

Been there, Done that :

**What you need to know in
starting an undergraduate
research career**

August 31, 2005

Undergraduate Research at Rochester

What is research?

Research is the systematic pursuit of knowledge and an exciting process of discovery. And it's not just for scientists! Every field of study has its own research problems and methods. As a researcher, you seek answers to questions of great interest to you. Your research problem could be aesthetic, social, political, scientific or technical. You choose the tools, gather, and analyze the data that will help you delve deeper and find answers.

Why should I do research?

To challenge yourself, to contribute to knowledge, to learn more about something that interests you passionately, to see if you want to go to graduate school, or to top off your undergraduate career with something you are really proud of - a capstone research project!

What is distinctive about research at UR?

The University is a major research institution with world-class faculty, laboratories, and libraries. It has a long-standing commitment to make these resources fully available to students as part of their undergraduate education. Because the University of Rochester has a small undergraduate population relative to many research universities, almost any student with a strong interest in doing research will be able to do so once he or she has an appropriate level of academic preparation. This means that if you are eager to investigate a subject in depth, whether it is the AIDS virus, voting patterns in the last presidential election, or the history of animated cartoons, we encourage you to seek a faculty "sponsor" - someone with the expertise to advise you - and start investigating your subject.

How is undergraduate research supported at UR?

In almost all cases, students seeking to do research will need the support of a faculty member. In addition, there are courses in almost every department that introduce students to research methods, or otherwise integrate research experience as part of the course. Students also may undertake research either for credit (for example, independent study courses, senior or honors theses, or the Senior Scholars Program) or for pay (for example, work/study, student research assistantship or internship). Several departments in the College also offer summer undergraduate research programs. An in-depth summer research experience is one of the best ways for students to get started and find out what doing research is really like.

How do I get involved in research?

1. Visit the Undergraduate Research and Mentoring Website < <http://www.rochester.edu/College/ugresearch/about.html> >
2. Visit the Journal of Undergraduate Research 's (*jur*) research opportunities website < <http://sa.rochester.edu/jur/research> >
3. Talk to faculty about research. Come to class early or talk to them after lecture. Make use of office hours as well.
4. NETWORK! Attend poster sessions, talks, workshops, seminars, etc... Chances are, you'll meet someone who share the same research passion with you, which can lead to working on the same project together.
5. Speak to your major advisor about research opportunities in your home department.
6. Investigate the independent research opportunities that are available in virtually every department! (i.e. IND 395, Hour, Women's Studies, etc..)
7. It's never too early to start thinking about summer internship programs. There are a lot of summer research opportunities available on campus.
8. Talk to everyone you can think of about your research ideas and ask for feedback and advice. By all means, e-mail the speakers who talked about their research. They are more than happy to help you.

Speaker Profiles

The Humanities and Social Sciences

Sam Boyer

Class Year 2006 (2007 T5)
Major Medieval Studies and Linguistics, T5 in International Politics and Culture

Research "Law and Society in Later Medieval England." (Medieval Senior Thesis)
A series of case studies examining interrelations between legislation and society in England ranging from 1215 to 1400. The case studies include circumstances surrounding the Statute of Treasons in 1352 and the English conquest of Wales in 1282, as well as some others yet to be determined. This project will be the culmination of several years' worth of related work.

"Media Use and Misuse of Terrorism-Related Terms." A longitudinal examination of the evolution of Western media use of terms like 'Terrorist,' 'Arab,' 'Islam,' and other such terms.

"Research is an intense and personally demanding process. Not only does truly good research require every inch of my mind to produce, but it takes my education to a whole new level. The methodical nature of it unlocks new ways of looking at the world, exponentially increasing the sophistication with which I look at the people and forces around me. Even something as seemingly esoteric as combing through centuries-old legal records has changed the way I process information on a daily basis, making me a better, wiser, and more patient person."

Rebekka Puderbaugh

Class Year 2006
Major Linguistics

Research I have been working with the Linguistics and BCS departments on various eye-tracking experiments including several dealing with reflexives and pronouns (also known as 'anaphors') in 'picture-NPs.' Eye movements

happen so quickly that they are almost unconscious reflexes. Knowing this, we can use state-of-the-art eye-tracking equipment to learn things about language processing (as well as other cognitive functions) that have never before been available to us for study. 'Picture NPs,' or noun phrases, are special in that they point out a possible area of overlap between pronouns and reflexives that was thought theoretically not to exist. Results from these studies inform this theory and support its development as an explanation of how anaphors function in language. My role in these studies has primarily been that of Research Assistant, performing duties around the lab such as running subjects, setting up new experiments and coding data from past experiments. As I have gained more experience with the process of collecting and interpreting data, I have become a more important part of the research groups dealing with these topics, attending lab meetings and preparing new experiments more independently.

“What I enjoy most about my research is developing close ties to the department and really getting to know professors, postdocs and grad students. These relationships are just as important as the research experience itself as they allow you to really get a taste of what it’s like to work in academia while also providing you with a strong base upon which to build your academic and research network.”

The Natural Sciences

Emileigh Greuber

Class Year 2007

Major Molecular Genetics

Research Dephosphorylation of G-Protein Coupled Receptors (GPCRs). I spent last summer doing an internship through the University of Rochester School of Medicine and Dentistry GEBS Scholar Program. I worked in the Department of Pharmacology studying at what stages in the endocytic pathway GPCRs are able to dephosphorylate.

“I’ve always been interested in biology, but getting a chance to work in a laboratory and try to answer questions that have not yet been answered is such a wonderful experience. What I’ve learned in lecture classes becomes more interesting and I was able to learn so much.”

“The three most important things to consider... First, stay focused on your studies. By working diligently in the lecture classes you'll be able to know if biology truly interests you and your hard work may impress faculty to invite to work in a lab. Second, make connections with faculty. Going to office hours, researching faculty websites, and getting a part-time job in a lab are all good ways to find out if laboratory research appeals to you and what areas of research you might enjoy. Lastly, work with your faculty mentor, graduate students and research fellows. Once you get in a lab, things don't always go as planned and it is important to talk to your colleagues and learn from their expertise.”

Erika Ilagan

Class Year 2007

Major Biochemistry

Research “Biochemical Properties of Simian Immunodeficiency Virus (African Green Monkey) Reverse Transcriptase Variants”. We are focusing on understanding the mechanism of mutation synthesis by SIV RT by analyzing the biochemical and structural properties of these RT fidelity mutants.

“Phosphorylation of Neurabin by ERK2” We discovered phosphorylation sites on the f-actin binding region of the protein, neurabin. We then found that phosphorylation on these sites reduced the affinity of neurabin to f-actin, which in turn affects cell morphology.

“ When I look back and examine how the past year has been with my research , I see both the best and worst sides of me. Working independently in a research lab allowed me to be fully immersed in wet bench research, which complemented my studies. I found myself more motivated to do course work while doing research, because I finally saw the application of what I've been learning. At the same time, being constantly around principal investigators, post-docs, and graduate students can be very humbling – it makes you realize how truly little you know about things. However, the dynamic relationships that you develop with the people you work with, together with the results that you eventually get, are more than enough to compensate with the hard work, occasional sleeplessness and strong determination that all comes with working in biomedical research.

“Do no be disappointed when you at times, especially in the beginning, find yourself a little lost. Learning how to cope with that uncertainty is an important part of your training to become a scientist”.

More Tips and Advice

Approaching Faculty with your Research Ideas and Interests

Approaching a faculty member to serve as your research advisor requires careful planning and preparation. We recommend a two-visit approach, following the steps outlined below, as you begin to make contact with a potential faculty research advisor.

VISIT #1: The first visit has two purposes: for you to meet the faculty and find out about the research he/she is doing, and to help you assess your comfort level in working with the person. Your goal for this first meeting is not to procure a research agreement, but rather to take away a piece of advice or an assignment that you may pursue further. This may be an assignment for further reading, an appointment to tour the lab or research site, a suggestion for another professor or graduate student with whom you should talk.

Before the meeting

Step 1: Conduct background research on the professor's current scholarship, research, and recent publications. Good starting points are the Iliad faculty interests database, professor's personal web pages (usually linked from the departmental web pages), and library online catalogs and databases. Your goal is to identify commonalities in your intellectual interests and to identify topics to discuss during your initial meeting.

Step 2: Plan an agenda, a set of questions, or list of topics to guide your discussion with the faculty member, as well as an idea of what you might like your "assignment" for follow-up to be. Your goal is to go into your meeting with the professor having a clear idea of your interests and a convincing picture of your engagement in the topic.

After Visit #1:

Take some time to reflect upon whether this faculty member would be a good match for your interests and expectations.

Step 3a: If you decide this faculty member is not right for you, write a note thanking the faculty for his/her time, and return any article or book that you may have borrowed. You should always seek to maintain good relations with the faculty member, even if you know you won't likely work with her/him in the near future.

Step 3b: If you are interested in pursuing a research advising relationship with the faculty member, do the assignment you set up at the conclusion of Visit #1: read the article, talk with the graduate or other students in the lab, read some other work the

faculty member has done. Then set up Visit #2

VISIT #2: Plan to focus your conversation on the assignment you have undertaken since Visit #1. Discuss your reactions, questions, and interest in pursuing specific research questions raised in the assignment, etc. Now, the time has come to express that you are very excited about this topic and that you would like to find a way to get more involved through a research assistantship in the lab or working group, a directed reading project, or another research opportunity.

It is possible that the professor will be unable at the time to take on another student. Or you may decide that the professor is not the right intellectual fit for you. You should then ask for a reference to another faculty member with similar areas of interest whom you might approach and begin the two-visit process again. Be sure to send a thank-you note.

Eight Points for Developing a Positive Working Relationship with Your Faculty Mentor

- Initiate a conversation early in your working relationship in which you and your faculty member agree upon expectations and working agreements:

How frequently will you meet face to face? How closely will you work with a graduate student or postdoctoral fellow in addition to the faculty member: What blocks of time, hours of the day, or hours per week, consecutive weeks or quarters will you work? How will you be trained? Will you attend lab or research group meetings, and, if so, will you need to prepare something for them? Will you work in the lab or research area, or is there work you may take home to complete? What kind of final product will you produce?

- Be the active, responsible party in initiating and organizing one-on-one communication: set meeting agendas, prioritize issues you want to discuss, be a leader in discussions.
- Work with your faculty member to set short- and long-term goals and deadlines for the different stages of your project.
- Learn your faculty member's communication habits: when does email suffice, when must you meet face-to-face, and when—if ever—may you call her or him at home?
- Consider sending summaries of meetings (agreements, assignments, work outlines), restating tasks and the division of labor.
- Always read books or articles your faculty member recommends to you and share your responses. Take their suggestions seriously and let them know that their time with you is well-spent.
- Be curious and share your knowledge. The more you do so, the more seriously your work and aspirations will be regarded.
- Always express your thanks after the faculty member has taken the time to meet with you. Send a thank you note or an email stating what you gained from the interaction and how you will to move ahead in your plans.

Guidelines for finding a project

Start with what you know:

Most undergraduates find projects from faculty members from whom they have taken classes. Many professors will make announcements in their classes or post information about available projects at their offices. Some even have links for information on their current research projects at their personal websites. A good place to start your search is to determine a faculty member with whom you may want to work on a project. Check their website to investigate their field of research. If it sounds interesting, approach them about the possibility of helping them with their research or of having an independent project.

Do your research:

If you do not have a specific faculty member in mind, begin by checking the research conducted in your department or the research interests of the faculty in your department. Read about the different types of research that is going on in your department. You may also do projects outside of your major, so consider checking the research being done in other departments, too. Find a field of research that interests you and learn a little more about it. Check the faculty members that are involved in this research area and check their personal websites or their office doors for any information on current projects, or make an appointment to talk with them about any projects. When you find one that looks promising, approach them about working on it.

Before approaching a faculty supervisor:

Please be considerate of the faculty member that you are going to be asking for a project. Try to avoid knocking on their door without any idea of their field of research or current projects. Make sure you have already read about the research they do and show an interest in the topic. Be prepared to tell them of any relevant coursework you have completed or other experience that you have that would be applicable to a project they may have. If possible, write up a short resume outlining these details. If you are responding to an advertised project, take time prior to speaking with them to investigate the project fully. Be prepared with some specific questions and ideas about the project.

FAQs

Can I work on a project outside of my major?

Absolutely. You will find that many research projects, especially larger ones, will need students from different backgrounds and with different skills. For example, an engineering product development project may need someone with knowledge of psychology and human factors to research human interaction with the product.

What if I have my own idea for a project?

Students may work with a faculty member on an existing research project or on a project based on your own ideas. You must have a project advisor, though. If you want to pursue your own project, find a faculty advisor who may be interested in your topic.

I'm not an engineering or science major. Can I still participate?

Definitely, you will find that faculty in all virtually every department in Rochester conduct research and may need undergraduate researchers to assist them. Usually, a brief profile including research interests is included in the "FACULTY" section of a department's webpage.

Do I have to be an upperclassman to do research?

Absolutely not. If you are truly passionate about a certain research area, it would help to express your interest as soon as possible. While some projects may require that you have completed certain classes or labs, it doesn't hurt to express your interest and ask faculty members if they are willing to train and accept students with less experience. Think about our suggested timetable for participating in undergraduate research.

- **As a Freshman:** Gain some basic knowledge through your classes and course projects that could be applied to a research project. Most projects will require knowledge from different fields of study, not just your major. Investigate the research being conducted by the faculty teaching your classes. Determine which research projects interest you personally and express your interest to faculty members.
- **As a Sophomore:** Begin to look more closely at research opportunities in your field of interest. Take more courses by a faculty whose research interests you. Begin working on a resume that outlines the applicable courses you have taken and class projects you have done. Talk with a faculty member about the possibility of doing an independent research project and begin familiarizing yourself with their work.
- **As a Junior:** Take an independent research project for credit, funding or experience. Consider taking projects that last for more than a semester. Consider taking more classes that will assist in your research field.
- **As a Senior:** Continue on the same or a new project. Submit an abstract to a conference detailing the work you have done and/or will finish this year. Include your research project as experience while applying for employment or graduate school.