

UNDERGRADUATE RESEARCH

GETTING STARTED

1. **Make a list** of the subjects that really interest you and that you'd like to explore.
2. **Decide what you could gain** from working on a project—such as simply learning more about a field of study, being better prepared for a future career, and working closely with faculty and graduate students who can offer professional guidance and mentoring.
3. **Check out UCSB web pages** to identify researchers working on projects that interest you. You might want to sit in on an upper-division class to get a sense of a subject's scope.
4. **Tell your professors of your interest** after class or during office hours. Make a specific appointment to discuss.

Before your appointment, read about the general research area and, perhaps, read one or two published papers before your meeting. Published papers are listed on faculty web pages.

Develop a description of up to a page explaining why you want to do research and why a faculty mentor should want to work with you. Include information on your major, if you have identified it; background courses you have taken; and time availability and commitment (number of quarters you will be available; hours per week; times available). Be sure the faculty member knows how to get in touch with you.

5. **Talk with the academic adviser in your major.** (And don't limit your thinking to just one discipline. Most UCSB professors work in at least two fields, and 20 percent of all faculty have appointments in more than one department.)

Reference: http://research.ucsb.edu/undergrad/get_started/index.shtml

Pre-Requisites: You must earn a 3.0 grade point average or higher for three consecutive quarters before you start research. This shows that you have the potential to understand the concepts you need to succeed in your research. You will need to be able to manage your time and balance your class work and research to maintain a 3.0 GPA.

Graduate schools require a 3.0 grade point average to be accepted into their programs. You will also need to take GRE exams and have letters of recommendation from faculty members. You need research experience to show that you understand the commitment required to becoming a successful graduate student.

Research: Doing research can be very exciting. You work with other members in a research group to collect and analyze data, write up the results and plan future experiments. You share your work with colleagues within your research group and at professional meetings. Research will help you learn how to work effectively with group members and develop communication and presentation skills. You will also learn how to ask questions, how to think about questions and answer questions. A researcher may not be ready to answer

certain questions until more advances are made in their field of research. Research is all about asking questions and finding answers.

Do not limit yourself to doing the grunt work. For example, if glassware needs to be washed it is something everyone needs to participate in, you should not be washing everyone else's glassware.

Why do you want to do research? To be successful in research, you must be very excited and interested in doing a project. Research can be very time consuming and there will be days where you work very hard and nothing ends up working or the data collected are not the results you need.

SUCCESS IN RESEARCH REQUIRES BOTH OPTIMISM AND PERSISTENCE.

People who have high levels of hope and who are optimistic, routinely have higher perceptions of psychological and physical well-being because they are more action-oriented, more effective at coping with stress, more willing to confront, more likely to put a situation in the best possible light, and more able to grow personally from difficult situations.

Reference: Successful College Teaching Problem Solving Strategies of Distinguished Professors by S. A. Baiocco and J. N. DeWaters, Pub. Allen & Bacon 1998.

<http://research.ucsb.edu/undergrad/>

Programs and Funding

Research Internships in Science and Engineering (RISE) The RISE Program is sponsored by the Materials Research Laboratory, the Advanced Optical Materials IGERT, and the California NanoSystems Institute located at the University of California, Santa Barbara

UC LEADS is a two-year enrichment program for UC juniors and seniors in science, technology, engineering, and mathematics. The goal of the UC LEADS (Leadership Excellence through Advanced Degrees) program is to educate California's future leaders, by preparing promising undergraduate students for success in UC graduate science, technology, engineering, and mathematics programs.

There are several other research programs on this website so check it out.

Getting the most out of the relationship with your research advisor:

Meet regularly: Meet once a week or at least every other week because it gives you motivation to make regular progress and it keeps your advisor aware of your work.

Prepare for you meetings. Come to each meeting with the following:

- List of topics to discuss
- Plan for what you hope to get out of the meeting
- Summary of what you have done since your last meeting
- List of any upcoming deadlines
- Notes from your previous meeting

Plan of action:

- After the meeting write a new summary of what you think you will be working on As you write, questions are likely to come up and need to be discussed with your advisor or coworker before you continue doing research
- Write a to do list for yourself
- List of related work to read

Show your advisor the results of your work as soon as possible – this will help your advisor understand your research and identify potential problems early in the process. You may need to do additional experiments to determine what variables affect the results.

Getting the most out of what you read:

Be organized: Keep an electronic bibliography with notes and pointers to where you have filed the paper (keep and file all the papers you have read or skimmed)

Be efficient – Only read what you need to:

- Start by reading only the conclusion, scanning figures and tables, and looking at their references
- Read the other sections only if the paper seems relevant or you think it may help you get a better perspective

Take notes on every paper you find worth reading:

- What problem are they trying to solve?
- What is their approach?
- How is it different from other approaches?
- What questions were left unanswered?

Staying Motivated

- When you meet your goals, reward yourself
- Don't compare yourself to senior researchers who have many more years of work experience and publications
- Don't be afraid to leave part of your research problem for future work

Exercise

Take a break, do something fun

Reference: Go to Stanford University Website, search for Graduate Student Survival Guide

APPLYING TO GRADUATE SCHOOL

When you apply to graduate schools you will be invited to visit the campus, meet with faculty, staff, graduate students and other perspective graduate students. When you meet with faculty you can ask how many years his or her students take to finish their Ph.D. and how many students have finished in the last ten years and what positions or jobs they have. How many papers do their students publish during their graduate studies? It's best to write and publish papers as you collect the data - waiting to write up your results in your thesis is overwhelming. Also, as you write, problems can come up that were unforeseen so you have to go back and do more experiments before you can complete and publish a paper.

Do grads write their own papers? Do students collaborate on projects? Does the group do both experiment and theory? This is important if you want to get a better understanding of your experimental results. Does the group collaborate with other groups within the department, other departments on campus, or with groups at other universities? Do their grad students attend conferences and give talks at these conferences? Does the advisor help provide support to travel to conferences?

Also, how long are their grads expected to teach? Are grads supported from a research grant in the summer? This is very important. If your advisor provides no support for the summer you have to teach all the time and your progress slows down. You need the summer to concentrate on just research (no classes, no teaching), and you need to get paid for doing research in the summer.

Most graduate schools will cover out-of-state tuition. It is important to make sure your out-of-state tuition is covered.

It would be best if the grad school you choose has at least two or three groups that you may like to join. To find out if you want to work for someone it is important to talk with graduate students and post-docs in the group. In a group where they have both grads and post-docs, you can work with both to make progress quickly. Ask members of the group how they interact with their advisor. How often do they meet with him/her? How often do they have group meetings? And how often do they present at group meetings, conferences, etc.

Deciding what group to work for is a very important - so most of our students do not join a group until winter or spring their first year. Some do a 6 week rotation in the groups that they think they want to join to figure out what works best for them.

It is also important to feel good about where you will be living. You will most likely be there for four to five years so it is important to be in a place you enjoy.

MD/PhD: If you are planning to do research in the medical field it is important to get involved with research as an undergraduate student. If you are not planning to apply to an MD/PhD program doing research will not necessarily help you become a better Medical Doctor.

AVOID doing research because you want to list this as an item on your resume or to obtain a letter of recommendation for medical school! This will most likely not work out well for you or your research advisor. Get involved with research only if you are very excited about your project.

MEDICAL SCHOOL or other HEALTH PROFESSIONS: Your academic history must demonstrate you have the capacity to understand the concepts. Work experience is essential. You must do things to show that you are interested in a given health profession and that you understand and will be able to meet the demands of the profession from an intellectual and personal perspective. You will need letters of recommendation from faculty in science. You can get to know faculty during office hours, field trips or outreach programs. Show your interest in the subject by asking questions from lecture, from homework or questions beyond the text.

OTHER OPPORTUNITIES: You can volunteer in a hospital, doctor's office, in the Raggedy Ann & Andy Program, the Chemistry Outreach or other Outreach Programs on campus. You can also apply to tutor for CLAS.

TUTORING CLAS: CLAS tutors are much more than just someone to help students learn subject matter. CLAS tutors are chosen because they can also serve as mentors for students. A CLAS tutor must be aware of their audience, be sensitive to individual students, and have excellent teaching and communication skills. You must be able to keep things in perspective, manage your time well and able to balance your work and personal life.