the academic computing group.

Colloquium Supplies: Manages the schedule of which grad sets up supplies, and handles the replenishment of said supplies.

Colloquium Lunches: A group of grads has lunch with the colloquium speaker every week; this person organizes the schedule

of who manages the lunch.

Morning Coffee: Organizes schedule. Now the dept handles *getting* supplies, which makes this job easier.

Grad Store: Supplies and handles the finances of the "Grad store", which is ISB 255 and has drinks, snacks, and some meal items.

Telescope: Keeps track of the dept. telescopes; helps out with faculty who have (small) telescope needs.

Space: Interacts with peter and the department office to figure out how to get everyone into the space we have, and organizing annual moves.

Ask-an-Astronomer: Handles questions from the public, maintains Ask an Astronomer web page.

Admissions: Participates on the annual admissions committee with designated faculty members.

Prospective: Coordinates prospective grad student visits. Is main point of contact (other than Raja) for prospective students.

Note: (Czars are selected in Fall for the next academic year)

3.8 Computing

Currently, computing is split between the astro network (astro.ucsc.edu) and UCOLick network (ucolick.org). Incoming students are generally put on the astro network to begin with. Once you have found an advisor, they should get you an account on the UCOLick network and a computer to connect to it. You should expect to make this transition by sometime in your second year.

Astro Network

The astro network is managed by Ramon Berger (astrohelp@acg.ucsc.edu). When you arrive and figure out where you are going to sit you should contact him to have him install a thin client at your desk – if you want a thin client. The alternative is that you could choose to bring your own computer and SSH into the astro network to use these resources when necessary (only recommended if the computer is a mac or linux/unix machine). The astro network does provide software (IDL, IRAF, Mathematica, ...), disk space, and printing, but it is the recent policy that email and websites are no longer supported. This is because these services are available campus wide. For specific reference information about this network, what software is provided, how to setup your website, email, and other issues go to <http://ucscastronetwork.wikidot.com/>.

If you have problems you can also contact the Grad Astro Network Czar, which is currently Neil Miller (neil@astro.ucsc.edu).

You can connect to the astro network by sshing to "saturn.ucsc.edu." This is also the same computer that you are using with the thin clients.NICS

UCOLick Network

The UCOLick network is the network for the University of California observatories and is therefore used by people in the department, as well as people affiliated with Lick observatory. Network, Information and Computing Services (NICS) administer the UCOLick network and provide support for machines connected to the network. This is the network you will spend the most time on while at UCSC, although you will probably not start off on it. When you get an account, you will be provided with an e-mail account an account on all public UNIX machines with a home directory, and space for a homepage (which will have the address www.ucolick.org/~username). Additionally, you will be able to connect a machine to the network, either as a managed or an unmanaged host as detailed below.

Resources

Generally, if you have problems with or want to figure out how to get something done on a machine connected to the UCOLick network, the first place to look is nics.ucolick.org. The Answers section contains information about setting up printers, e-mail, software available on the network, and many other topics. You should also note that this is a Wiki, so you are free to update it with anything you think others might find useful. If your questions aren't answered there, you can shoot off an e-mail to nics@ucolick.org. They will generally get back to you and have someone help you with your problem, but sometimes help tickets get lost or forgotten. Often, it is useful to go talk to someone face to face about your issue. The NICS offices are located on the bottom floor of Natural Sciences II.

There is also a grads computing czar, who you should feel free to talk to or e-mail about any questions or complaints you have about the UCOLick network. They should be able to help with some problems and provide advice. Additionally, the computing czar sits on the NICS advisory board (the CPMC) as the grad representative, and can bring up issues at monthly CPMC meetings.

When there are problems with the entire network, NICS generally posts information at nics.ucolick.org/BreakingNews. So if you are having problems connecting or some such, it is generally a good idea to look at breaking news to see if there is explanation there. In the event that the whole network goes down, and therefore you can't access anything at ucolick.org, including the breaking news section, there is a Google group at <http://groups.google.com/group/ucolick>, which also has updates. This has happened in the past and the Google group was very useful.

E-Mail

Your e-mail account will have the address username@ucolick.org. You can receive e-mail from the account using either the POP or IMAP protocol. The respective servers for these are pop.ucolick.org and imap.ucolick.org. NICS

recommends using IMAP. E-mail is sent through `smtp.ucolick.org`. This server requires password authentication, but can be accessed from outside the UCOLick network. Webmail access is provided at `webmail.ucolick.org`. You should note that your e-mail password is different from your user account password.

Managed host vs. unmanaged host

When you get an account on the UCOLick network, you will generally want to get a machine and hook it up to the network. You can choose to either have the machine connected as an unmanaged or a managed host. With an unmanaged host, you are provided with a network connection, a static hostname, and some level of support (although NICS does not explicitly offer hardware and software support for unmanaged hosts, they are usually helpful if you come to them with hardware problems). Unmanaged hosts have access to all software licenses on the UCOLick network; this includes things like Matlab and IDL. All administration of the machine is up to you and no backup services are provided. If you are at all comfortable with administering a machine, an unmanaged host is generally the better option, as an unmanaged host gives you significantly more control.

If you would like more support, you can have NICS manage your machine. In addition to the services provided to an unmanaged host, NICS will back up managed machines every other day and they explicitly provide support for both hardware and software. In terms of support, the big difference when your machine is managed is that NICS will install and update software for you. This can be both good and bad. On the positive side, for most software packages, they know what they are doing and can save you significant amounts of consternation. The downside is that it sometimes takes a significant amount of time for them to get it done, as many people are competing for their time. Having a managed host also makes your home directory directly available from any other computer on the network (of course as long as a user has the correct permissions to see it). It should also be noted that it costs your advisor a little more a month to pay for a managed host than an unmanaged one.

Public Machines

There are a number of public machines that you have access to as a user on the UCOLick network. Arguably, the most important is `ssh.ucolick.org`. If you are trying to connect to any machine on the network remotely, you first need to ssh into `ssh.ucolick.org`. The ssh machine will then forward you to some other machine on the network. Logging in through this machine can be somewhat obnoxious if you want to use something like scp or svn that needs to directly talk to a machine. Most of these problems can be worked around by ssh port forwarding. There is some information about how to do this on the NICS website.

The other available public machines are rumba, salsa, and mambo. In your home

directory on these machines is your public_html directory, where you can put your website and anything else you want accessible on the web.

Available Software

On public hosts, most standard UNIX applications are available. Additionally, many programs commonly used in astronomy are installed (such as IRAF). NICS also provides licenses for various pieces of software (such as IDL and Matlab) through the network so that you can run these programs on private hosts. A partial listing of software is available in the answers section of the NICS website. If the software you want is not available and you cannot install it, you should definitely contact NICS about possible options.

Printers

For a list of printers publicly available on the network, go to nics.ucolick.org/Answers/Printing/Public.

3.14 Funding Support

Assuming you don't have external support, you need to secure funding for the next quarter, every quarter. That is, suppose your Department fellowship is up (if you have one at all) after, say, two quarters. Then sometime during the winter quarter you need to find someone to do research with during the spring, or else sign up to TA in the spring. The Department fellowship given in the first year is the only real instance of "free" money - for the rest of your time you will need to GSR or TA (barring external support).

The gross pay for a GSR in our department before advancing to candidacy (prequal) is "Step 5", (\$1,860/mo.). The following quarter upon advancing to candidacy the pay increases to "Step 6" (\$1,946.50/mo). One year later, the pay increases again to "Step 7".

TAs and GSRs are paid at the beginning of each month, for the previous month. This means you may not get paid until November 1, depending on when you joined the payroll. If you are on a fellowship, you will be paid once at the beginning of the quarter - make sure the money lasts! It is possible to take out federal student loans while in graduate school. Not necessarily a bad thing, but be careful.

3.10 Miscellany

Your address at the mailroom (ISB 260) is as follow:

Your name

UCO/Lick Observatory

UCSC, Astronomy Department/ISB

1156 High Street
Santa Cruz, CA 95064

There are some office supplies in ISB 201. You are welcome to help yourself with needed items. The copy machines take copy-cards, not real money. When TAing, the Department can issue you a copy card for that purpose; similarly your research advisor can usually get you a copy card that deducts from his/her grant. For personal use, you need to purchase a copy card from one of the libraries, and maintain money on it.

You need a sticker from the department office at the beginning of each new quarter, which goes on the front of your student ID. This indicates that you are currently enrolled; without the sticker your ID has essentially expired, meaning you can't ride the bus for free and can not use the library.

4.0 The University

4.1 What's where, campus facilities

You may want to keep a campus map with you for a while, if you plan to be walking those footpaths and trails through the redwoods. Just getting from the ISB over to seemingly nearby places like McHenry Library or the Hahn Student Services can be confusing at first.

Science Hill

The astronomers and physicists are in the ISB, which is in the middle of "Science Hill", adjacent to Natural Sciences II, the Earth & Marine Sciences building, and the Center for Adaptive Optics building.

Student Union

The campus doesn't really have a student union in the sense that many other campuses do, but we didn't know what else to call this section. There's a region of campus east of ISB where the Bay Tree Bookstore and Graduate Student Commons are located. Incidentally, ID card services are located adjacent to the bookstore.

Cashier, Registrar, etc.

The campus cashier registrar and financial aid offices are all located in Hahn Student Services, between the bookstore and McHenry Library.

Libraries

The main university library is McHenry, located south/southeast of ISB along a couple of footpaths. You can buy a personal copy card there, among other things. The Science Library, more likely to be of use, is north of Nat. Sci II.

Mail

Outgoing campus mail and US mail can be dropped in the appropriate mailbags in the Department/Lick mailroom, ISB 260. There is a US Post Office located in Baskin Engineering, on its west side, lowest floor.

Restaurants and coffee carts

All the restaurants and coffee carts are listed on <http://housing.ucsc.edu/dining/locations.html>. You can also buy a sandwich or a salad from the "lunch lady". She comes to the hallway next to the main astronomy office (ISB 201) around 10:30am each day.

4.2 Structure

The University is organized by Divisions and Colleges. The undergraduate program revolves around the residential colleges (Kresge, College Eight, Porter, etc.), while academia for undergrads and grads involves the divisions. For instance, our department is a part of the Division of Physical and Biological Sciences. If you are ever asked what college you belong to (on a form for example), just say you are a grad student. This is confusing because really, we have no college, but there is a Graduate Division.

So for your purposes, the only relevant levels in the hierarchy are the Physical and Biological Sciences Division, through which you get paid when you TA (among other things), and the Graduate Division, which sets things like the deadlines for submitting one's PhD materials, thesis guidelines, etc. Many activities, such as registering for classes, changing your address with the Registrar, and more, can be done online. Use student portal for that at <https://my.ucsc.edu/>.

4.3 Transportation and parking

The University runs shuttles around the campus (Loop), (Perimeter) and (Core), free of charge. Maps with the various routes are at <http://www2.ucsc.edu/taps/maps>.

The Santa Cruz bus system has a series of bus routes numbered between 10 and 19, which service the University and own and are free to students during academic quarters. Their routes and other information are available at <http://www.scmtd.com>. Parking is expensive. Permits are available to grads are listed at <http://www2.ucsc.edu/taps/students>.

5 Santa Cruz and environment

5.1 Geography

Basic geography: the greater Santa Cruz area occupies the northern end of the Monterey Bay. Several towns merge smoothly together to form this area: from west to east they are Santa Cruz, Live Oak, Capitola, Soquel, and Aptos, with of course other small places too that we didn't name. Continuing around the Bay along Hwy 1, one arrives at Watsonville (important for your purposes because it hosts the local Target!) after 12-15 minutes' drive. Continuing on you eventually get to the other "end" of the Monterey Bay at Monterey itself. So, the immediately adjacent towns that you might see, for instance, in housing listings, are: Santa Cruz, Live Oak, Capitola, Soquel, Aptos, along the Bay roughly from west to east; in the hills north of Santa Cruz along Hwy 9 (and the San Lorenzo River) are the towns (from south to north) of Felton, Ben Lomond, and Boulder Creek; north of the campus along Empire Grade is Bonny Doon; Davenport is northwest of Santa Cruz along Hwy 1; north along Hwy 17 is Scotts Valley. The urban areas of the San Francisco Bay are closest "over the hill" at the South Bay - San Jose, Santa Clara, etc. This can be a 30-minute drive over Hwy 17, or much longer depending on traffic. All the larger cities from San Jose up to San Francisco (on the west side of the Bay) or up through Oakland and Berkeley (on the east side of the Bay) are easily two hours' drive from Santa Cruz, and often much shorter depending on traffic.

5.2 Housing

There is University housing for graduate students. The rent is expensive even by Santa Cruz standards, \$781 per month and going up every year. This buys you a room in a four-bedroom apartment with other grads. For more, check out <http://www.housing.ucsc.edu>

If you are married, in a domestic partnership, or have children or other dependents, you are eligible for Family Student Housing. Those with children are given priority; the rent is \$1131/month, which buys you a two-bedroom townhouse. This is a great deal in Santa Cruz. Check them out at <http://www.housing.ucsc.edu/housing>.

For living off-campus, the University has the Community Rentals Office where there are many listings. They are physically located in Social Sciences II, but you can now access the listings online at <https://housingweb.ucsc.edu/cro/welcome.asp>

OK, you're probably aware that getting housing in Santa Cruz is a challenge. If access to the University by bus, bike, or easy commute is important to you (as

it is to most), then you probably want to live in "Westside" Santa Cruz (west of the river), or in "eastside" Santa Cruz or Live Oak. As you move further east to Capitola, Soquel, Aptos, etc., you will find that you have to transfer bus routes to get to the University, or that your 12-minute car ride becomes 50 minutes during rush hour.

It's hard to pin down what a "typical" rent is; it of course depends on how great the place you're renting is. It is possible to pay less than \$500/month, but that is becoming rare. So, expect that you may need to fork out first and last month's rent plus a deposit in order to move in to a place - that could be \$1500-\$2000. Finding housing is a bit of a game. You are in competition with lots of other students, but remember that many of them are undergrads. You stand out if you present yourself differently. Rather than calling yourself a "student", emphasize that you are a "PhD student" or something similar. Don't assume that a potential landlord knows what a grad student is, or that it differs from an 18-year old college freshman. Pursue housing actively; passively leaving messages and waiting for calls back may work eventually but will take much longer than you'd like.

If you need references, Maria in the Department office, or perhaps a faculty member, will confirm your salary and status with the university. Note: one of the best deals in town is faculty/staff housing. Most of the time you will be able to see the ad for one year for two bedroom condo without garage, but very close to the university. The complex is located on Hagar Court and most of the occupants are faculty who take off one time or another and lease those places. They are small but very good deal considering location. Most of them rent/lease for \$1300-1500 per month.

5.3 Transportation

It is possible to live in Santa Cruz without a car. The bus system is pretty good, and free to enrolled students during academic quarters. Some service is available directly from where you might live to the University; from other locations you might have to transfer routes. Some public transport is available to get over the hill - via the Santa Cruz route that goes over 17, or via Greyhound and other bus services. Once over the hill it is not hard to make one's way to the Bay area's transit options like BART and Cal train.

There is a lot of support for bicyclists: bike racks on buses, a University van with bike trailer from Mission (next to Longs Drugs) to campus each morning up to 1:00pm. bike racks for BART and Cal Train, (for more info at: <http://www2.ucsc.edu/taps/>).

Most who have lived in Santa Cruz without a car gave in after a year or so - it is pretty difficult and time-consuming to go to the city or go to Target in Watsonville without a car.

A Useful Websites:

Santa Cruz Property Management:

<http://santacruzproperty.com/listings.cfm>

Bailey Properties <http://baileyproperties.com/rental>

UCSC Main Rental Office on/off campus:

<http://www.housing.ucsc.edu/housing/offcampus.html>

UCSC Community Rentals: <http://www.housing.ucsc.edu/housing/croforms.html>

Santa Cruz Sentinel listings: <http://www.santacruzsentinel.com/>

Department and UCSC

Department.: <http://www.astro.ucsc.edu/>

Directory: <http://natsci2.ucsc.edu/astro/>

UCO/Lick: <http://www.ucolick.org/>

Center for Adaptive Optics: <http://cfao.ucolick.org/>

Astro talk schedule: <http://astro.ucsc.edu/~Department/talks/>

Physics colloquium schedule:

http://physics.ucsc.edu/sem_news/index.html

Grad Astro Seminar: <http://www.ucolick.org/~novak/Gas/>

Our Ask-An-Astronomer: <http://www.ucolick.org/~mountain/AAA/>

UCSC Schedule of Classes: <http://reg.ucsc.edu>

Teleslug: <https://pisa.ucsc.edu/prd/sr0060/>

Cashier: <http://sbs.ucsc.edu/cashier.html>

Financial Aid: <http://www2.ucsc.edu/fin-aid/>

Registrar: <http://reg.ucsc.edu>

Academic Calendars: <http://reg.ucsc.edu/calendar>

Transportation and Parking: <http://www2.ucsc.edu/taps>

Bay Tree Bookstore: <http://slugstore.ucsc.edu/>

Grad Commons: <http://www2.ucsc.edu/gradcommons>

GSA: <http://www2.ucsc.edu/gsa>

UCSC Arts ; Lectures Series: <http://events.ucsc.edu/artslecs>

Grad Student Housing:

<http://www.housing.ucsc.edu/housing/graduate.html>

Family Student Housing:

<http://www.housing.ucsc.edu/housing/family.html>

Santa Cruz and environs

Santa Cruz Metro Transit (bus system): <http://www.scmttd.com>

When is the next bus off campus? <http://www.ucolick.org/cgi-bin/Tcl/nextbus.cgi>

Bay Area Rapid Transit: <http://www.bart.org>

Cal Train: <http://www.dot.ca.gov/dist05/>

What movies are playing, when?

<http://www.metroactive.com/movies/times-sc.html>

Was that an earthquake? Where? How big?

<http://quake.usgs.gov/recenteqs/latest.htm>