

A Guide to Undergraduate Research and Internships (REU's)

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This guide is intended for college students looking for research opportunities at their own university or elsewhere and for students looking for ways to succeed in their research work. It is aimed primarily towards Indiana University-Bloomington students, however, it may be useful for any undergraduate.

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“I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.” – Isaac Newton

I. Intro

a. Why research?

If you're passionate about science, undergraduate research is a great way to prepare yourself for graduate school admissions. While med schools do not explicitly require it, undergraduate research is a common factor in admission, and serves as a great way for you to decide if your field of interest is right for you.

Having said that, research significantly differs from doing academic work for college classes. While in a college class, you are fully aware of the material presented, how to solve problems, and what grade you have, research is often much more chaotic, self-styled, and sometimes even unrewarding. The skill sets of doing well in classes and those for research are related, but not identical. This means that you should be prepared to face issues and challenges, but also improve those skills that you might not develop in a classroom that will help you overcome them. It may be spending hours learning a computer programming language or a new technique. But you should focus on obtaining the skills that will help you as a physician or scientist.

II. Research Labs (or elsewhere)

a. How do I get involved in research?

Even if you've never done research before, whether you're a freshman or a senior, getting started is easier than it sounds. Also, for the sake of starting remaining impartial, when I arrived at IU, I didn't have any special scholarship (like Wells, Cox, or STARS) that would automatically place me in a lab. For me, and like most of us, I had to figure out how to find opportunities independently.

The first step is to find a professor in your field of interest. Search around on the IU departmental websites and email professors that interest you. Read some of their abstracts and skim through a few of their important papers. If it truly interests you, and you can show a keen interest in it in the email that you send to the professor, go for it. And, for premed, it doesn't necessarily have to be a biology or chemistry lab. These are the steps I used to get into a research lab that would eventually help me land my first summer internship (which I will describe in the next section).

For the email, start with who you are and what you're studying, then write any experience you have with research or scientific labs (if nothing, that's fine), and then write about how the professor's area of research affects you and why you love it. Show that you're confident and have at least a little scientific knowledge. Don't use informal language such as "Can I join your lab?" That comes off as incompetent. "Would it be possible for us to discuss opportunities?" works much better. To arrange for a time to meet, always ask him/her when he/she is available first. Keep the email short and succinct.

One of my emails was like this:

Dear Prof. XXXXXX,

I'm an undergraduate freshman at IU and majoring in Physics with the hopes of entering a biophysics graduate program. I'm currently taking courses in physics and biology this semester to prepare myself for it.

I'm very interested in research-based models of ecological systems. And I hope to explore areas of research such as this to understand the fundamental physical connections between systems in the natural world. Would it be possible for me to join your lab this semester or this year? I would like to start working as soon as possible. I can meet some time in person whenever you are available.

*Thank you for your time in reading this,
Sincerely,
So-and-so*

If no one gives you a response, don't hesitate to email one final time after a few weeks or so and ask if he/she received your email. You may even consider finding his/her office and stopping by during office hours to ask the professor in person. He/she may be more willing to give you a spot after meeting in person. Some professors may even direct you to other professors who might have openings for undergrads. The number of professors you email isn't that important as long as you find a lab that suits your interests. Don't forget to send short thanks to each professor that responds, whether the response is positive or not.

III. Research Internships

a. How do I get into Research Experiences for Undergraduates (REU's) and similar internships?

If you already have a research opportunity, congratulations! Work hard and enjoy the experience that comes with it. As time goes along, you might find your research exciting, but also wonder how you can branch out? You might want to research something else in your field or explore your own field in greater detail than what's offered at your university. Maybe you want a new experience that can broaden your horizons and let you explore your field of study in greater detail. Fortunately, many universities across the country offer summer Research Experiences for Undergraduates (REU), funded by the National Science Foundation (NSF). These REU's fund transportation, housing, and stipend money (usually \$2,000-\$5,000) for students to join a full-time research lab that interests them to prepare them for a career in science or related fields. While at an REU, you'll make valuable connections, meet motivated students, and get to explore another city for the summer. Each university's summer programs are offered to all undergraduates across the nation, no matter which university he or she attends. They are among the most competitive summer opportunities available, but incredibly prestigious, rewarding, and exciting. Bear in mind that there are other internships that aren't REU's, but are still very similar and style and you should look for and apply to whatever genuinely interests you.

To give an overview of my REU experience, I participated in a ten-week [Bioinformatics REU](#) at Cornell University. When I wasn't working on decoding the RNA of the tomato genome, I'd explore the beautifully serene waterfalls and hills, but also the bustling, exciting cities of upstate New York with the friends I made. Together, we'd go cliff-diving, boat-riding, running, and swimming, too. (Not to mention that the NSF paid for transportation, housing, and food along with a \$5,000 stipend for the 10-week experience.) Overall, participating in an REU was definitely one of the best decisions I've made in my academic career.

As for applying to REU's, it's not uncommon for acceptance rates to be as low as 10% or lower. (My particular REU accepted 19 students out of ~300 applicants.) Rest assured, the low acceptance rates don't mean it's impossible to get acceptance unless you're Albert Einstein, but, rather, the low acceptance rates are the result of three factors: (1). The applications are free. (2). Anyone can apply to any of them, no matter which university you attend. (3). The advent of the Internet has means applying to an REU is solely filling out a form in a few minutes and clicking "Submit." These factors lower the barrier of entry to application so that more and more students apply to these programs. Also, REU's are almost always paid. This means that the university will cover costs for transportation/housing and also provide a competitive stipend from anywhere from \$2,000-\$5,000 for the summer since you will be working full-time during the summer. All of these cause acceptance rates to drop. But, from the knowledge that I've gained from my particular research experience, I wish to provide the best advice for you to maximize your admissions chances.

By the way, if you're a freshman, don't worry that you don't have enough academic and research experience to get into an REU. I was accepted to my Cornell REU after only my freshman year. I believe you can follow my advice that I've learned from my experience to get into the best opportunities no matter what year you are.

b. Application process and tips:

In order to prepare yourself for the application process, you should be looking for ways to improve as a scientist during your undergraduate experience, since that will be the basis for your application's essay and resume. Start looking for REU programs during the fall before the summer for which you want to do research. Read scientific papers from those labs and work hard in your own research work too. Find a passion for what you do so that you can express that in your application.

The applications usually consist of several components, including essays, a resume, and a recommendation letter. I highly, highly recommend making appointments at the IU Career Development Center (<http://ascs.indiana.edu>) for help proofreading essays and resumes. (On a personal note, my original essays were awful, but the Career Development Center smothered them with editing marks and gave me advice on every single part of the application essay. It really made the difference between a lackluster essay and a spectacular one.)

Most applications require one or two essays/personal statements (usually 300-500 words) outlining your interest in the program and why they should choose you as an applicant. It's fine to write a "sample" essay and use it for each application, but make sure to tailor each essay to the specific university or program of interest.

Think of these personal statements like job interviews. Start with a strong statement of what you, as a person, can offer to the program and university. Be genuine, but don't exaggerate yourself. Be sure you show how the actions and activities you're learning at your home institution created those purposes. I'd recommend starting the personal statement with your purpose, then giving some background information about how you got interested, and lead up to a final restatement of your ultimate purpose and why the specific REU/institution can help you achieve your purpose.

As you continue, try to explain how your experience fits your personal description of yourself by offering examples of ways you have demonstrated your abilities in your research or academic experience. For example, you might mention a challenge you overcame in your academic career that showcases the resiliency in yourself. But don't make it seem like a generic fictional exaggeration of yourself. After explaining your experience, connect that to how the specific internship for which you are applying will help you in your journey. Mention your career goals and skills. Show how you are interested in that specific professor/program by mentioning something specific about it. Tie it into your own personal goals and make it unique and genuine. In preparation for my internship application process, I read papers published by the professors who I could possibly be working with, and I identified key areas of those papers that interested me. I described those areas in my essays and reflected on how the subject matter made me become who I am.

I recommend beginning to draft essays near the end of the fall semester (since most applications are due in January or February). I began writing my essays during winter break.

For the recommendation letter, ask your research professor at least a month before the deadline of your first application. If you don't have much one-on-one contact with your professor and you feel he/she might not be able to write an effective letter, you might want to consider asking the grad student you work with to write a letter and have your professor sign it (since most applications require a recommendation letter from a faculty member). Or you could ask your grad student and professor to write the letter together.

One ex-REU Admissions Officer wrote "If you apply to a REU, you should have done at least an hour or two of research on the institution's website. You should have identified one to three researchers at the site whose work interests you. You should have at least skimmed some of their published work, and by this I mean the peer-reviewed papers they have published. In your essay, you should mention them by name and explain what about their work intrigues you."

Make sure that you are conscious of what you are learning from your research. This way, you can reflect on that later. This will allow you to write amazing essays later when it comes time to apply for the internships. I've found that self-reflection has helped me actualize my own thoughts. When I say "self-reflection," it could mean writing down your thoughts and information into a journal as you work. That way, you can reflect on your experiences until you cultivate a purpose behind what you do.

Read his incredibly helpful article here:

<http://www.chemistry-blog.com/2012/03/22/a-brief-guide-to-writing-reu-applications/>

Another helpful article:

<https://sites.google.com/site/stemcareerprep/undergrad-concerns/is-it-better-to-do-research-or-an-internship-as-an-undergrad-1>

c. Undergraduate Research Internship Resources:

NSF's full list of REU's:

http://www.nsf.gov/crssprgm/reu/reu_search.jsp

AAMC (medically-related):

https://www.aamc.org/members/great/61052/great_summerlinks.html

RIT Big list of Internships:

<http://people.rit.edu/gtfsbi/Symp/summer.htm>

IU Biology:

<http://www.bio.indiana.edu/undergraduate/opportunities/research/>

American Psychological Association:

<http://www.apa.org/education/undergrad/research-opps.aspx>

IU Informatics:

<http://www.soic.indiana.edu/research/student-research/>

Mathematics:

<http://www.ams.org/programs/students/undergrad/emp-reu>

d. My research experience and story

After I joined my lab at Indiana University, I soon became obsessed with programming, and I'd spend hours a day learning new languages, writing simple programs, and reading any scientific paper that looked like I could understand it. During my breaks, I'd get as much work done as I could by writing algorithms and scripts for any biological process I could learn about. I'd follow bioinformatics blogs and find inspiration from other scientists elsewhere. Needless to say, I was trying to devote as much time to research and science as I possibly could. In hindsight, it was rather reckless and naïve, and I definitely would have been more relaxed if I were to do it again. But I do believe that my self-motivated, ambitious love of science allowed me to learn how to (and how not to) handle research experience. And, from my heedless search for knowledge, I learned how to be more strategic in my research experience and REU application process.

And, finally, a few words of advice from Jake:



Best of luck with everything, and I hope you've found this guide helpful in some way or another. If you have any further questions about the application process, the REU experience, or anything else research-related, feel free to send me an email (sather@umail.iu.edu).